

Registration Form

Surface Water Production CEU Training Course \$150.00
48 HOUR RUSH ORDER PROCESSING FEE ADDITIONAL \$50.00

Start and Finish Dates: _____

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

Name _____ **Signature** _____

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

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Email _____ **Fax (____)** _____

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

Operator ID # _____ **Exp Date** _____

Class/Grade _____

Your certificate will be mailed 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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***We will stop mailing the certificate of completion so we need your e-mail address.
We will e-mail the certificate to you, if no e-mail address; we will mail it to you.***

DISCLAIMER NOTICE

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

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

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

State Approval Listing URL...

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

You can obtain a printed version of the course manual from TLC for an additional \$79.95 plus shipping charges.

AFFIDAVIT OF EXAM COMPLETION

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

Grading Information

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

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

Thank you...

Surface Water Production Answer Key

Name _____

Phone _____

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

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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.**

Rush Grading Service

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

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

Grading Information

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

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

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

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E-MAIL _____ PHONE _____

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

1. Please rate the difficulty of your course.

Very Easy 0 1 2 3 4 5 Very Difficult

2. Please rate the difficulty of the testing process.

Very Easy 0 1 2 3 4 5 Very Difficult

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

Very Similar 0 1 2 3 4 5 Very Different

4. How did you hear about this Course? _____

5. What would you do to improve the Course?

How about the price of the course?

Poor _____ Fair _____ Average _____ Good _____ Great _____

How was your customer service?

Poor _____ Fair _____ Average _____ Good _____ Great _____

Any other concerns or comments.

SURFACE WATER PRODUCTION CEU TRAINING COURSE ASSIGNMENT

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

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

Multiple Choice, pick one answer only. All answers come exactly from the text.

Safe Drinking Water Act Terms

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. Within 30
 - E. None of the above

2. Class V Underground Injection Control (UIC) rule under development _____ not included in Class I, II, III or IV in which nonhazardous fluids are injected into or above underground sources of drinking water.
 - A. Alternative monitoring
 - B. Covering wells
 - C. When contaminants are detected
 - D. Reasonably available
 - E. None of the above

3. _____ is the process of identifying and inventorying contaminant sources within delineated source water protection areas through recording existing data, describing sources within the source water protection area, targeting likely sources for further investigation, collecting and interpreting new information on existing or potential sources through surveys, and verifying accuracy and reliability of the information gathered.
 - A. Drinking Water State Revolving Fund
 - B. Contamination Source Inventory
 - C. Class V Underground Injection Control
 - D. Sole Source Aquifer
 - E. None of the above

4. _____ is protozoan associated with the disease cryptosporidiosis in humans. The disease can be transmitted through ingestion of drinking water, person-to-person contact, or other exposure routes.
 - A. Giardia lamblia
 - B. Virus
 - C. Cryptosporidium
 - D. None of the above

5. _____ 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, source water protection, to enhance operations and management of drinking water systems, and other activities to encourage public water system compliance and protection of public health.
- Drinking Water State Revolving Fund
 - Contamination Source Inventory
 - Class V Underground Injection Control
 - Sole Source Aquifer
 - None of the above
6. _____ is a protozoan, which can survive in water for 1 to 3 months, associated with the disease giardiasis.
- Giardia lamblia
 - Virus
 - Cryptosporidium
 - Gastrointestinal bug
 - None of the above
7. The symptoms of this _____ disease may persist for weeks or months and include diarrhea, fatigue, and cramps.
- Giardia lamblia
 - Virus
 - Cryptosporidium
 - Gastrointestinal
 - None of the above
8. _____ is under section 107 of the SDWA Amendments of 1996, the statute reads, ". . . the Administrator shall also promulgate national primary drinking water regulations requiring disinfection as a treatment technique for all public water systems, including surface water systems, and as necessary, ground water systems."
- Ground Water Disinfection Rule
 - Maximum Contaminant Level
 - Maximum Contaminant Level Goal
 - The Safe Drinking Water Act
 - None of the above
9. In the SDWA, a(n) _____ is defined as "the maximum permissible level of a contaminant in water which is delivered to any user of a public water system." MCLs are enforceable standards.
- Ground Water Disinfection Rule
 - Maximum Contaminant Level
 - Maximum Contaminant Level Goal
 - The Safe Drinking Water Act
 - None of the above
10. _____ is the maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on the health effect of persons would occur, and which allows for an adequate margin of safety.
- Ground Water Disinfection Rule
 - Maximum Contaminant Level
 - Maximum Contaminant Level Goal
 - The Safe Drinking Water Act
 - None of the above

11. _____ is a unit of measure used to describe the turbidity of water. Turbidity is the cloudiness in water.
- A. Jackson unit
 - B. Secchi disk machine SDM
 - C. Cloudy water unit
 - D. Nephelometric Turbidity Unit
 - E. None of the above
12. _____ in drinking water are associated with methemoglobinemia, or blue baby syndrome, which results from interferences in the blood's ability to carry oxygen.
- A. Inorganic compounds
 - B. Nitrates
 - C. Organics
 - D. Radionuclides
 - E. None of the above
13. _____ contaminants of concern to drinking water include chlorohydrocarbons, pesticides, and others.
- A. Inorganic compounds
 - B. Nitrates
 - C. Organic
 - D. Radionuclides
 - E. None of the above
14. Phase I Contaminants. The Phase I Rule became effective on January 9, 1989. This rule, also called the _____, set water quality standards for 8 VOCs and required all community and Non-Transient, Non-Community water systems to monitor for, and if necessary, treat their supplies for these chemicals.
- A. Surface Water Treatment Rule
 - B. Volatile Organic Chemical Rule
 - C. Volatile Inorganic Chemical Rule
 - D. Clean Water Act
 - E. None of the above
15. The 8 VOCs regulated under this rule are: Benzene, _____, para-dichlorobenzene, trichloroethylene, vinyl chloride, 1,1,2-trichloroethane, 1,1-dichloroethylene, and 1,2-dichloroethane.
- A. Inorganic compounds
 - B. Nitrates
 - C. Carbon Tetrachloride
 - D. Radionuclides
 - E. None of the above
16. _____; generally used in expressions of water use, gallons per capita per day (gpcd).
- A. One person per day
 - B. Per capita Per person
 - C. Per day per person
 - D. None of the above
17. _____ Water Treatment. Refers to devices used in the home or office on a specific tap to provide additional drinking water treatment.
- A. Point-of-Use
 - B. Per capita
 - C. Point-of-Entry
 - D. Sole Source Aquifer
 - E. None of the above

18. _____ are elements that undergo a process of natural decay. As radionuclides decay, they emit radiation in the form of alpha or beta particles and gamma photons.
- A. Inorganic compounds
 - B. Nitrates
 - C. Organics
 - D. Radionuclides
 - E. None of the above
19. _____ can cause adverse health effects, such as cancer, so limits are placed on radionuclide concentrations in drinking water.
- A. Inorganic compounds
 - B. Nitrates
 - C. Radiation
 - D. Organics
 - E. None of the above
20. _____ was first passed in 1974 and established the basic requirements under which the nation's public water supplies were regulated.
- A. Surface Water Treatment Rule
 - B. The Safe Drinking Water Act
 - C. Volatile Inorganic Chemical Rule
 - D. Clean Water Act
 - E. None of the above
21. The US Environmental Protection Agency (EPA) is responsible for setting the national drinking water regulations, while individual states are responsible for ensuring that public water systems under their jurisdiction are complying with the regulations. The _____ was amended in 1986 and again in 1996.
- A. Surface Water Treatment Rule
 - B. The Safe Drinking Water Act
 - C. Volatile Inorganic Chemical Rule
 - D. Clean Water Act
 - E. None of the above
22. _____ is a facility or activity that stores, uses, or produces chemicals or elements, and that has the potential to release contaminants identified in a state program (contaminants with MCLs plus any others a state considers a health threat) within a source water protection area in an amount which could contribute significantly to the concentration of the contaminants in the source waters of the public water supply.
- A. Drinking Water State Revolving Fund
 - B. Significant Potential Source of Contamination
 - C. Class V Underground Injection Control
 - D. Sole Source Aquifer
 - E. None of the above
23. _____ Designation is the surface area above a sole source aquifer and its recharge area.
- A. Karst
 - B. Confined
 - C. Point-of-Entry
 - D. Sole Source Aquifer
 - E. None of the above

24. _____ is the area delineated by the state for a PWS or including numerous PWSs, whether the source is ground water or surface water or both, as part of the state SWAP approved by the EPA under section 1453 of the SDWA.

- A. Source Water Protection Area
- B. Confined aquifer
- C. Unconfined aquifer
- D. Sole Source Aquifer
- E. None of the above

25. _____ is a topographic boundary that is the perimeter of the catchment area of a tributary of a stream.

- A. Source Water Protection Area
- B. Sub-watershed
- C. Confined aquifer
- D. Unconfined aquifer
- E. None of the above

26. _____ is a state program implemented in accordance with the statutory language at section 1454 of the SDWA to establish local voluntary incentive-based partnerships for SWP and remediation.

- A. Drinking Water State Revolving Fund
- B. Contamination Source Inventory
- C. Class V Underground Injection Control
- D. State Source Water Petition Program
- E. None of the above

27. State Management Plan (SMP) Program. A state management plan under FIFRA required by the EPA to allow states (e.g. states, tribes and U.S. territories) the flexibility to design and implement approaches to manage the use of certain _____ to protect ground water.

- A. Inorganic compounds
- B. Nitrates
- C. Pesticides
- D. Virus
- E. None of the above

28. SWTR rule specifies maximum contaminant level goals for _____, viruses and Legionella, and promulgated filtration and disinfection requirements for public water systems using surface water sources, or by ground water sources under the direct influence of surface water.

- A. Giardia lamblia
- B. Inorganic compounds
- C. Nitrates
- D. Gastrointestinal diseases
- E. None of the above

29. The above regulations also specify water quality, treatment, and watershed protection criteria under which filtration may be avoided.

- A. Surface Water Treatment Rule
- B. The Safe Drinking Water Act
- C. Volatile Inorganic Chemical Rule
- D. Clean Water Act
- E. None of the above

30. _____ is used to determine, with a clear understanding of where the significant potential sources of contamination are located, the susceptibility of the public water systems in the source water protection area to contamination from these sources.
- A. Source Water Protection Area surveys
 - B. Sub-watershed analysis
 - C. Susceptibility Analysis
 - D. Inspection
 - E. None of the above
31. States must inventory sources of contamination to the extent they have the technology and resources to complete an inventory for a _____ delineated as described in the guidance.
- A. Source Water Protection Area
 - B. Sub-watershed area
 - C. Confined aquifer
 - D. Unconfined aquifer
 - E. None of the above
32. This system serves 25 non-resident persons per day for 6 months or less per year.
- A. Transient/Non-Transient, Community Water System
 - B. Transient/Non-Transient, Non-Community Water Systems
 - C. Public Water System Transient/Non-Transient,
 - D. Transient/Non-Transient, Private Water System
 - E. None of the above
33. This system serve at least 25 of the same non-resident persons per day for more than 6 months per year.
- A. Community Water System
 - B. Non-Community Water Systems
 - C. Public Water System Transient/Non-Transient,
 - D. Private Water System
 - E. None of the above
34. A specific treatment method required by the EPA to be used to control the level of a contaminant in drinking water.
- A. Ozone
 - B. RO
 - C. Treatment technique
 - D. Slow sand
 - E. None of the above
35. A treatment technique is a(n) _____ procedure or level of technical performance which public water systems must follow to ensure control of a contaminant.
- A. Civil action
 - B. Non-enforceable
 - C. Enforceable
 - D. Feasible
 - E. None of the above
36. Bacteria that are used as indicators of _____ in drinking water.
- A. Giardia lamblia
 - B. Total Coliform
 - C. Cryptosporidium
 - D. Fecal contaminants
 - E. None of the above

37. _____ is the property of a chemical to harm people who come into contact with it.

- A. Inorganic compound
- B. Odoriferous
- C. Toxicity
- D. Dangerous
- E. None of the above

38. Underground Injection Control (UIC) Program. The program is designed to prevent underground injection which endangers drinking water sources. The program applies to _____ and operators on Federal facilities, Native American lands, and on all U.S. land and territories.

- A. Wellhead Protection Area
- B. Treatment Technique
- C. Contamination Source Inventory
- D. Injection well owners
- E. None of the above

39. _____ is a topographic boundary area that is the perimeter of the catchment area of a stream.

- A. Wellhead Protection Area
- B. Watershed
- C. Contamination Source area
- D. Drawdown
- E. None of the above

40. _____ is a coordinating framework for environmental management that focuses public and private sector efforts to address the highest priority problems within hydrologically-defined geographic areas, taking into consideration both ground and surface water flow.

- A. Wellhead Protection Area
- B. Treatment Technique
- C. Contamination Source Inventory
- D. Watershed Approach
- E. None of the above

41. EPA is directed to conduct drinking water studies involving subpopulations at greater risk and biological mechanisms, and studies to support several rules including those addressing D/DBPs and _____.

- A. Global warming
- B. Population control
- C. Pharmaceuticals
- D. Cryptosporidium
- E. None of the above

SDWA Water Quality Information and MCLs

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

- A. Inorganic radiation
- B. Nitrates
- C. Organics
- D. Radioactive
- E. None of the above

43. Certain minerals are radioactive and may emit forms of radiation known as photons and _____.

- A. Inorganic radiation
- B. Beta radiation
- C. Organics
- D. Radioactive
- E. None of the above

44. Some people who drink water containing beta and photon emitters in excess of EPA standards over many years may have an increased risk of getting _____.

- A. Colitis
- B. Cancer
- C. Acute radon
- D. Poisoning
- E. None of the above

45. Some people who drink water containing _____ in excess of EPA standards over many years may have an increased risk of getting cancer.

- A. Inorganic radiation
- B. Beta radiation
- C. Radium 226 or 228
- D. Radioactive
- E. None of the above

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

- A. Radon
- B. Beta radiation
- C. Organics
- D. Radioactive
- E. None of the above

Inorganic Contaminants

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

- A. Inorganic compounds
- B. Nitrates
- C. Arsenic
- D. Fluoride
- E. None of the above

48. Each community makes its own decision about whether or not to add _____.

- A. Inorganic compounds
- B. Nitrates
- C. Arsenic
- D. Fluoride
- E. None of the above

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

- A. 4 mg/L
- B. 2 mg/L
- C. 50 parts per billion
- D. 100 parts per billion
- E. None of the above

50. The EPA has also set a secondary fluoride standard of _____ to protect against dental fluorosis.

- A. 4 mg/L
- B. 2 mg/L
- C. 50 parts per billion
- D. 100 parts per billion
- E. None of the above

51. Dental fluorosis, in its moderate or severe forms, may result in a brown staining and/or pitting of the permanent teeth. This problem occurs only in developing teeth, before they erupt from the gums. Children under nine should not drink water that has more than _____ of fluoride.

- A. 4 mg/L
- B. 2 mg/L
- C. 50 parts per billion
- D. None of the above

52. _____ pipes and plumbing fittings have been banned since August 1998.

- A. Copper
- B. Concrete
- C. Plastic
- D. Lead
- E. None of the above

New EPA Water Rules

53. _____ is a chemical that occurs naturally in the earth's crust.

- A. Inorganic compounds
- B. Nitrates
- C. Arsenic
- D. Radionuclides
- E. None of the above

54. When people either drink this water or eat animals and plants that drink it, they are exposed to arsenic. In the U.S., eating and drinking are the most common ways that people are exposed to arsenic, although it can also come from industrial sources. Studies have linked long-term exposure of arsenic in drinking water to a variety of _____ in humans.

- A. Colitis
- B. Cancer
- C. Acute radon
- D. Poisoning
- E. None of the above

55. To protect human health, an EPA standard limits the amount of arsenic in drinking water. Back in January 2001, the EPA revised the standard from 50 parts per billion (ppb), ordering that it fall to _____ by 2006.

- A. 4 mg/L
- B. 10 ppb
- C. 50 parts per billion
- D. 100 parts per billion
- E. None of the above

56. After adopting _____ as the new standard for arsenic in drinking water, the EPA decided to review the decision to ensure that the final standard was based on sound science and accurate estimates of costs and benefits. In October 2001, the EPA decided to move forward with implementing the 10ppb standard for arsenic in drinking water.

- A. 10 ppb
- B. 2 mg/L
- C. 50 parts per billion
- D. 100 parts per billion
- E. None of the above

ICR Information Collection Rule

57. The EPA has collected data required by the Information Collection Rule (ICR) to support future regulation of microbial contaminants, disinfectants, and _____.

- A. Disinfection byproducts
- B. Inorganics
- C. Turbidity
- D. Pesticides
- E. None of the above

58. The ICR rule is intended to provide the 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 _____, including Cryptosporidium; and engineering data to control these contaminants.

- A. Disinfection byproducts
- B. Inorganics
- C. Microorganisms
- D. Pesticides
- E. None of the above

59. Currently trihalomethanes are regulated at a maximum allowable annual average level of _____ for water systems serving over 10,000 people under the Total Trihalomethane Rule finalized by the EPA in 1979.

- A. 4 mg/L
- B. 2 mg/L
- C. 50 parts per billion
- D. 100 parts per billion
- E. None of the above

60. The Stage 1 Disinfectant/Disinfection Byproduct Rule standards became effective for trihalomethanes and other disinfection byproducts listed above in December 2001 for _____ surface water public water systems.

- A. Small
- B. Large
- C. Medium
- D. Private
- E. None of the above

61. Disinfection byproducts are formed when disinfectants used in water treatment plants react with _____ and/or natural organic matter (i.e., decaying vegetation) present in the source water. Different disinfectants produce different types or amounts of disinfection byproducts.
- A. Bromate
 - B. Monochloramine
 - C. Chloroform
 - D. Bromide
 - E. None of the above
62. Disinfection byproducts for which regulations have been established have been identified in drinking water, including trihalomethanes, haloacetic acids, _____, and chlorite.
- A. Bromate
 - B. Monochloramine
 - C. Chloroform
 - D. Dichloramine
 - E. None of the above
63. Trihalomethanes (THM) are a group of four chemicals that are formed along with other disinfection byproducts when chlorine or other disinfectants used to control microbial contaminants in drinking water react with naturally occurring _____ and inorganic matter in water.
- A. Oxygen
 - B. Solids
 - C. Turbidity
 - D. Organics
 - E. None of the above
64. The trihalomethanes are _____, bromodichloromethane, dibromochloromethane, and bromoform.
- A. Bromine
 - B. Monochloramine
 - C. Chloroform
 - D. Dichloramine
 - E. None of the above
65. The EPA has published the Stage 1 Disinfectants/Disinfection Byproducts Rule to regulate total trihalomethanes (TTHM) at a maximum allowable annual average level of _____.
- A. 4 mg/L
 - B. 2 mg/L
 - C. 80 parts per billion
 - D. 100 parts per billion
 - E. None of the above
66. Haloacetic Acids (HAA5) are a group of chemicals that are formed along with other disinfection byproducts when chlorine or other disinfectants used to control microbial contaminants in drinking water react with naturally occurring _____ and inorganic matter in water.
- A. Acid
 - B. Solid
 - C. Material
 - D. Organics
 - E. None of the above

67. The regulated haloacetic acids, known as HAA5, are: _____, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid.

- A. Bromine acids
- B. Monochloramine acids
- C. Monochloroacetic acid
- D. Dichloramine acids
- E. None of the above

68. The EPA has published the Stage 1 Disinfectants/Disinfection Byproducts Rule to regulate HAA5 at _____ annual average.

- A. 4 mg/L
- B. 2 mg/L
- C. 60 parts per billion
- D. 100 parts per billion
- E. None of the above

69. Bromate is a chemical that is formed when ozone used to disinfect drinking water reacts with naturally occurring bromide found in source water. The EPA has established the Stage 1 Disinfectants/Disinfection Byproducts Rule to regulate bromate at annual average of _____ in drinking water.

- A. 4 mg/L
- B. 2 mg/L
- C. 50 parts per billion
- D. 10 parts per billion
- E. None of the above

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

- A. 4 mg/L
- B. 2 mg/L
- C. 50 parts per billion
- D. 1 parts per million
- E. None of the above

Microbial Regulations

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

- A. Pathogens
- B. Organics
- C. Purification
- D. Contaminants
- E. None of the above

72. Among its provisions, the rule requires that a public water system, using surface water (or ground water under the direct influence of surface water) as its source, have sufficient treatment to reduce the source water concentration of Giardia and _____ by at least 99.9% and 99.99%, respectively.

- A. Viruses
- B. Organics
- C. Purification
- D. Contaminants
- E. None of the above

73. The Surface Water Treatment Rule specifies treatment criteria to assure that these performance requirements are met; they include _____, disinfectant residual, and disinfectant contact time conditions.

- A. Turbidity limits
- B. Organic limits
- C. Purification
- D. Contaminants
- E. None of the above

74. The Interim Enhanced Surface Water Treatment Rule was established in December 1998 to control _____, and to maintain control of pathogens while systems lower disinfection byproduct levels to comply with the Stage 1 Disinfectants/Disinfection Byproducts Rule.

- A. Total coliform
- B. Giardia lamblia
- C. Turbidity
- D. Cryptosporidium
- E. None of the above

75. The EPA established a Maximum Contaminant Level Goal (MCLG) of zero for all public water systems and a 99% removal requirement for _____ in filtered public water systems that serve at least 10,000 people.

- A. Total coliform
- B. Giardia lamblia
- C. Turbidity
- D. Cryptosporidium
- E. None of the above

76. _____ is an indicator of the physical removal of particulates, including pathogens.

- A. Organics
- B. Turbidity
- C. Purification
- D. Contaminants
- E. None of the above

77. The EPA is also planning to develop other rules to further control pathogens. The EPA has promulgated a Long Term 1 Enhanced Surface Water Treatment Rule, for systems serving fewer than 10,000 people, to improve physical removal of _____, and to maintain control of pathogens while systems comply with Stage 1 Disinfectants/Disinfection Byproducts Rule.

- A. Cryptosporidium
- B. Organics
- C. Purification
- D. Contaminants
- E. None of the above

Microbes

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

- A. And Viruses
- B. and Organics
- C. Bacteria
- D. Contaminants
- E. None of the above

79. Fecal Coliform and E. coli are _____ whose presence indicates that the water may be contaminated with human or animal wastes.
- A. Viruses
 - B. Organics
 - C. Bacteria
 - D. Contaminants
 - E. None of the above
80. Microbes in these wastes can cause short-term effects, such as _____, cramps, nausea, headaches, or other symptoms.
- A. Diarrhea
 - B. Cryptosporidiosis
 - C. Depression
 - D. Loss of sight
 - E. None of the above
81. Cryptosporidium is a parasite that enters lakes and rivers through sewage and animal waste. It causes _____, a mild gastrointestinal disease.
- A. Diarrhea
 - B. Cryptosporidiosis
 - C. Depression
 - D. Loss of sight
 - E. None of the above
82. The disease can be severe or _____ for people with severely weakened immune systems. The EPA and CDC have prepared advice for those with severely compromised immune systems who are concerned about Cryptosporidium.
- A. Chronic
 - B. Acute
 - C. Cancerous
 - D. Fatal
 - E. None of the above
83. Giardia lamblia is a parasite that enters lakes and rivers through sewage and animal waste. It causes _____ (e.g. diarrhea, vomiting, and cramps).
- A. Gastrointestinal illness
 - B. Cryptosporidiosis
 - C. Depression
 - D. Loss of touch
 - E. None of the above
84. _____ is manufactured from aluminum hydroxide by dehydroxylating it in a way that produces a highly porous material; this material can have a surface area significantly over 200 square meters/g.
- A. Activated alumina
 - B. Fluoride
 - C. Activated carbon
 - D. Dissolved organic carbon
 - E. None of the above

85. This compound is used as a desiccant (to keep things dry by absorbing water from the air) and as a filter of _____, arsenic and selenium in drinking water.

- A. Activated alumina
- B. Fluoride
- C. Activated carbon
- D. Dissolved organic carbon
- E. None of the above

86. This compound is made of _____(alumina; Al_2O_3), the same chemical substance as sapphire and rubies (but without the impurities that give those gems their color).

- A. Activated alumina
- B. Fluoride
- C. Activated carbon
- D. Aluminum oxide
- E. None of the above

87. _____ is also called activated charcoal or activated coal, is a form of carbon that 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. GOC
- C. Activated carbon
- D. Organic carbon
- E. None of the above

88. Due to its high degree of microporosity, just one gram of _____ has a surface area of approximately 500 m², as determined typically by nitrogen gas adsorption.

- A. Activated alumina
- B. Fluoride
- C. Activated carbon
- D. Dissolved organic carbon
- E. None of the above

89. Sufficient activation for useful applications may come solely from the high surface area, though further chemical treatment often enhances the adsorbing properties of the material. _____ is usually derived from charcoal.

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

90. _____ is a broad classification for organic molecules of varied origin and composition within aquatic systems.

- A. Activated alumina
- B. Fluoride
- C. Activated carbon
- D. Dissolved organic carbon
- E. None of the above

91. The "dissolved" fraction of _____ is an operational classification. Many researchers place the dissolved/colloidal cutoff at 0.45 micrometers, but 0.22 micrometers is also typical.
- A. Activated alumina
 - B. Organic carbon
 - C. Activated carbon
 - D. Fluoride
 - E. None of the above
92. EDTA is a widely used abbreviation for the chemical compound _____.
- A. Activated alumina
 - B. Electrodialysis acid
 - C. Ethylenediaminetetraacetic acid
 - D. Dissolved organic carbon
 - E. None of the above
93. _____ refers to the chelating agent with the formula $(\text{HO}_2\text{CCH}_2)_2\text{NCH}_2\text{CH}_2\text{N}(\text{CH}_2\text{CO}_2\text{H})_2$. This amino acid is widely used to sequester di- and trivalent metal ions (Ca^{2+} and Mg^{2+} for example).
- A. EDTA
 - B. Fluoride
 - C. Activated carbon
 - D. Dissolved organic carbon
 - E. None of the above
94. _____ forms especially strong complexes with $\text{Mn}(\text{II})$, $\text{Cu}(\text{II})$, $\text{Fe}(\text{III})$, $\text{Pb}(\text{II})$ and $\text{Co}(\text{III})$.
- A. Activated alumina
 - B. Ethylenediaminetetraacetic acid (EDTA)
 - C. Activated carbon
 - D. Dissolved organic carbon
 - E. None of the above
95. _____ recovery is an improved method and apparatus for recovering metal values from Electric Arc Furnace dust, particularly zinc and iron values, by mixing EAF dust and carbonaceous fines to form a particulate mixture; heating the mixture at a sufficient temperature and for a sufficient time to reduce and release volatile metals and alkali metals in a flue gas; collecting the released metals, and removing the metal values from the process as product.
- A. Nanofiltration
 - B. High temperature metals
 - C. Microfiltration
 - D. Dissolved organic carbon
 - E. None of the above
96. _____ 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. None of the above

97. _____ is a relatively recent membrane process used most often with low total dissolved solids water such as surface water and fresh groundwater, with the purpose of softening (polyvalent cation removal) and removal of disinfection by-product precursors such as natural organic matter and synthetic organic matter.

- A. Nanofiltration
- B. Semi-permeable
- C. Microfiltration
- D. Dissolved organic carbon
- E. None of the above

98. Safe Drinking Water Act (SDWA)

The major elements of Safe Drinking Water Act include: The law updates _____ process by focusing regulations on contaminants known to pose greater public health risks.

- A. The standard-setting
- B. Every three years
- C. At least five new candidate
- D. Levels of regulated contaminants
- E. None of the above

99. It replaces the current law's demand for 25 new standards _____ with a new process based on occurrence, relative risk and cost-benefit considerations.

- A. The standard-setting
- B. Every three years
- C. At least five new candidate
- D. Levels of regulated contaminants
- E. None of the above

100. It also requires the EPA to select _____ contaminants to consider for regulation every five years.

- A. The standard-setting
- B. Every three years
- C. At least five new candidate
- D. Levels of regulated contaminants
- E. None of the above

101. The EPA is directed to require public water systems to provide customers with annual _____ in newspapers and by direct mail.

- A. The standard-setting
- B. Consumer Confidence Reports
- C. Health concerns
- D. Maximum Contaminant Levels
- E. None of the above

102. The reports must list levels of regulated contaminants along with _____ (MCLs) and Maximum Contaminant Level Goals (MCLGs), along with plainly worded definitions of both.

- A. The standard-setting of
- B. Consumer Confidence Reports and
- C. Minimum Containment Level
- D. Maximum Contaminant Levels
- E. None of the above

103. The reports must also include a plainly worded statement of the _____ for any contaminants for which there has been a violation, describe the utility's sources of drinking water and provide data on unregulated contaminants for which monitoring is required, including Cryptosporidium and radon.

- A. The standard-setting
- B. Consumer Confidence Reports
- C. Health concerns
- D. Maximum Contaminant Levels
- E. None of the above

104. Although the EPA will continue to provide policy, regulations and guidance, state governments will now have more _____ allowing for improved communication between water providers and their local regulators.

- A. Standard-setting
- B. Consumer Confidence Reports
- C. Regulatory flexibility
- D. Maximum Contaminant Levels
- E. None of the above

105. States that have a source water assessment program may adopt alternative monitoring requirements to provide _____ for public water systems in accordance with EPA guidance.

- A. Standard-setting
- B. Permanent monitoring relief
- C. At least five new candidate
- D. Levels of regulated contaminants
- E. None of the above

106. This is the primary Federal legislation protecting drinking water supplied by _____ (those serving more than 25 people).

- A. Public water systems
- B. Consumer Confidence Reports
- C. Health concerns
- D. Maximum Contaminant Levels
- E. None of the above

107. The _____ is the lead agency and is mandated to set standards for drinking water.

- A. Federal government
- B. NRWA
- C. State official
- D. EPA
- E. None of the above

Water Treatment Section

108. The treatment needs of a water system are likely to differ depending on whether the system uses a _____ or surface water source.

- A. Groundwater
- B. Tap water
- C. Bottled water
- D. Purchased water
- E. None of the above

109. Common surface water contaminants include _____, microbiological contaminants (Giardia, viruses and bacteria) and low levels of varying types of organic chemicals.

- A. Untreated sewage
- B. Untreated Industrial waste
- C. Large debris
- D. Turbidity
- E. None of the above

110. Groundwater contaminants include naturally occurring inorganic chemicals (such as arsenic, fluoride, radium, radon and nitrate) and a number of _____ (VOCs) that have recently been detected in localized areas.

- A. Volatile organic chemicals
- B. Untreated Industrial waste
- C. Volatile organ compounds
- D. Turbidity
- E. None of the above

111. When selecting among the different treatment options, the water supplier must consider a number of factors. These include regulatory requirements, characteristics of the _____, configuration of the existing system, cost, operating requirements and future needs of the service area.

- A. Raw water
- B. Consumer confidence
- C. Change of climate
- D. Pumping
- E. None of the above

Preliminary Treatment

112. Most lakes and reservoirs are not free of logs, tree limbs, sticks, gravel, sand and rocks, 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. None of the above

113. Bar screens are made of straight steel bars at the intake of the plant. The spacing of the horizontal bars _____.

- A. Vary in size
- B. Will rank the size
- C. Depends on intake
- D. Size does not matter
- E. None of the above

114. Wire mesh screens are woven stainless steel material and the opening of the fabric is narrow. They require _____.

- A. Manual cleaning
- B. Automatic cleaning
- C. No cleaning
- D. Replacement
- E. None of the above

115. Mechanical bar screens vary in size and use some type of raking mechanism that travels horizontally down the bars to scrap the debris off. The type of screening used depends on the _____ and the size of the intake.

- A. Organics
- B. Fish
- C. Flow rate
- D. Raw water
- E. None of the above

Pre-Sedimentation

116. Once the water passes the bar screens, sand and grit are still present. This will damage plant equipment and pipes, so it must be removed. This is generally done with either rectangular- or round-shaped basin prior to _____

- A. Filtration
- B. Coagulation
- C. Purification
- D. Flocculation
- E. None of the above

117. Sedimentation basins are also used after the _____ process.

- A. Filtration
- B. Coagulation
- C. Purification
- D. Flocculation
- E. None of the above

118. Let's first look at the components of a rectangular clarifier. Most are designed with scrapers on the bottom to move the settled sludge to one or more hoppers at the influent end of the tank. It could have a _____ or traveling bridge used to collect the sludge.

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

119. The most common is a _____ collector. Most designs will have baffles to prevent short circuiting and scum from entering the effluent.

- A. Screw conveyor
- B. Conveyor belts and
- C. Dissolved air floatation
- D. Chain and flight
- E. None of the above

Flights and Chains

120. They move the settled sludge to the hopper in the clarifier for return and they also remove the scum from the _____ of the basin.

- A. Supernate
- B. Surface
- C. Scum box
- D. Armature
- E. None of the above

121. The flights are usually _____ flights mounted on parallel chains. The motor shaft is connected through a gear reducer to a shaft which turns the drive chain.

- A. Steel or brass
- B. Concrete
- C. Wood or nonmetallic
- D. Stainless steel
- E. None of the above

122. The drive chain _____ the drive sprockets and the head shafts. The shafts can be located overhead or below.

- A. Pushes
- B. Pulls
- C. Turns
- D. Travels
- E. None of the above

123. Some clarifiers may not have scum removal equipment, so the configuration of the shaft may vary. As the flights travel across the bottom of the clarifier, _____ are used to protect the flights.

- A. Wearing washers
- B. Wear rings
- C. Bearings
- D. Wearing shoes
- E. None of the above

124. To prevent damage due to overloads, a _____ is used.

- A. Bearings
- B. Gaskets
- C. Shear pin
- D. Ropes
- E. None of the above

125. The gear moves the drive chain. If a heavy load is put on the sludge collector system then the shear pin should break. This means that the gear would _____ around the shaft and movement of the drive chain would stop.

- A. Freeze up
- B. Simply slide
- C. Crack
- D. None of the above

Circular Clarifiers

126. In some circular or square tanks, _____ are used. The most common type has a center pier or column.

- A. Rotating scrapers
- B. Conveyor belts
- C. Dissolved air floatation
- D. Manual skimmers
- E. None of the above

127. The major mechanic parts of the clarifier are the _____; the sludge collector mechanism, and the scum removal system.

- A. Screw conveyor
- B. Conveyor belts
- C. Drive unit
- D. Chain and flight
- E. None of the above

128. Suspended particles carry an electrical charge which causes them to _____ one another.

- A. Attract
- B. Repel
- C. Disperse
- D. Mimic
- E. None of the above

129. The conventional process uses _____ and cationic polymer to neutralize the charge. That allows suspended particles to clump together to form more easily filtered particles.

- A. Alkalinity
- B. Alum (aluminum sulfate)
- C. Powdered activated carbon
- D. Chlorine
- E. None of the above

130. Alum combines with alkalinity in the _____ to form a white precipitate that neutralizes suspended particles' electrical charge and forms a base for coagulating those particles.

- A. Conventional technology
- B. Reconditioning cycle
- C. Raw water
- D. Depth filter
- E. None of the above

131. _____ 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. None of the above

132. Traditional filter systems use graded silica _____. Since the sand grains all have about the same density, larger grains lay toward the bottom of the filter bed and finer grains lay at the top of the filter bed.

- A. Conventional technology
- B. Sand filter media
- C. Traditional sand filter
- D. None of the above

133. Filtration occurs only within the first few inches of the _____ at the top of the bed.

- A. Conventional technology
- B. Reconditioning cycle
- C. Finer grains
- D. Depth filter
- E. None of the above

134. A depth filter has four layers of filtration media, each of different size and density. Light, coarse material lies at the top of the _____.

- A. Conventional technology
- B. Filter bed
- C. Traditional sand filter
- D. Depth filter
- E. None of the above

135. The media become progressively finer and denser in the lower layers. Larger suspended particles are removed by the _____ while smaller particles are removed in the lower layers.

- A. Conventional technology
- B. Reconditioning cycle
- C. Traditional sand filter
- D. Upper layers
- E. None of the above

136. Particles are trapped throughout the bed, not in just the top few inches. That allows a depth filter to run substantially longer and use less backwash water than a _____.

- A. Conventional technology
- B. Reconditioning cycle
- C. Traditional sand filter
- D. Depth filter
- E. None of the above

137. As suspended particles accumulate in a _____, the pressure drop through the filter increases.

- A. Conventional technology
- B. Reconditioning cycle
- C. Filter bed
- D. Depth filter
- E. None of the above

138. When the pressure difference between filter inlet and outlet increases by 5 - 10 psi (34 to 68 kPa) from the beginning of the cycle, the filter should be reconditioned. Operating beyond this pressure drop increases the chance of fouling - called " _____ " - within the filter.

- A. Conventional technology
- B. Reconditioning cycle
- C. Mud-balling
- D. Depth filter
- E. None of the above

139. The _____ consists of an up-flow backwash followed by a down-flow rinse. Backwash is an up-flow operation, at about 14 gpm per square foot (34m/hr) of filter bed area that lasts about 10 minutes.

- A. Conventional technology
- B. Reconditioning cycle
- C. Traditional sand filter
- D. Depth filter
- E. None of the above

140. Turbidity washes out of the filter bed as the filter media particles scour one another. The down-flow rinse settles the bed before the filter returns to service. _____ lasts about 5 to 10 minutes.

- A. Conventional technology
- B. Reconditioning cycle
- C. Traditional sand filter
- D. Fast rinse
- E. None of the above

141. _____ is often used to enhance filter performance, particularly when turbidity includes fine colloidal particles.

- A. Conventional technology
- B. Chemical pretreatment
- C. Traditional sand filter
- D. Depth filter
- E. None of the above

142. _____ are usually electrically charged. Feeding chemicals such as alum (aluminum sulfate), ferric chloride, or a cationic polymer neutralizes the charge, allowing the particles to cling to one another and to the filter media.

- A. Cationic polymer
- B. Suspended particles
- C. Chemical pretreatment
- D. Sedimentation process
- E. None of the above

143. _____ may increase filtered water clarity, measured in NTU, by 90% compared with filtration alone.

- A. Cationic polymer
- B. Filtered water
- C. Chemical pretreatment
- D. Sedimentation process
- E. None of the above

144. If an operator is present to make adjustments for variations in the raw water, _____ clarity improvements in the range of 93 to 95% are achievable.

- A. Cationic polymer
- B. Filtered water
- C. Chemical pretreatment
- D. Sedimentation process
- E. None of the above

Package Plants

145. Representing a slight modification of _____, package plants are usually built in a factory, mounted on skids, and transported virtually assembled to the operation site.

- A. Cationic polymer
- B. Conventional filtration technology
- C. Chemical pretreatment
- D. Sedimentation process
- E. None of the above

146. These are appropriate for small community systems where full water treatment is desired, but without the construction costs and space requirements associated with separately constructed _____, filter beds, clear wells, etc.

- A. Cationic polymer
- B. Filtered water
- C. Chemical pretreatment
- D. Sedimentation basins
- E. None of the above

147. In addition to the conventional filtration processes, package plants are found as two types: tube-type clarifiers and _____.

- A. Filtration
- B. Adsorption clarifiers
- C. Chemical pretreatment
- D. Sedimentation process
- E. None of the above

Direct Filtration Plant vs. Conventional Plant

148. The only difference is that the _____ or step is omitted from the Direct Filtration plant.

- A. Filtration
- B. Filtered water
- C. Chemical pretreatment
- D. Sedimentation process
- E. None of the above

Rapid Sand Filtration

149. Also known as _____, this is the most prevalent form of water treatment technology in use today.

- A. Cationic polymer treatment
- B. Rapid-sand filtration
- C. Chemical pretreatment
- D. Sedimentation process
- E. None of the above

150. This filtration process employs a combination of _____ in order to achieve maximum effectiveness.

- A. Filtration
- B. Physical and chemical processes
- C. Chemical pretreatment
- D. Sedimentation process
- E. None of the above

Coagulation

151. At the Water Treatment Plant, _____, commonly called alum, is added to the water in the "flash mix" to cause microscopic impurities in the water to clump together.

- A. Cationic polymers
- B. Coagulation
- C. Coagulant chemicals
- D. Aluminum Sulfate
- E. None of the above

152. The alum and the water are mixed rapidly by the _____. The resulting larger particles will be removed by filtration.

- A. Cationic polymers
- B. Flash mixer
- C. Coagulant chemicals
- D. Aluminum Sulfate
- E. None of the above

153. _____ is the process of joining together particles in water to help remove organic matter.
- A. Cationic polymers
 - B. Coagulation
 - C. Coagulant chemicals
 - D. Aluminum Sulfate
 - E. None of the above
154. When solid matter is too small to be removed by a depth filter, the fine particles must be coagulated, or "stuck together" to form larger particles which can be filtered. This is achieved through the used of _____.
- A. Cationic polymers
 - B. Coagulation
 - C. Coagulant chemicals
 - D. Aluminum Sulfate
 - E. None of the above
155. _____ are required since colloidal particles by themselves have the tendency to stay suspended in water and not settle out.
- A. Cationic polymers
 - B. Coagulation aids
 - C. Coagulant chemicals
 - D. Aluminum Sulfate chemicals
 - E. None of the above
156. This is primarily due to a negative charge on the surface of the particles. All matter has a residual surface charge to a certain degree. But since _____ are so small, their charge per volume is significant.
- A. Cationic polymers
 - B. Colloidal particles
 - C. Coagulant chemicals
 - D. Aluminum Sulfate molecules
 - E. None of the above
157. The like charges on the _____ repel each other, and they stay suspended in water.
- A. Cationic polymers
 - B. Coagulation
 - C. Coagulant chemicals
 - D. Aluminum Sulfate
 - E. None of the above
158. _____ such as "alum" (aluminum Sulfate) work by neutralizing the negative charge, which allows the particles to come together.
- A. Cationic polymers aids
 - B. Coagulation
 - C. Coagulant chemicals
 - D. None of the above
159. Other coagulants are called " _____ ", which 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. Coagulant chemicals
 - D. Aluminum Sulfate salts
 - E. None of the above

160. New chemicals have been developed which combine the properties of alum-type coagulants and _____. Which chemical is used depends on the application, and will usually be chosen by the engineer designing the water treatment system.

- A. Cationic polymers
- B. Coagulation
- C. Coagulant chemicals
- D. Aluminum Sulfate
- E. None of the above

161. _____ is the most widely used coagulant in water treatment. Coagulation is necessary to meet the current regulations for almost all potable water plants using surface water.

- A. Cationic polymers
- B. Coagulation
- C. Coagulant chemicals
- D. Aluminum Sulfate
- E. None of the above

162. Aluminum Sulfate is also excellent for removing nutrients such as phosphorous in wastewater treatment. Liquid _____ is a 48.86% solution.

- A. Cationic polymers
- B. Coagulation
- C. Coagulant chemicals
- D. Aluminum Sulfate
- E. None of the above

163. Large microorganisms, including algae and amoebic cysts, are readily removed by _____ and filtration. Bacterial removals of 99% are also achievable.

- A. Cationic polymers
- B. Coagulation
- C. Coagulant chemicals
- D. Aluminum Sulfate
- E. None of the above

164. More than 98% of poliovirus type 1 was removed by conventional _____ and filtration. Several recent studies have shown that bacteria and viral agents are attached to organic and inorganic particulates.

- A. Cationic polymers
- B. Coagulation
- C. Coagulant chemicals
- D. None of the above

165. _____ by conventional coagulation and filtration is a major component of effective treatment for the removal of pathogens.

- A. Removal of these particulates
- B. Agitation of the water
- C. Floc particles mix
- D. Destabilized or coagulated particles
- E. None of the above

Flocculation

166. The process of bringing together _____ to form larger masses which can be settled and/or filtered out of the water being treated.

- A. Equalization basin
- B. Agitation of the water
- C. Floc particles mix
- D. Destabilized or coagulated particles
- E. None of the above

167. In this process, which follows the rapid mixing, the chemically treated water is sent into a basin where the suspended particles can collide, _____ (stick together), and form heavier particles called "floc".

- A. Equalization basin
- B. Agitation of the water
- C. Agglomerate
- D. Destabilized or coagulated particles
- E. None of the above

168. Gentle _____ and appropriate detention times (the length of time water remains in the basin) help facilitate this process.

- A. Equalization basin
- B. Agitation of the water
- C. Floc particles mix
- D. Destabilized or coagulated particles
- E. None of the above

169. The water is slowly mixed in contact chambers allowing the coagulated particles, now called "floc," to become larger and stronger. As these _____ 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. None of the above

Pre-Sedimentation

170. Depending on the quality of the source water, some plants have pre-sedimentation. To allow larger _____ in a reservoir or lake (sand, heavy silt) reducing solid removal loads.

- A. Particles time to settle
- B. Agitation of the water
- C. Floc particles to mix
- D. Coagulated particles
- E. None of the above

171. Provides an equalization basin which _____.

- A. Evens out fluctuations
- B. Agitation of the water
- C. Floc particles mix
- D. Destabilized or coagulated particles
- E. None of the above

Sedimentation

172. The process of _____ (going to the bottom of the vessel) in water.

- A. Suspended solid particles settling out
- B. Agitation of the water
- C. Floc particles mix
- D. Destabilized or coagulated particles
- E. None of the above

173. Following flocculation, a sedimentation step may be used. During sedimentation, the velocity of the water is decreased so that the suspended material, including flocculated particles, _____ by gravity.

- A. Can settle out
- B. Agitation of the water
- C. Floc particles mix
- D. Destabilized or coagulated particles
- E. None of the above

174. Once settled, the _____ that is later removed from the bottom of the basin.

- A. Particles combine to form a sludge
- B. Agitation of the water
- C. Floc particles will mix
- D. Destabilized or coagulated particles will form
- E. None of the above

Filtration

175. A water treatment step used to remove turbidity, dissolved organics, odor, taste and color. The water flows by gravity through large filters of _____, silica sand, garnet and gravel. The floc particles are removed in these filters.

- A. Activated carbon filters
- B. Cartridge filters
- C. Anthracite coal
- D. Rapid-sand filters
- E. None of the above

176. The rate of filtration can be adjusted to meet water consumption needs. 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. Granular synthetic material
- D. Rapid-sand filters
- E. None of the above

177. The most widely used are _____ in tanks. In these units, gravity holds the material in place and the flow is downward.

- A. Activated carbon filters
- B. Cartridge filters
- C. Granular synthetic material
- D. Rapid-sand filters
- E. None of the above

178. The filter is periodically cleaned by a reversal of flow and the _____ into a drain.

- A. Activated carbon filters
- B. Cartridge filters
- C. Discharge of back-flushed water
- D. Rapid-sand filters
- E. None of the above

179. _____ made of fabric, paper, or plastic material are also common and are often much smaller and cheaper, as well as disposable.

- A. Activated carbon filters
- B. Cartridge filters
- C. Granular synthetic material
- D. Rapid-sand filters
- E. None of the above

180. Filters are available in several ratings, depending on the size of _____.

- A. Activated carbon filters
- B. Cartridge filters
- C. Granular synthetic material
- D. Rapid-sand filters
- E. None of the above

181. _____, will also remove turbidity, but would not be recommended for that purpose only.

- A. Activated carbon filters
- B. Cartridge filters
- C. Granular synthetic material
- D. Rapid-sand filters
- E. None of the above

182. With most of the larger particles settled out, the water now goes to the _____. 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. Activated carbon filters
- B. Filtration process
- C. Granular synthetic material
- D. Rapid-sand filters
- E. None of the above

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

- A. Head loss
- B. Uniform the media
- C. Activated carbon
- D. Post-disinfection
- E. None of the above

184. Evaluation of overall _____ should be conducted on a routine basis, at least once per day.

- A. Head loss
- B. Filtration process performance
- C. Effluent control structure
- D. Post-disinfection
- E. None of the above

185. Poor chemical treatment can often result in either early turbidity breakthrough or rapid head loss buildup. The more _____, the slower head loss buildup.

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

186. All water treatment plants that use surface water are governed by the _____.

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

Declining Rate Filters

187. The flow rate will vary with _____. Each filter operates at the same rate, but can have a variable water level.

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

188. This system requires a(n) _____ (weir) to provide adequate media submergence.

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

Detention Time

189. The actual time required for a small amount of water to pass through a _____ 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. Head loss
- B. Sedimentation basin
- C. Effluent control structure
- D. Post-disinfection
- E. None of the above

Disinfection

190. Chlorine is added to the water at the flash mix for pre-disinfection. The chlorine kills or inactivates harmful microorganisms. Chlorine is added again after filtration for _____.

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

Jar Testing

191. Jar testing traditionally has been done on a routine basis in most water treatment plants to control the _____. Much more information, however, can be obtained with only a small modification in the conventional method of jar testing. It is the quickest and most economical way to obtain good reliable data on the many variables which affect the treatment process.

- A. Chlorine
- B. Coagulants
- C. Natural water
- D. Coagulant dose
- E. None of the above

pH

192. 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. Most _____ has a pH between 6.0 and 8.5.

- A. Treated water
- B. Disinfectants
- C. Natural water
- D. None of the above

Caustic

193. NaOH (also called Sodium Hydroxide) is a strong chemical used in the treatment process to neutralize acidity, _____, or raise the pH value.

- A. Chlorine
- B. Coagulants
- C. Natural water
- D. Coagulant dose
- E. None of the above

Polymer

194. A type of chemical, when combined with other types of coagulants, aids in binding small _____ to larger particles to help in the settling and filtering processes.

- A. Chlorine
- B. Coagulants
- C. Suspended particles
- D. Coagulant dose
- E. None of the above

Post-Chlorine

195. Where the water is chlorinated to make sure it holds a _____ in the distribution system.

- A. Residual
- B. Coagulants
- C. Natural water
- D. Coagulant dose
- E. None of the above

Pre-Chlorine

196. Where the raw water is dosed with a large concentration of _____.

- A. Chlorine
- B. Coagulants
- C. Natural water
- D. Coagulant dose
- E. None of the above

Pre-Chlorination

197. The addition of _____ before the filtration process will help: control algae and slime growth.

- A. Chlorine
- B. Coagulants
- C. Natural water
- D. Coagulant dose
- E. None of the above

Raw Turbidity

198. The turbidity of the water coming to the treatment plant from the _____ source.

- A. Chlorine basin
- B. Coagulant basin or
- C. Raw water
- D. Neutral
- E. None of the above

Settled Solids

199. Solids that have been removed from the _____ by the coagulation and settling processes.

- A. Turbidity machine
- B. Raw water
- C. First step
- D. Subsequent treatment processes
- E. None of the above

Hydrofluosilicic Acid

200. (H_2SiF_6) a clear, _____ with a pH ranging from 1 to 1.5. Used in water treatment to fluoridate drinking water.

- A. Gas
- B. But colored liquid
- C. Fluoridating drinking water liquid
- D. Fuming corrosive liquid
- E. None of the above

Corrosion Control

201. The pH of the water is adjusted with _____, commonly called soda ash. Soda ash is fed into the water after filtration.

- A. Acid
- B. Sodium carbonate
- C. Fluoride acid
- D. Subsequent treatment processes
- E. None of the above

Zinc Orthophosphate

202. A chemical used to coat the pipes in the _____ to inhibit corrosion.

- A. Turbidity
- B. Raw water
- C. Fluoridate drinking water
- D. Subsequent treatment processes
- E. None of the above

Taste and Odor Control

203. _____ is occasionally added for taste and odor control. PAC is added to the flash mix.

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

Water Quality

204. Water testing is conducted throughout the treatment process. Items like _____, pH, and chlorine residual are monitored and recorded continuously. Some items are tested several times per day, some once per quarter and others once per year.

- A. Turbidity
- B. Raw water
- C. Fluoride drinking water chemical
- D. Subsequent treatment processes
- E. None of the above

Sampling

205. Collect the _____ at least 6 inches under the surface by plunging the container mouth down into the water and turning the mouth towards the current by dragging the container slowly horizontal.

- A. Turbidity
- B. Water sample
- C. Fluoridate drinking water sample
- D. Mudball
- E. None of the above

206. Care should be taken not to disturb the bottom of the _____ or along the sides. So as not to stir up any settled solids. This would create erroneous results.

- A. Turbidity source
- B. Water source
- C. Filter
- D. Basin
- E. None of the above

Chemical feed and rapid mix

207. Chemicals are added to the water in order to _____. These may include pH adjusters and coagulants.

- A. Presume detention times
- B. Improve the subsequent treatment processes
- C. Modify y the conventional process
- D. Adjust up-flow clarifier
- E. None of the above

208. Coagulants are chemicals, such as alum, that neutralize positive or negative charges on small particles, allowing them to stick together and form larger particles that are more easily removed by _____ (settling) or filtration.

- A. Adjusting detention times
- B. Sedimentation
- C. Modifying conventional process
- D. Opening the clarifier
- E. None of the above

209. A variety of _____, such as baffles, static mixers, impellers, and in-line sprays can be used to mix the water and distribute the chemicals evenly.

- A. Presumed detention times
- B. Sedimentation/clarification process
- C. Modification of the conventional process
- D. An up-flow clarifier with low-density plastic bead media
- E. None of the above

Short-Circuiting

210. 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. This 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 with low-density plastic bead media
- E. None of the above

Tube Settlers

211. This modification of the conventional process contains many metal "tubes" that are placed in the _____, or clarifier.

- A. Presumed detention times
- B. Sedimentation basin
- C. Modification of the conventional process
- D. An up-flow clarifier with low-density plastic bead media
- E. None of the above

212. These tubes are approximately 1 inch deep and 36 inches long, split-hexagonal shape, and installed at an angle of _____ or less.

- A. Presumed detention times
- B. Sedimentation/clarification process
- C. Modification of the conventional process
- D. Low-density plastic bead media
- E. None of the above

213. These tubes provide for a very large surface area upon which particles may settle as the water flows upwards. The slope of the tubes facilitates gravity settling of the solids to the bottom of the basin, where they can be _____.

- A. Presumed detention times
- B. Sedimentation/clarification process
- C. Modification of the conventional process
- D. Collected and removed
- E. None of the above

214. The large surface settling area also means that adequate clarification can be obtained with detention times of 15 minutes or less. As with _____ treatment, this sedimentation step is followed by filtration through mixed media.

- A. Presumed detention times
- B. Sedimentation/clarification process
- C. Conventional
- D. An up-flow clarifier
- E. None of the above

Adsorption Clarifiers

215. The concept of the _____ was developed in the early 1980's. This technology uses an up-flow clarifier with low-density plastic bead media, usually held in place by a screen.

- A. Adsorption clarifier package plant
- B. Sedimentation/clarification process
- C. Conventional process
- D. Up-flow clarifier process
- E. None of the above

216. This adsorption media is designed to enhance the sedimentation/clarification process by combining flocculation and sedimentation into one step. In this step, 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. A modification of the conventional process
- D. Decreased
- E. None of the above

217. Air scouring _____ followed by water flushing. Cleaning of this type of clarifier is initiated more often than filter backwashing because the clarifier removes more solids.

- A. Presumed detention times
- B. Cleans adsorption clarifiers
- C. Increases by adsorption
- D. Reduces by adsorption
- E. None of the above

218. Tube-settler type of package plant, the _____ is followed by mixed-media filtration and disinfection to complete the water treatment.

- A. Detention times
- B. Sedimentation/clarification process
- C. Modification of the conventional process
- D. Lunch hour
- E. None of the above

Clearwell

219. The final step in the conventional filtration process, the clearwell provides temporary storage for the treated water. The two main purposes for this storage are to have filtered water available for backwashing the filter, and to _____ (or contact time) for the chlorine (or other disinfectant) to kill any microorganisms that may remain in the water.

- A. Enforce standards to protect
- B. Filter and disinfection
- C. Influence bacteria to change to dead stasis
- D. Provide detention time
- E. None of the above

EPA Filter Backwash Rule

220. The U.S. Environmental Protection Agency (EPA) has finalized the Long Term 1 Enhanced Surface Water Treatment Rule and Filter Backwash Rule (LT1FBR) 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. None of the above

221. This rule will apply to public water systems using surface water or ground water under the direct _____.

- A. Enforceable standards to protect
- B. Filtration and disinfection can remove
- C. Influence of surface water
- D. Main purposes for this storage
- E. None of the above

222. This rule will extend protections against _____ and other disease-causing microbes to the 11,500 small water systems which serve fewer than 10,000 people annually.

- A. Enforceable standards
- B. Filtration and disinfection
- C. Influence of surface water
- D. Outbreaks
- E. None of the above

223. This rule also establishes filter backwash requirements for certain public water systems of all sizes. The _____ 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. Main purposes
- E. None of the above

Background

224. The Safe Drinking Water Act (SDWA) requires the EPA to set _____ public health from contaminants which may occur in drinking water.

- A. Enforceable standards to protect
- B. Filtration and disinfection can remove
- C. Influence of surface water
- D. Main purposes for this storage
- E. None of the above

225. 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. None of the above

226. _____ may include diarrhea, cramps, nausea, possibly jaundice, and headaches and fatigue.

- A. Disease symptoms
- B. Cryptosporidium
- C. Waterborne disease outbreaks
- D. Microbiological contaminants
- E. None of the above

227. The EPA has set enforceable drinking water treatment requirements to reduce the risk of _____.

- A. Disease symptoms
- B. Control of Cryptosporidium
- C. Waterborne disease outbreaks
- D. Microbiological pollutants
- E. None of the above

228. Treatment technologies such as filtration and disinfection can remove or inactivate _____.

- A. Disease symptoms
- B. Cysts
- C. Foodborne disease outbreaks
- D. Microbiological contaminants
- E. None of the above

229. Physical removal is critical to the _____ because it is highly resistant to standard disinfection practice.

- A. Disease symptoms process
- B. Control of Cryptosporidium
- C. Anal to mouth process
- D. Process
- E. None of the above

230. Cryptosporidiosis may manifest itself as a severe infection that can last several weeks and may cause the _____ compromised immune systems. In 1993, Cryptosporidium caused over 400,000 people in Milwaukee to experience intestinal illness.

- A. Disease symptoms
- B. Death of individuals with
- C. Waterborne disease outbreaks
- D. Microbiological contaminants
- E. None of the above

231. More than 4,000 were hospitalized, and at least 50 deaths were attributed to the _____ outbreak.

- A. Cryptosporidium
- B. Cryptosporidiosis
- C. Waterborne disease outbreaks
- D. Microbiological contaminants
- E. None of the above

232. The 1996 Amendments to SDWA require the EPA to promulgate an Interim Enhanced Surface Water Treatment Rule (IESWTR) and a _____ (announced in December 1998).

- A. Stage 1 Disinfection Byproducts Rule
- B. LT1FBR
- C. IESWTR
- D. Public water systems
- E. None of the above

233. The _____ set the first drinking water standards to control Cryptosporidium in large water systems, by establishing filtration and monitoring requirements for systems serving more than 10,000 people each.

- A. Stage 1 Disinfection Byproducts Rule
- B. LT1FBR
- C. IESWTR
- D. None of the above

234. The _____ proposal builds on those standards by extending the requirements to small systems.

- A. Stage 1 Disinfection Byproducts Rule
- B. LT1FBR
- C. IESWTR
- D. Public water systems
- E. None of the above

What will the LT1FBR require?

235. The _____ provisions will apply to public water systems using surface water or ground water under the direct influence of surface water systems.

- A. Stage 1 Disinfection Byproducts Rule
- B. LT1FBR
- C. IESWTR
- D. Public water systems
- E. None of the above

LT1 Provisions - Apply to systems serving fewer than 10,000 people, and fall into the three following categories:

Turbidity

236. Conventional and _____ must comply with specific combined filter effluent turbidity requirements.

- A. Updated watershed control
- B. Direct filtration systems
- C. Disinfection profile
- D. Disinfection benchmark
- E. None of the above

237. Conventional and _____ must comply with individual filter turbidity requirements.

- A. Updated raw water control
- B. Direct filtration systems
- C. Disinfection processes
- D. Disinfection benchmark
- E. None of the above

Disinfection Benchmarking

238. 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. None of the above

239. 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. None of the above

Other Requirements

240. 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. None of the above

The Filtration Process

241. Removal of _____ plays an important role in the natural treatment of groundwater as it percolates through the soil. It is also a major part of most water treatment.

- A. Coagulation and flocculation processes
- B. Coagulation or oxidation processes
- C. Serious problems in filter operation
- D. Suspended solids by filtration
- E. None of the above

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

- A. Coagulation and flocculation may occur in the filter bed
- B. Coagulation or oxidation processes
- C. Serious problems in filter operation
- D. A combination of complex physical and chemical mechanisms
- E. None of the above

243. Since surface water sources are subject to run-off and do not undergo natural filtration, it must be filtered to _____.

- A. Aid the coagulation and flocculation processes
- B. Provide coagulation or oxidation processes
- C. Remove particles and impurities
- D. Retain the combination of complex physical and chemical mechanisms
- E. None of the above

244. The filter used in the _____ that traps suspended material between the grains of filter media.

- A. Coagulation and flocculation may occur in the filter bed
- B. Coagulation or oxidation processes
- C. Filtration process can be compared to a sieve or microstrainer
- D. Physical and chemical mechanisms
- E. None of the above

245. Since most _____ through the spaces between the grains of the filter media, straining is the least important process in filtration.

- A. Suspended particles can easily pass
- B. Coagulation passes
- C. Serious problems in filter operation passes
- D. Turbidity passes
- E. None of the above

246. Filtration primarily depends on a _____, the most important being adsorption.

- A. Coagulation and flocculation process
- B. Coagulation or oxidation processes
- C. Serious problems in filter operation
- D. Combination of complex physical and chemical mechanisms
- E. None of the above

247. Adsorption is the process of particles sticking onto the surface of the individual filter grains or onto the previously deposited materials. The forces that attract and hold the particles to the grains are the same as those that work in _____.

- A. Coagulation and flocculation
- B. Coagulation or oxidation processes
- C. Main filter
- D. Complex physical and chemical mechanisms
- E. None of the above

248. Some _____, especially if coagulation and flocculation of the water before filtration was not properly controlled. Incomplete coagulation can cause serious problems in filter operation.

- A. Coagulation and flocculation may occur in the filter bed
- B. Coagulation or oxidation processes will work
- C. Serious problems in filter operation
- D. Physical and chemical mechanisms
- E. None of the above

Types of Filters

249. Several types of filters are used for water treatment. The earliest ones developed were the _____. They typically have filter rates of around 0.05 gpm/ft² of surface area. This type of filter requires large filter areas.

- A. Schmutzdecke
- B. Slow rate filtration
- C. Backwash
- D. Slow sand filters
- E. None of the above

250. The top several inches of the sand has to be removed regularly, usually by hand due to the mass of growing material ("_____") that collects in the filter. The sand removed is usually washed and returned to the filter.

- A. Schmutzdecke
- B. Slow rate filtration
- C. Backwash
- D. Filter rates
- E. None of the above

251. These filters are still in use in some small plants, especially in the western United States, as well as in many developing countries. They may also be used as a final step in wastewater treatment. Most filters are classified by filtration rate, type of _____, or type of operation.

- A. Schmutzdecke
- B. Slow rate filtration
- C. Backwash
- D. Filter media
- E. None of the above

Rapid Sand Filters

252. Rapid sand filters can accommodate filter rates 40 times those of _____.

- A. Rapid sand filters
- B. Slow sand filters
- C. Backwash
- D. Filter rates
- E. None of the above

253. The _____ is generally constructed of concrete and is most often rectangular.

- A. Rapid sand filters
- B. Slow rate filtration
- C. Backwash
- D. Filter rates
- E. None of the above

254. Filters in large plants are usually constructed next to each other in a row, allowing the piping from the _____ to feed the filters from a central pipe gallery.

- A. Rapid sand filters
- B. Sedimentation basins
- C. Backwash
- D. Filter rates
- E. None of the above

255. Some smaller plants are designed with the filters forming a square of four filters with a central pipe gallery feeding the filters from a _____.

- A. Rapid sand filters
- B. Slow rate filtration
- C. Backwash
- D. Filter rates
- E. None of the above

Filter Sand

256. The filter sand used in rapid sand filters is manufactured specifically for the purpose of water filtration. Most _____ contain 24-30 inches of sand, but some newer filters are deeper. The sand used is generally 0.4 to 0.6 mm in diameter.

- A. Rapid sand filters
- B. Slow rate filtration
- C. Backwash
- D. Filter rates
- E. None of the above

257. The _____ also distributes the backwash water evenly across the total filter. 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. Rapid sand filters
- B. Slow rate filtration
- C. Backwash
- D. Filter rates
- E. None of the above

258. A pipe lateral system uses a _____ with several perforated laterals on each side. Piping materials include cast iron, asbestos cement, and PVC. The perforations are usually placed on the underside of the laterals to prevent them from plugging with sand.

- A. Rapid sand filter
- B. Control manifold
- C. Backwash
- D. Filter rate
- E. None of the above

259. This also allows the backwash to be directed against the floor, which helps keep the gravel and _____ from being directly disturbed by the high velocity water jets.

- A. Sand Beds
- B. Slow rate filtration
- C. Backwash
- D. Filter rate
- E. None of the above

False floor

260. 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 filters
- B. Slow rate filtration
- C. Backwash
- D. Filter underdrain
- E. None of the above

261. This type of underdrain allows the _____ or open space under the floor to act as the collection area for the filtered water and for the distribution of the filter backwash water.

- A. Rapid sand filters
- B. Slow rate filtration
- C. Plenum
- D. Filter rates
- E. None of the above

Leopold system

262. 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. Backwashing of the filter or backwash cycle
- D. Removed filtered water
- E. None of the above

263. This type of _____ used with an undergravel layer, although some new designs allow for sand retention without gravel.

- A. Backwash water Or troughs
- B. Surface wash system
- C. Backwashing of the filter or backwash cycle
- D. Remove the filtered water
- E. None of the above

Washwater Troughs

264. Washwater troughs placed above the filter media collect the _____ and carry it to the drain system.

- A. Backwash water
- B. Surface wash system
- C. Backwashing of the filter or backwash cycle
- D. Remove the filtered water
- E. None of the above

265. Proper placement of these troughs is very important to ensure that the filter media is not carried into the troughs during the _____ and removed from the filter.

- A. Backwash
- B. Surface wash system
- C. Backwashing of the filter or backwash cycle
- D. Remove the filtered water
- E. None of the above

266. The 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 water Or troughs
- B. Surface wash system
- C. Backwash
- D. Remove the filtered water
- E. None of the above

National Drinking Water Regulations

267. The _____ establishes national standards of which the states are responsible for enforcing.

- A. EPA
- B. Local official
- C. State official
- D. Town mayor
- E. None of the above

268. Primary drinking water regulations, by definition, include either a _____ (MCL) or, when a MCL is not economically or technologically feasible, a prescribed treatment technique which would prevent adverse health effects to humans.

- A. Maximum contaminant level
- B. Consumer Confidence Reports
- C. Maximum Containment Level Goals
- D. Levels of regulated contaminants
- E. None of the above

269. The Act instructs the EPA on how to select _____ and specifies how the EPA must establish national primary drinking water regulations once a contaminant has been selected.

- A. Adverse health effects
- B. Consumer Confidence Reports
- C. Maximum Containment Level Goals
- D. Contaminants for regulation
- E. None of the above

Contaminant Selection

270. 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. By February 1998 and _____, the EPA must publish a list of contaminants that may warrant regulation.

- A. Regulate at least 5
- B. Every 5 years
- C. Is a two-part process
- D. Within 30 day
- E. None of the above

271. The EPA must determine whether or not to _____ of the listed contaminants. The Act 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. Regulate at least 5
- B. Every 5 years
- C. Is a two-part process
- D. Within 30 day
- E. None of the above

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

- A. Cryptosporidium
- B. Non-enforceable
- C. Enforceable
- D. Feasible
- E. None of the above

Standard Setting

273. For each contaminant that the EPA has determined merits regulation, the EPA must set a non-enforceable maximum contaminant level goal (MCLG) at a level at which no known or anticipated adverse _____ health effects occur, and which allows an adequate margin of safety.

- A. Cryptosporidium
- B. Non-enforceable
- C. Enforceable
- D. Feasible
- E. None of the above

274. If the EPA determines that the benefits do not justify the costs, the EPA may, with certain exceptions, promulgate a standard that maximizes health _____ benefits at a cost that is justified by the benefits.

- A. Technologies
- B. Contaminants
- C. Risk reduction
- D. Costs
- E. None of the above

State Primacy

275. The primary _____ 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. Regulation
- B. Non-enforceable
- C. Enforcement
- D. Feasible
- E. None of the above

276. Whenever the EPA finds that a public water system in a state with primary enforcement authority does not comply with regulations, the Agency must notify _____ and the system and provide assistance to bring the system into compliance.

- A. The Federal government
- B. The CWA
- C. The State
- D. EPA
- E. None of the above

277. If the state fails to commence enforcement action _____ after the notification, the EPA is authorized to issue an administrative order or commence a civil action.

- A. Regulate at least 5
- B. Every 5 years
- C. Is a two-part process
- D. Within 30 day
- E. None of the above

Nonprimacy State

278. In a nonprimacy state, the EPA must notify an elected local official (if any has jurisdiction over the water system) before commencing an _____ action against the system.

- A. Cryptosporidium
- B. Non-enforceable
- C. Enforcement
- D. Feasible
- E. None of the above

279. Primacy states may establish _____ 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. Alternative monitoring
- B. Permanent monitoring
- C. Contaminants detected
- D. Reasonably available
- E. None of the above

280. _____ with approved source water protection programs may adopt alternative monitoring requirements to provide permanent monitoring relief to qualified systems for chemical contaminants.

- A. Federal government
- B. NRWA
- C. States
- D. EPA
- E. None of the above

281. P.L. 104-182 requires states to adopt programs for training and certifying operators of community and nontransient noncommunity systems. The EPA must publish guidelines specifying minimum standards for operator certification by February 1999. _____, the EPA must withhold 20% of a state's SRF grant unless the state has an operator certification program (Section 1419).

- A. Two years thereafter
- B. Every 5 years
- C. Is a two-part process
- D. Within 30 day
- E. None of the above

Other Provisions

282. Public water systems must notify customers of violations with potential for serious health effects _____.

- A. Regulate at least 5
- B. Every 5 years
- C. within 24 hours
- D. Within 30 day
- E. None of the above

283. Systems must also issue to customers _____ on contaminants detected in their drinking water.

- A. Alternative monitoring
- B. Permanent monitoring
- C. Annual reports
- D. Reasonably available
- E. None of the above

284. Section 1417 requires any pipe, solder, or flux used in the installation or repair of public water systems or of plumbing in residential or nonresidential facilities providing drinking water to be " _____ " (as defined in the Act).

- A. Filtered
- B. Replaced
- C. Lead free
- D. Chlorinated
- E. None of the above

285. The Administrator has emergency powers to issue orders and commence _____ if a contaminant likely to enter a public drinking water supply system poses a substantial threat to public health and state or local officials have not taken adequate action.

- A. Civil action
- B. Non-enforceable
- C. Enforceable
- D. Feasible
- E. None of the above

286. If a chemical necessary for water treatment is not reasonably available, the Administrator can issue a " _____," in which case the President can order an allocation of the chemical to those needing it.

- A. Alternative monitoring
- B. Permanent monitoring
- C. Certification of need
- D. Reasonably available
- E. None of the above

287. This type of control monitors the level of water on the top of the filter and attempts to control this level from the start of the operation to the end. This is accomplished by the controller operating a valve on the _____.

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

288. The valve will be nearly closed at the start of the filter run and fully open at the end. This design is used when the _____ or pressure on the filter is limited.

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

289. Both controllers consist of a venturi tube or some other type of metering device, as well as a valve to control the flow from the filter. In most cases, the valve is controlled by an automatic control device, often an air-actuated type valve that is controlled by the _____.

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

Loss of head indicator

290. As filtration proceeds, an increasing amount of pressure, called _____ across the filter, is required to force the water through the filter.

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

291. The _____ 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. None of the above

292. Usually the difference in the _____ is measured 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
- E. None of the above

In-line Turbidimeter

293. _____ in water is caused by small suspended particles that scatter or reflect light so that the water appears to be cloudy.

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

294. _____ of the filtered water may shelter bacteria, preventing chlorine from reaching it during the final disinfection process.

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

Filtration Process

295. Water from the source or, more commonly, from _____, 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. Shelter bacteria
- B. Suspended material
- C. Pre-treatment processes
- D. Floc
- E. None of the above

296. When the filtration is started after being backwashed, there will be little head loss. In filters with a control valve installed on the filter effluent pipe, the _____ is restricted during this time.

- A. Shelter bacteria
- B. Suspended material
- C. Turbidity
- D. Filter flow
- E. None of the above

297. A _____ is almost fully closed when a filter is clean so that the desired water level on top of the filter is maintained.

- A. Headloss
- B. Constant rate flow valve
- C. Flow restrictor
- D. Backwash cycle
- E. None of the above

298. As the filter becomes dirty with suspended material, the valve opens gradually until the increase in the water level above the filter indicates that the filter needs _____.

- A. Headloss
- B. Flow redistributes
- C. Flow restrictor
- D. Backwashing
- E. None of the above

Back Washing

299. Proper backwashing is a very important step in the operation of a filter. If the filter is not _____ completely, it will eventually develop additional operational problems.

- A. Mudballed
- B. Flow redistributed
- C. Flow restricted
- D. Backwashed
- E. None of the above

300. In most cases the filter backwash rate will not break up the mass on the top of the filter. The design engineer will recommend the installation of a surface wash of some type, the most common being a set of _____ that are suspended above the media during filtration.

- A. Headloss
- B. Floc(s)
- C. Air wash
- D. Backwash cycle
- E. None of the above

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