Registration form

Water Quality CEU Training Course $150.00
RUSH PROCESS FEE ADDITIONAL $40.00 ONLY IF NECESSARY

Start and Finish Dates:_________________________
You will have 90 days from this date in order to complete this course

Name_________________________________**Signature**___________________________
(This will appear on your certificate as above)

Address:____

City____________________ **State**________ **Zip**___________ **Email**______________

Phone:
Home (   )_______________**Work (   )**_______________**Fax (   )**_________________

Operator ID# ______________________________**Expiration Date**___________________

Class/Grade__________________________________
Your certificate will be mailed to you in about two weeks.

Please circle which certification you are applying the course CEU's.
Water Treatment   Water Distribution   Wastewater Collection   Wastewater Treatment

Pretreatment   Other ___________________________

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

Technical Learning College
Western Campus
PO Box 420, Payson AZ 85547-0420
(928) 468-0665   Fax (928) 272-0747
Toll Free (866) 557-1746
info@tlch2o.com

3 digit code on back of card______

American Express
Visa or MasterCard #____________________________________**Exp. Date**_________

If you've paid on the Internet, Please write your customer#__________________

Referral's Name____

Please fax 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 $40.00. 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.

Thank you…

Water Quality Answer Key Name

Phone Number Address

Please circle or X

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

Please mail or fax this survey with your final exam

WATER QUALITY CEU TRAINING COURSE

CUSTOMER SERVICE RESPONSE CARD

DATE:________________

NAME:___________________________

ADDRESS:____

E-MAIL_______________________________PHONE_______________________

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

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

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

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

4. How did you hear about this Course? _______________________________

5. What would you do to improve the Course?

____

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Any other concerns or comments.

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Water Quality CEU Training Course Assignment

The Water Quality Assignment is available in Word on the Internet for your convenience, please visit www.ABCTLC.com and download the assignment and e-mail it back to TLC.

You will have 90 days from receipt of this manual to complete it in order to receive your Professional Development Hours (**PDHs**) or Continuing Education Unit (**CEU**). A score of 70 % or better is necessary to pass this course. If you should need any assistance, please email or fax all concerns and the completed **ANSWER KEY** to info@tlch2o.com.

The Surface Water Treatment Rule requires systems using surface water or ground water under the direct influence of surface water to (1) disinfect their water, and (2) filter their water or meet criteria for avoiding filtration so that the following contaminants are controlled at the following levels:

1. __________: 99.9% killed/inactivated
A. Legionella
B. Viruses
C. Giardia lamblia
D. Turbidity
E. Both B and C

2. No limit, but EPA believes that if __________ and viruses are inactivated, Legionella will also be controlled.
A. Fecal coliform and E. coli
B. Viruses
C. Giardia lamblia
D. Turbidity
E. HPC

3. At no time can __________ (cloudiness of water) go above 5 nephelolometric turbidity units (NTU); systems that filter must ensure that the turbidity go no higher than 1 NTU (0.5 NTU for conventional or direct filtration) in at least 95% of the daily samples in any month.
A. Fecal coliform and E. coli
B. Viruses
C. Giardia lamblia
D. Turbidity
E. HPC

4. No more than 500 bacterial colonies per milliliter.
A. Fecal coliform and E. coli
B. Viruses
C. Giardia lamblia
D. Turbidity
E. HPC

5. __________ are bacteria whose presence indicates that the water may be contaminated with human animal wastes. Microbes in these wastes can cause diarrhea, cramps, nausea, headaches, or other symptoms.
A. Fecal coliform and E. coli
B. Viruses
C. Giardia lamblia
D. Turbidity
E. HPC

6. A public water system that serves at least 15 service connections used by year-round residents of the area served by the system or regularly serves at least 25 year-round residents.
A. Sole Source Aquifer (SSA) Designation
B. Source Water Protection Area (SWPA)
C. Significant Potential Source of Contamination
D. Sub watershed
E. None of the Above

7. An analysis 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. This analysis will assist the state in determining which potential sources of contamination are "significant."
A. Susceptibility Analysis
B. State Management Plan (SMP) Program
C. Significant Potential Source of Contamination
D. Surface Water Treatment Rule (SWTR)
E. None of the Above

8. One gallon of pure ___________, a common solvent, will contaminate approximately 292 million gallons of water.
A. Trichloroethylene
B. Microbes
C. Contaminants
D. Coliform bacteria
E. Human or animal wastes

9. ___________are common in the environment and are generally not harmful.
A. Trichloroethylene
B. Microbes
C. Contaminants
D. Coliform bacteria
E. Human or animal wastes

10. MCLs are enforceable standards. The margins of safety in ___________ ensure that exceeding the MCL slightly does not pose significant risk to public health.
A. MCLGs
B. MCL
C. Dental fluorosis
D. Fluoride
E. Lead

11. ___________ were not established before the 1986 Amendments to the Safe Drinking Water Act.
A. MCLGs
B. MCL
C. Dental fluorosis
D. Fluoride
E. Lead

12. Lead and copper are regulated in a __________ which requires systems to take tap water samples at sites with lead pipes or copper pipes that have lead solder and/or are served by lead service lines.
A. MCLGs
B. MCL
C. Dental fluorosis
D. Treatment Technique
E. Lead

13. The __________, which triggers water systems into taking treatment steps if exceeded in more than 10% of tap water samples, for copper is 1.3 mg/L, and for lead is 0.015mg/L.
A. MCLGs
B. MCL
C. Dental fluorosis
D. Action level
E. Lead

14. Each water system must certify, in writing, to the state (using third-party or manufacturer's certification) that when __________ are used in drinking water systems, the combination (or product) of dose and monomer level does not exceed the levels specified, as follows: Acrylamide = 0.05% dosed at 1 mg/L (or equivalent)
A. Acrylamide
B. Epichlorohydrin
C. All of the Above
D. None of the Above

15. Each water system must certify, in writing, to the state (using third-party or manufacturer's certification) that when acrylamide and epichlorohydrin are used in drinking water systems, the combination (or product) of dose and monomer level does not exceed the levels specified, as follows: __________ = 0.01% dosed at 20 mg/L (or equivalent)
A. Acrylamide
B. Epichlorohydrin
C. All of the Above

16. 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. Trichloroethylene
B. Microbes
C. Contaminants
D. Coliform bacteria
E. Human or animal wastes

17. Fecal Coliform and E coli are bacteria whose presence indicates that the water may be contaminated with ___________.
A. Trichloroethylene
B. Microbes
C. Contaminants
D. Coliform bacteria
E. Human or animal wastes

18. ___________ in these wastes can cause short-term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms.
A. Trichloroethylene
B. Microbes
C. Contaminants
D. Coliform bacteria
E. Human or animal wastes

19. ___________ is a parasite that enters lakes and rivers through sewage and animal waste.
A. Cryptosporidium
B. Cryptosporidiosis
C. Giardia lamblia
D. Gastrointestinal illness
E. None of the Above

20. Cryptosporidium causes ___________, a mild gastrointestinal disease.
A. Cryptosporidium
B. Cryptosporidiosis
C. Giardia lamblia
D. Gastrointestinal illness
E. None of the Above

21. ___________ disease can be severe or fatal for people with severely weakened immune systems.
A. Cryptosporidium
B. Cryptosporidiosis
C. Giardia lamblia
D. Gastrointestinal illness
E. None of the Above

22. The EPA and CDC have prepared advice for those with severely compromised immune systems who are concerned about ___________.
A. Cryptosporidium
B. Cryptosporidiosis
C. Giardia lamblia
D. Gastrointestinal illness
E. None of the Above

23. ___________is a parasite that enters lakes and rivers through sewage and animal waste.
A. Cryptosporidium
B. Cryptosporidiosis
C. Giardia lamblia
D. Gastrointestinal illness
E. None of the Above

24. ___________causes gastrointestinal illness (e.g. diarrhea, vomiting, and cramps).
A. Cryptosporidium
B. Cryptosporidiosis
C. Giardia lamblia
D. Gastrointestinal illness
E. None of the Above

25. ___________ are a broad group of bacteria including nonpathogens, pathogens, and opportunistic pathogens; they may be an indicator of poor general biological quality of drinking water. Often referred to as HPC.
A. Alpha emitters
B. Beta/photon emitters
C. Opportunistic pathogens
D. Combined Radium 226/228
E. HPC

26. Certain minerals are radioactive and may emit a form of radiation known as alpha radiation. Some people who drink water containing alpha emitters in excess of the EPA standards over many years may have an increased risk of getting cancer.
A. Alpha emitters
B. Beta/photon emitters
C. Opportunistic pathogens
D. Combined Radium 226/228
E. Radon gas

27. Certain minerals are radioactive and may emit forms of radiation known as photons and beta radiation. Some people who drink water containing beta and photon emitters in excess of the EPA standards over many years may have an increased risk of getting cancer.
A. Alpha emitters
B. Beta/photon emitters
C. Opportunistic pathogens
D. Combined Radium 226/228
E. Radon gas

28. Some people who drink water containing radium 226 or 228 in excess of the EPA standards over many years may have an increased risk of getting cancer.
A. Alpha emitters
B. Beta/photon emitters
C. Opportunistic pathogens
D. Combined Radium 226/228
E. Radon gas

29. ___________can dissolve and accumulate in underground water sources, such as wells, and in the air in your home. Breathing radon can cause lung cancer. Drinking water containing radon presents a risk of developing cancer. Radon in air is more dangerous than radon in water.
A. Alpha emitters
B. Beta/photon emitters
C. Opportunistic pathogens
D. Combined Radium 226/228
E. Radon gas

30. Chlorine _______________ with hydrogen sulfide and water to form hydrochloric acid, and it reacts with carbon monoxide and sulfur dioxide to form phosgene and sulfuryl chloride.
A. Combustible materials
B. Attack
C. Incompatible
D. Reacts
E. Should be avoided

31. Solvents used as degreasers or cleaning agents. Improper disposal of __________ can lead to contamination of natural waters.
A. CARBONATE HARDNESS
B. VOLATILE ORGANIC COMPOUNDS
C. ALKALINITY
D. DISINFECTION BY-PRODUCTS
E. NONE OF THE ABOVE

32. __________ tend to evaporate very easily. This characteristic gives __________ very distinct chemical odors like gasoline, kerosene, lighter fluid, or dry cleaning fluid. Some __________ are suspected cancer-causing agents.
A. CARBONATE HARDNESS
B. VOLATILE ORGANIC COMPOUNDS
C. ALKALINITY
D. DISINFECTION BY-PRODUCTS

33. __________are organic chemical compounds that have high enough vapor pressures under normal conditions to significantly vaporize and enter the atmosphere.
A. CARBONATE HARDNESS
B. VOLATILE ORGANIC COMPOUNDS
C. ALKALINITY
D. DISINFECTION BY-PRODUCTS
E. NONE OF THE ABOVE

34. A wide range of carbon-based molecules, such as aldehydes, ketones, and other light hydrocarbons are __________. The term often is used in a legal or regulatory context and in such cases the precise definition is a matter of law. These definitions can be contradictory and may contain "loopholes"; e.g. exceptions, exemptions, and exclusions.
A. CARBONATE HARDNESS
B. VOLATILE ORGANIC COMPOUNDS
C. ALKALINITY
D. DISINFECTION BY-PRODUCTS
E. NONE OF THE ABOVE

35. The United States Environmental Protection Agency defines a __________ as any organic compound that participates in a photoreaction; others believe this definition is very broad and vague as organics that are not volatile in the sense that they vaporize under normal conditions can be considered volatile by this EPA definition. The term may refer both to well characterized organic compounds and to mixtures of variable composition.
A. CARBONATE HARDNESS
B. VOLATILE ORGANIC COMPOUNDS
C. ALKALINITY
D. DISINFECTION BY-PRODUCTS
E. NONE OF THE ABOVE

36. __________ is the measure of Calcium and Magnesium and other hard ions associated with carbonate (CO32-) and bicarbonate (HCO3-) ions contained in a solution, usually water. It is usually expressed either as parts per million (ppm or mg/L), or in degrees (KH - from the German "Karbonathärte").
A. CARBONATE HARDNESS
B. VOLATILE ORGANIC COMPOUNDS
C. ALKALINITY
D. DISINFECTION BY-PRODUCTS
E. NONE OF THE ABOVE

37. One German degree of __________is equivalent to about 17.8575 mg/L.
A. CARBONATE HARDNESS
B. VOLATILE ORGANIC COMPOUNDS
C. ALKALINITY
D. DISINFECTION BY-PRODUCTS
E. NONE OF THE ABOVE

38. Both measurements (mg/L or KH) are usually expressed "as CaCO3" – meaning the amount of hardness expressed as if calcium carbonate was the sole source of hardness. Every bicarbonate ion only counts for half as much carbonate hardness as a carbonate ion does.
A. CARBONATE HARDNESS
B. VOLATILE ORGANIC COMPOUNDS
C. ALKALINITY
D. DISINFECTION BY-PRODUCTS
E. NONE OF THE ABOVE

39. If a solution contained 1 liter of water and 50 mg NaHCO3 (baking soda), it would have a __________of about 18 mg/L as CaCO3. If you had a liter of water containing 50 mg of Na2CO3, it would have a carbonate hardness of about 29 mg/L as CaCO3.
A. CARBONATE HARDNESS
B. VOLATILE ORGANIC COMPOUNDS
C. ALKALINITY
D. DISINFECTION BY-PRODUCTS
E. NONE OF THE ABOVE

40. __________supplements non-carbonate (a.k.a "permanent") hardness where hard ions are associated with anions such as Chloride that do not precipitate out of solution when heated.
A. CARBONATE HARDNESS
B. VOLATILE ORGANIC COMPOUNDS
C. ALKALINITY
D. DISINFECTION BY-PRODUCTS
E. NONE OF THE ABOVE

41. __________is removed from water through the process of softening. Softening can be achieved by adding lime in the form of Ca(OH)2, which reacts first with CO2 to form calcium carbonate precipitate, reacts next with multi-valent cations to remove carbonate hardness, then reacts with anions to replace the non-carbonate hardness due to multi-valent cations with non-carbonate hardness due to calcium.
A. CARBONATE HARDNESS
B. VOLATILE ORGANIC COMPOUNDS
C. ALKALINITY
D. DISINFECTION BY-PRODUCTS
E. NONE OF THE ABOVE

42. The process requires recarbonation through the addition of carbon-dioxide to lower the pH which is raised during the initial softening process.
A. CARBONATE HARDNESS
B. VOLATILE ORGANIC COMPOUNDS
C. ALKALINITY
D. DISINFECTION BY-PRODUCTS
E. NONE OF THE ABOVE

43. __________is a measure of the ability of a solution to neutralize acids to the equivalence point of carbonate or bicarbonate.
A. CARBONATE HARDNESS
B. VOLATILE ORGANIC COMPOUNDS
C. ALKALINITY
D. DISINFECTION BY-PRODUCTS
E. NONE OF THE ABOVE

44. __________ is closely related to the acid neutralizing capacity (ANC) of a solution and ANC is often incorrectly used to refer to alkalinity.
A. CARBONATE HARDNESS
B. VOLATILE ORGANIC COMPOUNDS
C. ALKALINITY
D. DISINFECTION BY-PRODUCTS
E. NONE OF THE ABOVE

45. The acid neutralizing capacity refers to the combination of the solution and solids present (e.g., suspended matter, or aquifer solids), and the contribution of solids can dominate the ANC (see carbonate minerals below).
A. CARBONATE HARDNESS
B. VOLATILE ORGANIC COMPOUNDS
C. ALKALINITY
D. DISINFECTION BY-PRODUCTS

46. The __________ is equal to the stoichiometric sum of the bases in solution. In the natural environment carbonate alkalinity tends to make up most of the total alkalinity due to the common occurrence and dissolution of carbonate rocks and presence of carbon dioxide in the atmosphere.
A. CARBONATE HARDNESS
B. VOLATILE ORGANIC COMPOUNDS
C. ALKALINITY
D. DISINFECTION BY-PRODUCTS
E. NONE OF THE ABOVE

47. Other common natural components that can contribute to __________ include borate, hydroxide, phosphate, silicate, nitrate, dissolved ammonia, the conjugate bases of some organic acids and sulfide. Solutions produced in a laboratory may contain a virtually limitless number of bases that contribute to alkalinity.
A. CARBONATE HARDNESS
B. VOLATILE ORGANIC COMPOUNDS
C. ALKALINITY
D. DISINFECTION BY-PRODUCTS
E. NONE OF THE ABOVE

48. __________ is usually given in the unit mEq/L (milliequivalent per liter). Commercially, as in the pool industry, alkalinity might also be given in the unit ppm or parts per million.
A. CARBONATE HARDNESS
B. VOLATILE ORGANIC COMPOUNDS
C. ALKALINITY
D. DISINFECTION BY-PRODUCTS
E. NONE OF THE ABOVE

49. __________ is sometimes incorrectly used interchangeably with basicity. For example, the pH of a solution can be lowered by the addition of CO_2. This will reduce the basicity; however, the alkalinity will remain unchanged.
A. CARBONATE HARDNESS
B. VOLATILE ORGANIC COMPOUNDS
C. ALKALINITY
D. DISINFECTION BY-PRODUCTS
E. NONE OF THE ABOVE

50. __________The products created due to the reaction of chlorine with organic materials (e.g. leaves, soil) present in raw water during the water treatment process.
A. CARBONATE HARDNESS
B. VOLATILE ORGANIC COMPOUNDS
C. ALKALINITY
D. DISINFECTION BY-PRODUCTS
E. NONE OF THE ABOVE

51. Some people who drink water containing arsenic in excess of the EPA's standard over many years could experience skin damage or problems with their circulatory system, and may have an increased risk of getting cancer.
A. Alpha emitters
B. Beta/photon emitters
C. Opportunistic pathogens
D. Combined Radium 226/228
E. Arsenic

52. Many communities add ___________ to their drinking water to promote dental health. Each community makes its own decision about whether or not to add fluoride.
A. MCLGs
B. MCL
C. Dental fluorosis
D. Fluoride
E. Lead

53. The EPA has set an enforceable drinking water standard for ___________ of 4 mg/L (some people who drink water containing fluoride in excess of this level over many years could get bone disease, including pain and tenderness of the bones).
A. MCLGs
B. MCL
C. Dental fluorosis
D. Fluoride
E. Lead

54. The EPA has also set a secondary fluoride standard of 2 mg/L to protect against ___________.
A. MCLGs
B. MCL
C. Dental fluorosis
D. Fluoride
E. Lead

55. ___________, 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.
A. MCLGs
B. MCL
C. Dental fluorosis
D. Fluoride
E. Lead

56. Children under nine should not drink water that has more than 2 mg/L of ___________.
A. MCLGs
B. MCL
C. Dental fluorosis
D. Fluoride
E. Lead

57. Where the water is chlorinated to make sure to hold a residual in the distribution system.
A. Polymer
B. Pre Chlorine
C. Prechlorination
D. Post Chlorine

58. A pH of 7 is considered to be _______________. Most natural water has a pH between 6.0 and 8.5.
A. Base
B. Alkaline
C. Raise
D. Neutral

59. The addition of chlorine before the filtration process will help control algae and slime growth
A. Post Chlorine
B. Polymer
C. Prechlorination
D. None of the Above

60. Solids that have been removed from the raw water by the coagulation and settling processes.
A. Zinc Orthophosphate
B. Settled Solids
C. Corrosion Control
D. Taste and Odor Control
E. None of the Above

61. Caustic NaOH (also called Sodium Hydroxide) is a strong chemical used in the treatment process to neutralize acidity, increase alkalinity or _______________ the pH value.
A. Neutral
B. Raise
C. Alkaline

62. Where the raw water is dosed with a large concentration of chlorine.
A. Pre Chlorine
B. Polymer
C. Chlorine
D. Prechlorination

63. The turbidity of the water coming to the treatment plant from the raw water source.
A. Zinc Orthophosphate
B. Settled Solids
C. Corrosion Control
D. Taste and Odor Control
E. None of the Above

64. As with __________________, it is important to remember that activities many miles away from you may affect the quality of ground water.
A. Well
B. Surface water
C. Community
D. Reservoirs
E. Aquifers

65. Your annual drinking __________________will tell you where your water supplier gets your water.
A. Contaminants
B. Contaminated
C. Dissolved minerals
D. Discharge
E. None of the Above

66. Your water will normally contain chlorine and varying amounts of __________________ including calcium, magnesium, sodium, chlorides, sulfates and bicarbonates, depending on its source.
A. Contaminants
B. Contaminated
C. Dissolved minerals
D. Discharge
E. Insecticides

67. It is also not uncommon to find traces of iron, manganese, copper, aluminum, nitrates, __________________ and herbicides.
A. Contaminants
B. Contaminated
C. Dissolved minerals
D. Discharge
E. Insecticides

68. Although the maximum amounts of all these substances as mentioned above, are strictly limited by the regulations. These are usually referred to as__________________.
A. Contaminants
B. Contaminated
C. Dissolved minerals
D. Discharge
E. Insecticides

69. Surface water is usually__________________ and unsafe to drink.
A. Contaminants
B. Contaminated
C. Dissolved minerals
D. Discharge
E. Insecticides

70. The Phase I Rule became effective on January 9. 1989. This rule, also called the Volatile Organic Chemical Rule, or VOC Rule, 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. Nitrates
B. Phase I Contaminants
C. Organics
D. Nephelolometric Turbidity Units
E. Radionuclides

71. The 8 VOCs regulated under this rule are: Benzene, Carbon Tetrachloride, para-dichlorobenzene, trichloroethylene, vinyl chloride, 1,1, 2-trichlorethane, 1,1-dichloroethylene, and 1,2-dichlorothane.
A. Nitrates
B. Phase I Contaminants
C. Organics
D. Nephelolometric Turbidity Units
E. Radionuclides

72. A unit of measure used to describe the turbidity of water.
A. Nitrates
B. Phase I Contaminants
C. Organics
D. Nephelolometric Turbidity Units
E. Radionuclides

73. Turbidity is the cloudiness in water.
A. Nitrates
B. Phase I Contaminants
C. Organics
D. Nephelolometric Turbidity Units
E. Radionuclides

74. Inorganic compounds that can enter water supplies from fertilizer runoff and sanitary wastewater discharges.
A. Nitrates
B. Phase I Contaminants
C. Organics
D. Nephelolometric Turbidity Units
E. Radionuclides

75. __________ in drinking water are associated with methemoglobanemia, or blue baby syndrome, which results from interferences in the blood's ability to carry oxygen.
A. Nitrates
B. Phase I Contaminants
C. Organics
D. Nephelolometric Turbidity Units
E. Radionuclides

76. 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. Nitrates
B. Phase I Contaminants
C. Organics
D. Nephelolometric Turbidity Units
E. Radionuclides

77. Radiation can cause adverse health effects, such as cancer, so limits are placed on radionuclide concentrations in drinking water.
A. Nitrates
B. Phase I Contaminants
C. Organics
D. Nephelolometric Turbidity Units
E. Radionuclides

78. ______________ was first passed in 1974 and established the basic requirements under which the nation's public water supplies were regulated.
A. Risk
B. SDWA
C. Toxicity
D. To the Extent Practical
E. None of the Above

79. The ______________ 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.
A. Risk
B. SDWA
C. Toxicity
D. To the Extent Practical
E. None of the Above

80. The ______________ was amended in 1986 and again in 1996.
A. Risk
B. SDWA
C. Toxicity
D. To the Extent Practical
E. None of the Above

81. The potential for harm to people exposed to chemicals. In order for there to be risk, there must be hazard and there must be exposure.
A. Risk
B. SDWA
C. Toxicity
D. To the Extent Practical

82. Bacteria that are used as indicators of ______________ in drinking water.
A. Risk
B. SDWA
C. Toxicity
D. To the Extent Practical
E. None of the Above

83. The property of a chemical to harm people who come into contact with it.
A. Risk
B. SDWA
C. Toxicity
D. To the Extent Practical

84. States must inventory sources of contamination to the extent they have the technology and resources to ______________ delineated as described in the guidance.
A. Risk
B. SDWA
C. Toxicity
D. To the Extent Practical
E. None of the Above

85. All information sources may be used, ______________ Federal and state inventories of sources.
A. Risk
B. SDWA
C. Toxicity
D. To the Extent Practical
E. None of the Above

86. The surface and subsurface area surrounding a well or well field, supplying a PWS, through which contaminants are reasonably likely to move toward and reach such water well or well field.
A. Transient non-community systems
B. Transient/Non-Transient, Non-Community Water Systems
C. Treatment Technique
D. Wellhead Protection Area
E. Underground Injection Control (UIC) Program

87. Water systems that are non-community systems: transient systems serve 25 non-resident persons per day for 6 months or less per year.
A. Transient non-community systems
B. Transient/Non-Transient, Non-Community Water Systems
C. Treatment Technique
D. Wellhead Protection Area
E. Underground Injection Control (UIC) Program

88. _________________ typically are restaurants, hotels, large stores, etc. Non-transient systems regularly serve at least 25 of the same non-resident persons per day for more than 6 months per year. These systems typically are schools, offices, churches, factories, etc.
A. Transient non-community systems
B. Transient/Non-Transient, Non-Community Water Systems
C. Treatment Technique
D. Wellhead Protection Area
E. Underground Injection Control (UIC) Program

89. A specific treatment method required by the EPA to be used to control the level of a contaminant in drinking water. In specific cases where the EPA has determined it is not technically or economically feasible to establish an MCL, the EPA can instead specify a treatment technique.
A. Transient non-community systems
B. Transient/Non-Transient, Non-Community Water Systems
C. Treatment Technique
D. Wellhead Protection Area

90. A treatment technique is an enforceable procedure or level of _____________________ which public water systems must follow to ensure control of a contaminant.
A. Transient non-community systems
B. Transient/Non-Transient, Non-Community Water Systems
C. Treatment Technique
D. Wellhead Protection Area
E. None of the Above

91. A topographic boundary area that is the perimeter of the catchment area of a stream.
A. Watershed Approach
B. Watershed Area
C. Watershed
D. None of the Above

92. A watershed approach 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. Watershed Approach
B. Watershed Area
C. Watershed
D. None of the Above

93. A topographic area that is within a line drawn connecting the highest points uphill of a drinking water intake, from which overland flow drains to the intake.
A. Watershed Approach
B. Watershed Area
C. Watershed
D. None of the Above

94. ____________ growth is supplied by the energy of the sun, as algae absorb this energy it converts carbon dioxide to oxygen. This creates aerobic conditions that supply fish with oxygen.
A. pH
B. Algae
C. THM
D. PAC or GAC
E. None of the Above

95. Without sun light, the ____________ would consume oxygen and release carbon dioxide.
A. pH
B. Algae
C. THM
D. PAC or GAC
E. None of the Above

96. The lack of ____________in water is known as anaerobic conditions.
A. pH
B. Algae
C. THM
D. PAC or GAC
E. None of the Above

97. Certain vegetation removes the excess nutrients that would promote the growth of ____________.
A. pH
B. Algae
C. THM
D. PAC or GAC
E. None of the Above

98. Too much algae will imbalance the lake and this will result in ____________.
A. pH
B. Algae
C. THM
D. PAC or GAC
E. None of the Above

99. Most treatment plant upsets such as taste and odor, color, and filter clogging is due to ____________.
A. pH
B. Algae
C. THM
D. PAC or GAC
E. None of the Above

100. The type of ____________ determines the problem it will cause for instance slime, corrosion, color, and toxicity.
A. pH
B. Algae
C. THM
D. PAC or GAC
E. None of the Above

101. Algae can be controlled by using chemicals such as ____________.
A. pH
B. Algae
C. THM
D. PAC or GAC
E. None of the Above

102. Depending on federal regulations and the amount of copper found natural in water, operators have used Potassium Permanganate, ____________and Chlorine.
A. pH
B. Algae
C. THM
D. PAC or GAC
E. None of the Above

103. The ____________and alkalinity of the water will determine how these chemicals will react. Most systems no longer use Chlorine because it reacts with the organics in the water to form Trihalomethanes.
A. pH
B. Algae
C. THM
D. PAC or GAC
E. None of the Above

104. _____________ form when disinfectants added to drinking water to kill germs react with naturally-occurring organic matter in water.
A. pH
B. Algae
C. THM
D. PAC or GAC
E. None of the Above

105. Some people who drink water containing ______________in excess of EPA's standard over many years may experience problems with their liver, kidneys, or central nervous systems, and may have an increased risk of getting cancer.
A. pH
B. Algae
C. THM
D. PAC or GAC
E. None of the Above

106. 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 __________.

A. Mechanical bar screens
B. Screening
C. Horizontal bars
D. Clarifiers
E. None of the Above

107. The best way to protect the plant is __________.

A. Mechanical bar screens
B. Screening
C. Horizontal bars
D. Clarifiers
E. None of the Above

108. Bar screens are made of straight steel bars at the intake of the plant. The spacing of the __________will rank the size.

A. Mechanical bar screens
B. Screening
C. Horizontal bars
D. Clarifiers
E. None of the Above

109. __________are woven stainless steel material and the opening of the fabric is narrow. Both require manual cleaning.

A. Mechanical bar screens
B. Screening
C. Horizontal bars
D. Clarifiers
E. None of the Above

110. __________vary in size and use some type of raking mechanism that travels horizontally down the bars to scrap the debris off.

A. Mechanical bar screens
B. Screening
C. Horizontal bars
D. Clarifiers
E. None of the Above

111. Improving the clarity of surface water has always presented a challenge because source quality varies. Traditional treatments rely on __________with lengthy times.

A. Graded silica sand filter media
B. On expensive, construction-intensive processes
C. Which causes them to repel
D. Conventional water treatment process
E. Form a white precipitate that

112. Suspended particles carry an electrical charge __________one another.
A. Graded silica sand filter media
B. On expensive, construction-intensive processes
C. Which causes them to repel
D. Conventional water treatment process
E. Form a white precipitate that

113. The __________uses alum (aluminum sulfate) and cationic polymer to neutralize the charge. That allows suspended particles to clump together to form more easily filtered particles.
A. Graded silica sand filter media
B. On expensive, construction-intensive processes
C. Which causes them to repel
D. Conventional water treatment process
E. Form a white precipitate that

114. Alum combines with alkalinity in the raw water to __________neutralizes suspended particles' electrical charge and forms a base for coagulating those particles.
A. Graded silica sand filter media
B. On expensive, construction-intensive processes
C. Which causes them to repel
D. Conventional water treatment process
E. Form a white precipitate that

115. Since the sand __________ 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. Material
B. Particles
C. Density
D. Grains
E. Media

116. Filtration occurs only within the first few inches of the finer __________ at the top of the bed.
A. Material
B. Particles
C. Density
D. Grains
E. Media

117. A depth filter has four layers of filtration __________, each of different size and density.
A. Material
B. Particles
C. Density
D. Grains
E. Media

118. Light, coarse __________ lies at the top of the filter bed.
A. Material
B. Particles
C. Density
D. Grains

119. The __________ become progressively finer and denser in the lower layers. Larger suspended particles are removed by the upper layers while smaller particles are removed in the lower layers.
A. Material
B. Particles
C. Density
D. Grains
E. Media

120. __________ 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 traditional sand filter.
A. Material
B. Particles
C. Density
D. Grains
E. Media

121. Turbidity washes out of the filter bed as the filter media particles __________ one another. The down flow rinse settles the bed before the filter returns to service.
A. Scour
B. Cycle
C. Mud-balling
D. Backwash
E. Fast rinse

122. __________ lasts about 5 to 10 minutes.
A. Scour
B. Cycle
C. Mud-balling
D. Backwash
E. Fast rinse

123. As suspended __________ accumulate in a filter bed, the pressure drop through the filter increases.
A. Material
B. Particles
C. Density
D. Grains
E. Media

124. When the pressure difference between filter inlet and outlet increases by 5 - 10 psi from the beginning of the __________, the filter should be reconditioned.
A. Scour
B. Cycle
C. Mud-balling
D. Backwash
E. Fast rinse

125. Operating beyond this pressure drop increases the chance of fouling - called "__________ " - within the filter.
A. Scour
B. Cycle
C. Mud-balling
D. Backwash
E. Fast rinse

126. The reconditioning cycle consists of an up flow __________ followed by a down flow rinse.
A. Scour
B. Cycle
C. Mud-balling
D. Backwash
E. Fast rinse

127. __________ is an up flow operation, at about 14 gpm per square foot (34m/hr) of filter bed area that lasts about 10 minutes.
A. Scour
B. Cycle
C. Mud-balling
D. Backwash
E. Fast rinse

128. Chemical pretreatment is often used to enhance filter performance, particularly when turbidity includes fine ______________.
A. Colloidal particles
B. NTU
C. Electrically charged
D. Full water treatment
E. None of the Above

129. Suspended particles are usually ______________.
A. Colloidal particles
B. NTU
C. Electrically charged
D. Full water treatment
E. None of the Above

130. ______________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. Colloidal particles
B. NTU
C. Electrically charged
D. Full water treatment
E. None of the Above

131. 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. Colloidal particles
B. NTU
C. Electrically charged
D. Full water treatment
E. None of the Above

132. These are appropriate for small community systems where _______________ is desired, but without the construction costs and space requirements associated with separately constructed sedimentation basins, filter beds, clear wells, etc.
A. Colloidal particles
B. NTU
C. Electrically charged
D. Full water treatment
E. None of the Above

133. Chemical pretreatment may increase filtered water clarity, measured in ____________, by 90% compared with filtration alone.
A. Colloidal particles
B. NTU
C. Electrically charged
D. Full water treatment
E. None of the Above

134. If an operator is present to make adjustments for variations in the raw water, filtered water ______________in the range of 93 to 95% are achievable.
A. Colloidal particles
B. NTU
C. Electrically charged
D. Full water treatment
E. None of the Above

135. In addition to the _______________ filtration processes, package plants are found as two types: tube-type clarifiers and adsorption clarifiers. This is the most prevalent form of water treatment technology in use today.
A. Particles
B. Alum
C. Conventional
D. Coagulation
E. Coagulant

136. This filtration process employs a combination of _______________ and chemical processes in order to achieve maximum effectiveness.
A. Particles
B. Alum
C. Physical
D. Coagulation
E. Coagulant

137. At the Water Treatment Plant, aluminum sulfate, commonly called _______________, is added to the water in the "flash mix" to cause microscopic impurities in the water to clump together.
A. Particles
B. Alum
C. Conventional
D. Coagulation
E. Coagulant

138. The ________________ and the water are mixed rapidly by the flash mixer. The resulting larger particles will be removed by filtration.
A. Particles
B. Alum
C. Conventional
D. Coagulation
E. Coagulant

139. ________________ is the process of joining together particles in water to help remove organic matter.
A. Particles
B. Alum
C. Conventional
D. Coagulation
E. Coagulant

140. 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 use of ________________ chemicals.
A. Particles
B. Alum
C. Conventional
D. Coagulation
E. Coagulant

141. Coagulant chemicals are required since colloidal particles by themselves have the tendency to stay suspended in water and not settle out. This is primarily due to a negative charge on the surface of the ________________.
A. Particles
B. Alum
C. Conventional
D. Coagulation
E. Coagulant

142. All matter has a residual surface charge to a certain degree. But since colloidal particles are so small, their charge per volume is significant. Therefore, the like charges on the _________________repel each other, and they stay suspended in water.
A. Particles
B. Alum
C. Conventional
D. Coagulation

143. _________________ chemicals such as "alum" (aluminum sulfate) work by neutralizing the negative charge, which allows the particles to come together. Other coagulants are called "cationic polymers", which can be thought of as positively charged strings that attract the particles to them, and in the process, form a larger particle.
A. Particles
B. Alum
C. Conventional
D. Coagulation
E. Coagulant

144. New chemicals have been developed which combine the properties of alum-type coagulants and cationic polymers. Which chemical is used depends on the _______________, and will usually be chosen by the engineer designing the water treatment system.
A. Particles
B. Alum
C. Application
D. Coagulation
E. Coagulant

145. Aluminum Sulfate is the most widely used ________________ in water treatment.
A. Particles
B. Alum
C. Conventional
D. Coagulation
E. Coagulant

146. ________________ is necessary to meet the current regulations for almost all potable water plants using surface water.
A. Particles
B. Aluminum Sulfate
C. Conventional
D. Coagulation

147. ________________is also excellent for removing nutrients such as phosphorous in wastewater treatment. Liquid Aluminum Sulfate is a 48.86% solution.
A. Particles
B. Aluminum Sulfate
C. Conventional
D. Coagulation
E. Coagulant

148. Large microorganisms, including algae and amoebic cysts, are readily removed by _______________ and filtration. Bacterial removals of 99% are also achievable.
A. Gravity
B. Floc
C. Detention times
D. Destabilized
E. Coagulation

149. More than 98% of poliovirus type 1 was removed by conventional ______________ and filtration.
A. Gravity
B. Floc
C. Detention times
D. Destabilized
E. Coagulation

150. Several recent studies have shown that bacteria and viral agents are attached to organic and inorganic particulates. Hence, removal of these particulates by conventional _______________ and filtration is a major component of effective treatment for the removal of pathogens.
A. Gravity
B. Floc
C. Detention times
D. Destabilized
E. Coagulation

151. The process of bringing together ________________ or coagulated particles to form larger masses which can be settled and/or filtered out of the water being treated.
A. Gravity
B. Floc
C. Detention times
D. Destabilized
E. Coagulation

152. In this process, which follows the rapid mixing, the chemically treated water is sent into a basin where the suspended particles can collide, agglomerate (stick together), and form heavier particles called _______________.
A. Gravity
B. Floc
C. Detention times
D. Destabilized
E. Coagulation

153. Gentle agitation of the water and appropriate _______________ (the length of time water remains in the basin) help facilitate this process.
A. Gravity
B. Floc
C. Detention times
D. Destabilized
E. Coagulation

154. The water is slowly mixed in________________ allowing the coagulated particles, now called "floc," to become larger and stronger.
A. Gravity
B. Floc
C. Contact chambers
D. Destabilized
E. Coagulation

155. As floc particles mix in the water, bacteria and other microorganisms are caught in the floc ________________ .
A. Structure
B. Floc
C. Detention times
D. Destabilized
E. Coagulation

156. Depending on the quality of the _______________, some plants have pre-sedimentation.
A. Gravity
B. Floc
C. Source Water
D. Destabilized
E. Coagulation

157. Pre-sedimentation allows larger particles time to _______________ in a reservoir or lake (sand, heavy silt) reducing solid removal loads.
A. Gravity
B. Floc
C. Settle
D. Destabilized
E. Coagulation

158. Pre-sedimentation provides an _______________ which evens out fluctuations in concentrations of suspended solids.
A. Gravity
B. Floc
C. Equalization basin
D. Destabilized
E. Coagulation

159. 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, can settle out by _______________.
A. Gravity
B. Floc
C. Detention times
D. Destabilized
E. Coagulation

160. Once settled, the _______________ combine to form a sludge that is later removed from the bottom of the basin.
A. Particles
B. Floc
C. Detention times
D. Destabilized
E. Coagulation

161. A water treatment step used to remove turbidity, ________________, odor, taste and color.
A. Gravity
B. Floc
C. Dissolved organics
D. Destabilized
E. Coagulation

162. The water flows by gravity through large filters of anthracite coal, silica sand, garnet and ________________.
A. Gravel
B. Floc
C. Detention times
D. Destabilized
E. Coagulation

163. The floc particles are ________________ in these filters. The rate of filtration can be adjusted to meet water consumption needs.
A. Remove, Removal or Removed
B. Flushed
C. Disposable
D. Settled out
E. None of the Above

164. Filters for suspended particle _______________ can also be made of graded sand, granular synthetic material, screens of various materials, and fabrics.
A. Remove, Removal or Removed
B. Flushed
C. Disposable
D. Settled out
E. None of the Above

165. The most widely used are rapid-sand filters in tanks. In these units, gravity holds the material in place and the flow is downwards. The filter is periodically cleaned by a reversal of flow and the discharge of back _______________ water into a drain.
A. Remove, Removal or Removed
B. Flushed
C. Disposable
D. Settled out
E. None of the Above

166. Cartridge filters made of fabric, paper, or plastic material are also common and are often much smaller and cheaper, as well as_______________.
A. Remove, Removal or Removed
B. Flushed
C. Disposable
D. Settled out
E. None of the Above

167. Filters are available in several ratings, depending on the size of particles to be ______.
A. Remove, Removal or Removed
B. Flushed
C. Disposable
D. Settled out
E. None of the Above

168. Activated carbon filters, described earlier, will also _______________ turbidity, but would not be recommended for that purpose only.
A. Remove, Removal or Removed
B. Flushed
C. Disposable
D. Settled out
E. None of the Above

169. With most of the larger particles _______________, the water now goes to the filtration process. At a rate of between 2 and 10 gpm per square foot, the water is filtered through an approximate 36" bed of graded sand.
A. Remove, Removal or Removed
B. Flushed
C. Disposable
D. Settled out
E. None of the Above

170. Anthracite coal or activated carbon may also be included in the sand to improve the filtration process, especially for the _______________ of organic contaminants, taste, and odor problems.
A. Remove, Removal or Removed
B. Flushed
C. Disposable
D. Settled out
E. None of the Above

171. _______________of overall filtration process performance should be conducted on a routine basis, at least once per day.
A. Remove, Removal or Removed
B. Evaluation
C. Disposable
D. Settled out
E. None of the Above

172. Poor chemical treatment can often result in either early turbidity breakthrough or rapid head loss buildup. The more uniform the media, the _______________ head loss buildup.
A. Remove, Removal or Removed
B. Evaluation
C. Disposable
D. Slower
E. None of the Above

173. All water treatment plants that use surface water are _______________ by the U.S. EPA's Surface Water Treatment Rules or SWTR.
A. Remove, Removal or Removed
B. Evaluation
C. Governed
D. Settled out
E. None of the Above

174. Direct Filtration Plant vs. Conventional Plant The only difference is that the sedimentation process or step is omitted from the ___________ plant.
A. Detention Time
B. Direct Filtration
C. Declining Rate Filters
D. Disinfection
E. Jar testing

175. The flow rate will vary with head loss. Each filter operates at the same rate, but can have a variable water level.
A. Detention Time
B. Direct Filtration plant
C. Declining Rate Filters
D. Disinfection
E. Jar testing

176. This system requires an effluent control structure (weir) to provide adequate media submergence.
A. Detention Time
B. Direct Filtration plant
C. Declining Rate Filters
D. Disinfection
E. Jar testing

177. The actual time required for a small amount of water to pass through a sedimentation basin at a given rate of flow, or the calculated time required for a small amount of liquid to pass through a tank at a given rate of flow.
A. Detention Time
B. Direct Filtration plant
C. Declining Rate Filters
D. Disinfection
E. Jar testing

178. 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 post-disinfection.
A. Detention Time
B. Direct Filtration plant
C. Declining Rate Filters
D. Disinfection
E. Jar testing

179. ________________traditionally has been done on a routine basis in most water treatment plants to control the coagulant dose.
A. Detention Time
B. Direct Filtration plant
C. Declining Rate Filters
D. Disinfection
E. Jar testing

180. 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. These include: Determination of most _______________ coagulant.
A. Sequence
B. Effective
C. Optimum
D. Application
E. Expression

181. Determination of _______________ coagulation pH for the various coagulants.
A. Sequence
B. Effective
C. Optimum
D. Application
E. Expression

182. Optimum point of _______________ of polymers in the treatment train.
A. Sequence
B. Effective
C. Optimum
D. Application
E. Expression

183. Optimum sequence of _______________ of coagulants, polymers and pH adjustment chemicals.
A. Sequence
B. Effective
C. Optimum
D. Application
E. Expression

184. pH ______________ of a basic or acid condition of a liquid.
A. Sequence
B. Effective
C. Optimum
D. Application
E. Expression

185. The pH range is from 0-14, zero being the most acid and 14 being the most _________.
A. Neutral
B. Alkaline
C. Raise

186. A type of chemical when combined with other types of coagulants aid in binding small suspended particles to larger particles to help in the settling and filtering processes.
A. Post Chlorine
B. Polymer
C. Pre Chlorine
D. Prechlorination

187. A chemical used to coat the pipes in the distribution system to inhibit corrosion.
A. Zinc Orthophosphate
B. Settled Solids
C. Corrosion Control
D. Taste and Odor Control
E. None of the Above

188. Powdered activated carbon (PAC) is occasionally added for taste and odor control. PAC is added to the flash mix.
A. Zinc Orthophosphate
B. Settled Solids
C. Corrosion Control
D. Taste and Odor Control
E. None of the Above

189. The rule specifies maximum contaminant level goals for Giardia lamblia, 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. The regulations also specify water quality, treatment, and watershed protection criteria under which filtration may be avoided.
A. Susceptibility Analysis
B. State Management Plan (SMP) Program
C. Significant Potential Source of Contamination
D. Surface Water Treatment Rule (SWTR)
E. None of the Above

190. A clean, constant supply of drinking water is essential to every community. People in large cities frequently drink water that comes from surface water sources, such as lakes, rivers, and __________________.

A. Well
B. Watershed
C. Community
D. Reservoirs
E. Aquifers

191. Sometimes these sources are close to the __________________. Other times, drinking water suppliers get their water from sources many miles away.

A. Well
B. Watershed
C. Community
D. Reservoirs

192. In either case, when you think about where your drinking water comes from, it's important to consider not just the part of the river or lake that you can see, but the entire __________________.

A. Well
B. Watershed
C. Community
D. Reservoirs
E. Aquifers

193. The __________________ is the land area over which water flows into the river, lake, or reservoir.

A. Well
B. Watershed
C. Community
D. Reservoirs
E. Aquifers

194. In rural areas, people are more likely to drink ground water that was pumped from a __________________.

A. Well
B. Watershed
C. Community
D. Reservoirs

195. These wells tap into __________________--the natural reservoirs under the earth's surface--that may be only a few miles wide, or may span the borders of many states.

A. Well
B. Watershed
C. Community
D. Reservoirs
E. Aquifers

196. Water testing is conducted throughout the treatment process. Items like turbidity, pH and chlorine residual are monitored and recorded continuously. Some items are __________ several times per day, some once per quarter and others once per year.
A. Allowing
B. Tested
C. Plunging
D. Improve
E. None of the Above

197. Collect the water sample at least 6 inches under the surface by _______________ the container mouth down into the water and turning the mouth towards the current by dragging the container slowly horizontal.
A. Allowing
B. Tested
C. Plunging
D. Improve
E. None of the Above

198. Care should be taken not to disturb the bottom of the water source or along the sides so as not to _______________any settled solids. This would create erroneous errors.
A. Allowing
B. Tested
C. Plunging
D. Improve
E. None of the Above

199. Chemicals are added to the water in order to _______________ the subsequent treatment processes.
A. Allowing
B. Tested
C. Plunging
D. Improve
E. None of the Above

200. Chemicals may _______________ pH adjusters and coagulants.
A. Allowing
B. Tested
C. Plunging
D. Improve
E. None of the Above

201. Coagulants are chemicals, such as alum, that neutralize positive or negative charges on small particles, _______________ them to stick together and form larger particles that are more easily removed by sedimentation (settling) or filtration.
A. Allowing
B. Tested
C. Plunging
D. Improve
E. None of the Above

202. Hydrofluosilicic Acid (H2SiF6) a clear, fuming corrosive liquid with a pH ranging from 1 to 1.5. Used in water treatment to _____________.
A. Zinc Orthophosphate
B. Settled Solids
C. Corrosion Control
D. Taste and Odor Control
E. None of the Above

203. The pH of the water is adjusted with sodium carbonate, commonly called soda ash. Soda ash is fed into the water after filtration.
A. Zinc Orthophosphate
B. Settled Solids
C. Corrosion Control
D. Taste and Odor Control
E. None of the Above

204. A variety of devices, such as baffles, static mixers, impellers, and in-line sprays can be used to mix the water and _______________evenly.
A. Distribute the chemicals
B. Water flows upwards
C. Short Circuiting
D. Conventional process
E. Gravity settling

Chlorine can be added as sodium hypochlorite, calcium hypochlorite or chlorine gas. When any of these is added to water, chemical reactions occur as these equations show:

205. Cl 2 + H 2 O → HOCl + ____________
(chlorine gas) (water) (hypochlorous acid) (hydrochloric acid)
A. HCl
B. Ca(OH)
C. HOCl
D. OCl –
E. None of the Above

206. CaOCl + H 2 O → ____________ + Ca(OH)
(calcium hypochlorite) (water) (hypochlorous acid) (calcium hydroxide)
A. HCl
B. Ca(OH)
C. 2HOCl
D. OCl –
E. None of the Above

207. NaOCl + H 2 O → ____________ + Na(OH)
(sodium hypochlorite) (water) (hypochlorous acid) (sodium hydroxide)
A. HCl
B. Ca(OH)
C. HOCl
D. OCl –
E. None of the Above

208. All three forms of chlorine produce ____________when added to water. Hypochlorous acid is a weak acid but a strong disinfecting agent. The amount of hypochlorous acid depends on the pH and temperature of the water. Under normal water conditions, hypochlorous acid will also chemically react and break down into a hypochlorite ion.
A. HCl
B. Ca(OH)
C. HOCl
D. OCl –
E. None of the Above

209. ____________: HOCl H + + OCl – Also expressed HOCl → H + + OCl –
(hypochlorous acid) (hydrogen) (hypochlorite ion)
A. HCl
B. Ca(OH)
C. HOCl
D. OCl –
E. None of the Above

210. The ____________is a much weaker disinfecting agent than hypochlorous acid, about 100 times less effective.
A. HCl
B. Ca(OH)
C. HOCl
D. OCl –
E. None of the Above

211. Let’s now look at how pH and temperature affect the ratio of hypochlorous acid to hypochlorite ions. As the temperature is decreased, the ratio of ____________increases.
A. HCl
B. Ca(OH)
C. HOCl
D. OCl –
E. None of the Above

212. Temperature plays a small part in the acid ratio. Although the ratio of ____________is greater at lower temperatures, pathogenic organisms are actually harder to kill.
A. HCl
B. Ca(OH)
C. HOCl
D. OCl –
E. None of the Above

213. All other things being equal, higher water temperatures and ____________are more conducive to chlorine disinfection.
A. HCl
B. Ca(OH)
C. HOCl
D. OCl –
E. None of the Above

214. A number of cities use _____________ to disinfect their source water and to reduce THM formation.
A. Chlorate and chlorite
B. Ozone
C. THMs
D. Chloramines
E. None of the Above

215. Although _____________ is a highly effective disinfectant, it breaks down quickly, so that small amounts of chlorine or other disinfectants must be added to the water to ensure continued disinfection as the water is piped to the consumer's tap.
A. Chlorate and chlorite
B. Ozone
C. THMs
D. Chloramines
E. None of the Above

216. Modifying water treatment facilities to use _____________ can be expensive, and ozone treatment can create other undesirable by-products that may be harmful to health if they are not controlled (e.g., bromate).
A. Chlorate and chlorite
B. Ozone
C. THMs
D. Chloramines
E. None of the Above

217. Examples of other disinfectants include _____________ and chlorine dioxide.
A. Chlorate and chlorite
B. Ozone
C. THMs
D. Chloramines
E. None of the Above

218. _____________are weaker disinfectants than chlorine, especially against viruses and protozoa; however, they are very persistent and, as such, can be useful for preventing re-growth of microbial pathogens in drinking water distribution systems.
A. Chlorate and chlorite
B. Ozone
C. THMs
D. Chloramines
E. None of the Above

219. Chlorine dioxide can be an effective disinfectant, but it forms ____________, compounds whose toxicity has not yet been fully determined.
A. Chlorate and chlorite
B. Ozone
C. THMs
D. Chloramines
E. None of the Above

220. Assessments of the health risks from these and other _____________disinfectants and chlorination by-products are currently under way.
A. Chlorate and chlorite
B. Ozone
C. THMs
D. Chloramines
E. None of the Above

221. In general, the preferred method of controlling chlorination by-products is removal of the naturally occurring _____________from the source water so it cannot react with the chlorine to form by-products.
A. Chlorate and chlorite
B. Ozone
C. THMs
D. Chloramines
E. None of the Above

222. THM levels may also be reduced through the replacement of chlorine with alternative disinfectants. A third option is removal of the _____________by adsorption on activated carbon beds.
A. Chlorate and chlorite
B. Ozone
C. THMs
D. Chloramines
E. None of the Above

223. It is extremely important that water treatment plants ensure that methods used to control chlorination by-products do not compromise the effectiveness of _____________.
A. Chlorate and chlorite
B. Ozone
C. THMs
D. Chloramines
E. None of the Above

Alternate Disinfectants

224. _____________is a very weak disinfectant for Giardia and virus reduction.
A. Chlorine dioxide
B. Chloramine
C. Dry sodium chlorite
D. Ozone
E. None of the Above

225. It is recommended that it be used in conjunction with a stronger disinfectant. It is best utilized as a stable distribution system disinfectant.
A. Chlorine dioxide
B. Chloramine
C. Dry sodium chlorite
D. Ozone
E. None of the Above

226. In the production of _____________, the ammonia residuals in the finished water, when fed in excess of the stoichiometric amount needed, should be limited to inhibit growth of nitrifying bacteria.
A. Chlorine dioxide
B. Chloramine
C. Dry sodium chlorite
D. Ozone
E. None of the Above

227. _____________may be used for either taste or odor control or as a pre-disinfectant. Total residual oxidants (including chlorine dioxide and chlorite, but excluding chlorate) shall not exceed 0.30 mg/L during normal operation or 0.50 mg/L (including chlorine dioxide, chlorite and chlorate) during periods of extreme variations in the raw water supply.
A. Chlorine dioxide
B. Chloramine
C. Dry sodium chlorite
D. Ozone
E. None of the Above

228. Ozone does not provide a system residual and should be used as a primary disinfectant only in conjunction with _____________.
A. Chlorine dioxide
B. Chloramine
C. Dry sodium chlorite
D. Ozone
E. None of the Above

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

230. _____________provides good Giardia and virus protection but its use is limited by the restriction on the maximum residual of 0.5 mg/L ClO2/chlorite/chlorate allowed in finished water. This limits usable residuals of chlorine dioxide at the end of a process unit to less than 0.5 mg/L.
A. Chlorine dioxide
B. Chloramine
C. Dry sodium chlorite
D. Ozone
E. None of the Above

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

232. This modification of the _______________ contains many metal "tubes" that are placed in the sedimentation basin, or clarifier. These tubes are approximately 1 inch deep and 36 inches long, split-hexagonal shape, and installed at an angle of 60 degrees or less.
A. Distribute the chemicals
B. Water flows upwards
C. Short Circuiting
D. Conventional process
E. Gravity settling

233. These tubes provide for a very large surface area upon which particles may settle as the _______________.
A. Distribute the chemicals
B. Water flows upwards
C. Short Circuiting
D. Conventional process
E. Gravity settling

234. The slope of the tubes facilitates _______________of the solids to the bottom of the basin, where they can be collected and removed.
A. Distribute the chemicals
B. Water flows upwards
C. Short Circuiting
D. Conventional process
E. Gravity settling

235. 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. Distribute the chemicals
B. Water flows upwards
C. Short Circuiting
D. Conventional
E. Gravity settling

236. This technology uses an_______________ with low-density plastic bead media, usually held in place by a screen.
A. Distribute the chemicals
B. Up flow clarifier
C. Short Circuiting
D. Conventional process
E. Gravity settling

237. This adsorption media is designed to enhance the _______________process by combining flocculation and sedimentation into one step.
A. Distribute the chemicals
B. Sedimentation/clarification
C. Short Circuiting
D. Conventional process
E. Gravity settling

238. In this step, turbidity is reduced by _______________ of the coagulated and flocculated solids onto the adsorption media and onto the solids already adsorbed onto the media.
A. Distribute the chemicals
B. Water flows upwards
C. Short Circuiting
D. Conventional process
E. Adsorption

239. Air scouring cleans _______________followed by water flushing.
A. Mixed-media filtration
B. Filter backwashing
C. Temporary storage
D. Filtered water available
E. Adsorption clarifiers

240. Cleaning of this type of clarifier is initiated more often than _____________because the clarifier removes more solids.
A. Mixed-media filtration
B. Filter backwashing
C. Temporary storage
D. Filtered water available
E. Adsorption clarifiers

241. As with the tube-settler type of package plant, the sedimentation/clarification process is followed by _______________and disinfection to complete the water treatment.
A. Mixed-media filtration
B. Filter backwashing
C. Temporary storage
D. Filtered water available
E. Adsorption clarifiers

242. The final step in the conventional filtration process, the clearwell provides _____________ for the treated water.
A. Mixed-media filtration
B. Filter backwashing
C. Temporary storage
D. Filtered water available
E. Adsorption clarifiers

243. The two main purposes for this storage are to have _______________for backwashing the filter, and to provide detention time (or contact time) for the chlorine (or other disinfectant) to kill any microorganisms that may remain in the water.
A. Mixed-media filtration
B. Filter backwashing
C. Temporary storage
D. Filtered water available
E. Adsorption clarifiers

244. The pathogens must survive in the water. This _______________of the water and the length of time the pathogens are in the water.
A. Caused by bacteria
B. Depends on the temperature
C. May survive for months
D. Inadequately treated
E. None of the Above

245. Some pathogens will survive for only a short time in water, others, such as Giardia or Cryptosporidium, _______________.
A. Caused by bacteria
B. Depends on the temperature
C. May survive for months
D. Inadequately treated
E. None of the Above

246. The pathogens in the water must enter the water system's intake and in numbers sufficient to infect people. The water is either not treated or _______________for the pathogens present. A susceptible person must drink the water that contains the pathogen.
A. Caused by bacteria
B. Depends on the temperature
C. May survive for months
D. Inadequately treated
E. None of the Above

247. Illness (disease) will occur. This _____________that must occur for the transmission of disease via drinking water.
A. Caused by bacteria
B. Depends on the temperature
C. May survive for months
D. Inadequately treated
E. None of the Above

248. By breaking the chain at any point, the _______________will be prevented.
A. Caused by bacteria
B. Depends on the temperature
C. May survive for months
D. Inadequately treated
E. None of the Above

249. Campylobacteriosis is the most common ________________caused by bacteria.
A. Caused by bacteria
B. Depends on the temperature
C. May survive for months
D. Inadequately treated
E. None of the Above

250. Symptoms include abdominal pain, malaise, fever, nausea and vomiting; they usually begin three to five days ________________. The illness is frequently over within two to five days and usually lasts no more than 10 days.
A. Caused by bacteria
B. Depends on the temperature
C. May survive for months
D. Inadequately treated
E. None of the Above