Registration form

WATER TREATMENT

48HOUR 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

List number of hours worked on assignment must match State Requirement. _____

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Operator ID #_____Exp. Date_____

Class/Grade_____

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

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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.

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http://www.abctlc.com/downloads/PDF/CEU%20State%20Approvals.pdf

You can obtain a printed version of the course manual from TLC for an additional $169.95 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.

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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.

CERTIFICATION OF COURSE PROCTOR

Technical Learning College requires that our students who takes a correspondence or home study program course must pass a proctored course reading, quiz and final examination. The proctor must complete and provide to the school a certification form approved by the commission for each examination administered by the proctor.

Instructions. When a student completes the course work, fill out the blanks in this section and provide the form to the proctor with the examination.

Name of Course:_____

Name of Licensee:_____

Instructions to Proctor. After an examination is administered, complete and return this certification and examination to the school in a sealed exam packet or in pdf format.

I certify that:

1. I am a disinterested third party in the administration of this examination. I am not related by blood, marriage or any other relationship to the licensee which would influence me from properly administering the examination.
2. The licensee showed me positive photo identification prior to completing the examination.
3. The enclosed examination was administered under my supervision on _____. The licensee received no assistance and had no access to books, notes or reference material.
4. I have not permitted the examination to be compromised, copied, or recorded in any way or by any method.
5. Provide an estimate of the amount of time the student took to complete the assignment.

Time to complete the entire course and final exam. _____

Notation of any problem or concerns:

Name and Telephone of Proctor (please print):

_____

_____

Signature of Proctor

WATER TREATMENT Answer Key

Name_____

Phone _____

Did you check with your State agency to ensure this course is accepted for credit?

No refund

You are responsible to ensure this course is accepted for credit. No refunds.
Method of Course acceptance confirmation. Please fill this section

Website __ Telephone Call___ Email____ Spoke to_____

Did you receive the approval number, if applicable? _____

What is the course approval number, if applicable? _____

You can electronically complete this assignment in Adobe Acrobat DC.

Please Circle, Bold, Underline or X, one answer per question. A **felt tipped pen** works best.

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

WATER TREATMENT CEU COURSE
CUSTOMER SERVICE RESPONSE CARD

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

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

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How did you hear about this Course? _____

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Any other concerns or comments.

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Disclaimer Notice

Amount of Time for Course Completion – How many hours you spent on course?

Must match State Hour Requirement _____ (Hours)

I understand that I am 100 percent responsible to ensure that TLC receives the Assignment and Registration Key. I understand that TLC has a zero tolerance towards not following their rules, cheating or hostility towards staff or instructors. I need to complete the entire assignment for credit. There is no credit for partial assignment completion. My exam was proctored.

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Please Sign that you understand and will abide with TLC's Rules.

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Please scan the **Registration Page, Answer Key, Proctoring Report, Survey and Driver's License** and email these documents to info@TLCH2O.com.

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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 course contains general EPA's SDWA federal rule requirements. Please be aware that each state implements water / sampling procedures/ safety / environmental / SDWA regulations that may be more stringent than EPA's regulations. Check with your state environmental/health agency for more information. These rules change frequently and are often difficult to interpret and follow. Be careful to be in compliance with your regulatory agencies and do not follow this course for any compliance concerns.

Water Treatment CEU Training Course Assignment

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

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

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

Please write down any questions you were not able to find the answers or that have errors.

Hyperlink to the Glossary and Appendix
http://www.abctlc.com/downloads/PDF/WTGlossary.pdf

Water Quality Section
Surface (Raw) Water Introduction
1. Operators need to appropriately treat surface water is never pure of_____, it. Most of the earth's water sources obtain their water supplies through precipitation.
A. Excess nutrients C. Pollution
B. Biological actions D. None of the above

2. _____ enhancement and formation of policy measures (administrative and engineering) revolves around most effective types of treatment methods and/or chemicals.
A. Universal solvent C. Surface water
B. Water quality D. None of the above

Surface Water Properties
3. Water is accepted as the _____ because will dissolve most substances that comes in contact.
A. Universal solvent C. Surface water
B. Water quality D. None of the above

4. Runoff could produce mud, leaves, decayed vegetation, and human and animal refuse. The discharge from industry could increase_____. Some lakes and reservoirs may experience seasonal turnover.
A. Volatile organic compounds C. Excess nutrients
B. Water quality D. None of the above

Managing Water Quality at the Source
5. Contingent upon the region, source water may have several restrictions of use as part of a Water Shed Management Plan. In some areas, it may be restricted from recreational use, discharge or runoff from agriculture, or_____ .
A. Excess nutrients C. Industrial and wastewater discharge
B. Biological actions D. None of the above

6. Another characteristic of quality control is aquatic plants. The ecological equilibrium in lakes and reservoirs plays a natural part in purifying and sustaining the life of the lake. Certain vegetation removes the excess nutrients that would promote the growth of algae. Too much algae will imbalance the lake and kill fish.
A. True B. False

7. Most treatment plant upsets are such as taste and odor, color, and filter clogging is due to algae. The type of algae determines the problem it will cause, for instance slime, corrosion, color, and toxicity.
A. True B. False

8. Contingent upon federal regulations and the amount of copper found natural in water, operators have used_____ , powdered activated carbon and chlorine to control algae blooms.
A. pH and alkalinity C. Potassium permanganate
B. Metals, and non-metals D. None of the above

Physical Characteristics of Water
9. Physical characteristics are the elements found that are considered alkali, metals, and non-metals such as carbonates, fluoride,_____. The consumer relates it to scaling of faucets or staining.
A. pH and alkalinity C. Powdered activated carbon and chlorine
B. Sulfides or acids D. None of the above

10. pH is the negative logarithm of the hydrogen ion concentration, [H^+], a measure of the degree to which a solution is_____ .
A. Alkalinity C. Hydrogen ion (H^+)
B. Acidic or alkaline D. None of the above

11. The more acidic a solution the greater the hydrogen ion concentration and the lower the pH; a pH of 7.0 indicates neutrality, a pH of less than 7 indicates acidity, and a pH of more than 7 indicates _____.
A. Acid C. Alkalinity
B. Base D. None of the above

Alkalinity
12. Alkalinity of water is its acid-neutralizing capacity. It is the sum of all the titratable bases. The measured value may vary significantly with the end-point pH used.
A. True B. False

13. _____ with an overabundance of alkaline earth metal concentrations is significant in determining the suitability of water for irrigation.
A. Alkalinity C. Hydrogen ion (H^+)
B. Acid D. None of the above

14. Alkalinity measurements are used in the interpretation and control of water and wastewater treatment processes
A. True B. False

Turbidity Introduction

15. The turbidity in natural surface waters is composed of a large number of sizes of particles. The sizes of particles can be changing constantly, depending on precipitation and _____ factors.

A. MCL C. Temperature
B. Manmade D. None of the above

16. Generally, higher turbidity levels require higher coagulant dosages. However, seldom is the relationship between turbidity level and _____linear.

A. Coagulant dosage C. Temperature
B. Total Dissolved Solids (TDS) D. None of the above

17. Low _____waters can be very difficult to coagulate due to the difficulty in inducing collision between the colloids.

A. Turbidity C. Total Dissolved Solids (TDS)
B. Colloids D. None of the above

Turbidity MCL

18. An MCL for turbidity established by the EPA because _____interferes with disinfection. This characteristic of water changes the most rapidly after a heavy rainfall.

A. Conductivity C. Temperature
B. Turbidity D. None of the above

Dissolved Oxygen

19. The level of dissolved oxygen in natural waters is often a direct indication of quality, since aquatic plants produce oxygen, while microorganisms generally consume it as they feed on _____.

A. Pollutants C. E. coli bacteria
B. Organic matter D. None of the above

20. _____ is essential for the support of fish and other aquatic life and aids in the natural decomposition of organic matter.

A. Dissolved oxygen C. Solubility of oxygen
B. Thermal stratification D. None of the above

Objections to Hard Water

Scale Formation

21. Hard water forms scale, usually_____, which causes a variety of problems. Left to dry on the surface of glassware and plumbing fixtures, including showers doors, faucets, and sink tops; hard water leaves unsightly white scale known as water spots.

A. Magnesium carbonate C. Calcite
B. Calcium carbonate D. None of the above

Secondary Standard

22. TDS is most often measured in parts per million (ppm) or milligrams per liter of water (mg/L). The normal TDS level ranges from _____

A. 50 ppm to 1,000 ppm C. 50 ppm to 100 ppm
B. 5 ppm to 10 ppm D. None of the above

(S) Means the answer can be plural or singular in nature

Langelier Saturation Index

23. The Langelier Saturation index (LSI) is an evenness scale derived from the theoretical concept of saturation and provides an indicator of the degree of saturation of water with respect to calcium carbonate. It can be shown that the Langelier saturation index (LSI) approximates the base 10 logarithm of the _____saturation level.

A. Magnesium carbonate C. Calcite
B. Calcium carbonate D. None of the above

More on the Stage 2 DBP Rule

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

A. Stage 2 DBP rule C. Long Term 2 Enhanced Surface Water Treatment Rule
B. Stage 1 DBPR D. None of the above

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

A. Disinfection of drinking water C. Amendments to the SDWA
B. Water distribution D. None of the above

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

A. Stage 1 DBPR C. Interim Enhanced Surface Water Treatment Rule
B. Stage 2 DBPR D. None of the above

What are Disinfection Byproducts (DBPs)?

27. Total trihalomethanes and haloacetic acids are widely occurring _____ formed during disinfection with chlorine and chloramine.

A. Gases C. Classes of DBPs
B. Substances D. None of the above

Are THMs and HAAs the only disinfection byproducts?

28. The presence of TTHM and HAA5 is representative of the occurrence of many other chlorination DBPs; thus, an increase of TTHM and HAA5 generally indicates an increase of DBPs from chlorination.

A. True B. False

All disinfectants form DBPs in one of two reactions:

29. Chorine and chlorine-based compounds (halogens) react with organics in water causing the hydrogen atom to substitute other atoms, resulting in halogenated by-products.

A. True B. False

30. Secondary by-products are also formed when multiple disinfectants are used.

A. True B. False

31. The EPA Surface Water Treatment Rule (SWTR) requires systems using public water supplies from either surface water or groundwater under the direct influence of surface water to disinfect.

A. True B. False

Public Health Concerns

32. Results from toxicology studies have shown several DBPs (e.g., bromodichloromethane, bromoform, chloroform, dichloroacetic acid, and bromate) to be inert to laboratory animals.

A. True B. False

33. Other DBPs (e.g., chlorite, bromodichloromethane, and certain haloacetic acids) have also been shown to cause adverse mutations (extra chromosomes) in laboratory animals.
A. True B. False

Disinfection Byproduct Research and Regulations Summary
The IPCS (IPCS 2000, p. 375) reached similar conclusions:
34. _____is unquestionably the most important step in the treatment of water for drinking water supplies.
A. DBP(s) C. Disinfection
B. Turbidity (particle) D. None of the above

35. The risk of illness and death resulting from exposure to pathogens in drinking water is very much greater than the risks from_____.
A. Disinfectants and DBPs C. Natural organic matter precursors
B. Turbidity (particle) D. None of the above

Controlling Disinfection Byproducts
36. Treatment techniques are available that provide water suppliers the opportunity to maximize potable water safety and quality while minimizing the risk of _____.
A. DBP risks C. Disinfectants and DBPs
B. Turbidity (particle) D. None of the above

The EPA guidance discusses three processes to effectively remove natural organic matter prior to disinfection:
Coagulation and Clarification
37. Most treatment plants optimize their coagulation process for _____removal.
A. Inorganic coagulants C. Turbidity (particle)
B. Most contaminants D. None of the above

Absorption
38. Activated carbon can be used to absorb _____ that react with disinfectants to form byproducts.
A. Inorganic coagulants C. Soluble organics
B. Most contaminants D. None of the above

Membrane Technology
39. Membrane processes use hydraulic pressure to force water through a semi-permeable membrane that rejects most _____. Variations of this technology include reverse osmosis (RO), nanofiltration (low pressure RO), and microfiltration (comparable to conventional sand filtration).
A. Inorganic coagulants C. Insoluble organics
B. Contaminants D. None of the above

40. EPA predicted that most water systems will be able to achieve compliance with new DBP regulations through the use of one or more of these relatively low cost methods (EPA, 1998). Water system managers may also consider switching from chlorine to alternative disinfectants to reduce formation of _____.
A. THMs and HAAs C. Natural organic matter
B. Optimization of pH D. None of the above

Organisms Descriptors and Meanings

41. Photo means...
A. Feed or nourish C. Light
B. Other (Organic carbon) D. None of the above

42. Litho means...
A. Rock C. Light
B. Organic D. None of the above

43. Auto means...
A. Without air C. Self (Inorganic carbon)
B. With air D. None of the above

44. Aerobic means...
A. Without air C. Self (Inorganic carbon)
B. With air D. None of the above

45. Hetero means...
A. Feed or nourish C. Light
B. Other (Organic carbon) D. None of the above

46. Anaerobic means...
A. Without air C. Self (Inorganic carbon)
B. With air D. None of the above

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

47. Which of the following may come from a variety of sources such as agriculture, urban stormwater run-off, and residential uses?
A. Radioactive contaminants C. Inorganic contaminants
B. Pesticides and herbicides D. Microbial contaminants

48. Which of the following, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife?
A. Microbial contaminants C. Inorganic contaminants
B. Pesticides and herbicides D. All of the above

49. Which of the following can be naturally occurring or be the result of oil and gas production and mining activities?
A. Radioactive contaminants C. Inorganic contaminants
B. Pesticides and herbicides D. Microbial contaminants

Background

50. Coliform bacteria and chlorine residual are the only routine sampling and monitoring requirements for small ground water systems with chlorination. The coliform bacteriological sampling is governed by the Coliform Reduction amendment of the SDWA.
A. True B. False

TCR

51. The TCR recommends most of the Public Water Systems (PWS) to monitor their distribution system for bacteria according to the written sample sitting plan for that system.
A. True B. False

Routine Sampling Requirements

52. Total coliform samples must be collected by PWSs at sites that are representative of water quality throughout the distribution system according to a written sample siting plan subject to state review and revision.
A. True B. False

53. Each total coliform-positive (TC+) routine sample must be tested for the presence of heterotrophic bacteria.
A. True B. False

54. If any TC+ sample is also E. coli-positive (EC+), then the EC+ sample result must be reported to the state by the end of the month that the PWS is notified.
A. True B. False

55. Reduced monitoring is general available for PWSs using only surface water and serving 1,000 or fewer persons that meet certain additional PWS criteria.
A. True B. False

Dangerous Waterborne Microbes

56. Which of the following is a parasite that enters lakes and rivers through sewage and animal waste. It causes cryptosporidiosis, a mild gastrointestinal disease. The disease can be severe or fatal for people with severely weakened immune systems.
A. Coliform Bacteria C. Giardia lamblia
B. Cryptosporidium D. None of the above

57. Which of the following is a parasite that enters lakes and rivers through sewage and animal waste. It causes gastrointestinal illness e.g. diarrhea, vomiting, and cramps?
A. Coliform Bacteria C. Protozoa
B. Cryptosporidium D. None of the above

58. Which of the following is a species of the rod-shaped bacterial genus Shigella?
A. Fecal coliform bacteria C. Shigella dysenteriae
B. Cryptosporidium D. None of the above

59. Which of the following are microscopic organisms that live in the intestines of warm-blooded animals? They also live in the waste material, or feces, excreted from the intestinal tract. When fecal coliform bacteria are present in high numbers in a water sample, it means that the water has received fecal matter from one source or another.
A. Fecal coliform bacteria C. Shigella dysenteriae
B. Cryptosporidium D. None of the above

60. Which of the following 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. Coliform Bacteria C. Giardia lamblia
B. Cryptosporidium D. None of the above

61. Which of the following are bacteria whose presence indicates that the water may be contaminated with human or animal wastes? Microbes in these wastes can cause short-term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms.
A. Fecal Coliform and E. coli C. Shigella dysenteriae
B. Cryptosporidium D. None of the above

Bacteriological Monitoring Introduction
62. Which of the following are usually harmless, occur in high densities in their natural environment and are easily cultured in relatively simple bacteriological media?
A. Indicator bacteria C. Viruses
B. Amoebas D. None of the above

63. According to the text, the routine microbiological analysis of your water is for?
A. Contamination C. Coliform bacteria
B. Colloids D. None of the above

Bacteria Sampling
64. Water samples for _____must always be collected in a sterile container.
A. Amoebas C. Viruses
B. Bacteria tests D. None of the above

Methods
65. The MMO-MUG test, a product marketed as _____, is the most common. The sample results will be reported by the laboratories as simply coliforms present or absent.
A. Colilert C. Total coliform analysis
B. Coliform D. None of the above

Microbial Regulations
66. One of the key regulations developed and implemented by the United States Environmental Protection Agency (USEPA) to counter pathogens in drinking water is the Surface Water Treatment Rule.
A. True B. False

Basic Types of Water Samples
67. It is important to properly identify the type of sample you are collecting.
A. True B. False

The three (3) types of samples are:
68. Samples collected following a coliform present routine sample. The number of repeat samples to be collected is based on the number of _____ samples you normally collect.
A. Repeat C. Routine
B. Special D. None of the above

69. A PWS fails to take every required repeat sample after any single TC+ sample
A. Trigger: Level 1 Assessment C. All of the above
B. Trigger: Level 2 Assessment D. None of the above

70. A PWS incurs an E. coli MCL violation.
A. Trigger: Level 1 Assessment C. All of the above
B. Trigger: Level 2 Assessment D. None of the above

(S) Means the answer can be plural or singular in nature

71. A PWS collecting at least 40 samples per month has greater than 5.0 percent of the routine/repeat samples in the same month that are TC+.
A. Trigger: Level 1 Assessment C. All of the above
B. Trigger: Level 2 Assessment D. None of the above

72. A PWS has a second Level 1 Assessment within a rolling 12-month period.
A. Trigger: Level 1 Assessment C. All of the above
B. Trigger: Level 2 Assessment D. None of the above

73. A PWS on state-approved annual monitoring has a Level 1 Assessment trigger in 2 consecutive years.
A. Trigger: Level 1 Assessment C. All of the above
B. Trigger: Level 2 Assessment D. None of the above

74. A PWS collecting fewer than 40 samples per month has 2 or more TC+ routine/ repeat samples in the same month.
A. Trigger: Level 1 Assessment C. All of the above
B. Trigger: Level 2 Assessment D. None of the above

Maximum Contaminant Levels (MCLs)
75. State and federal laws establish standards for drinking water quality. Under normal circumstances when these standards are being met, the water is safe to drink with no threat to human health. These standards are known as maximum contaminant levels (MCL). When a particular contaminant exceeds its MCL a potential health threat may occur.
A. True B. False

Positive or Coliform Present Results
76. If you are notified of a positive coliform test result you need to contact either the Drinking Water Program or your local county health department within 72 hours, or by the next business day after the MCL compliance violation
A. True B. False

77. With a positive total coliform sample, you have contacted an agency for assistance, you will be instructed as to the proper repeat sampling procedures and possible corrective measures for solving the problem. It is very important to initiate the _____as the corrective measures will be based on those results.
A. Perform routine procedures C. Corrective measures
B. Repeat sampling immediately D. None of the above

Heterotrophic Plate Count HPC
78. Heterotrophic Plate Count (HPC) --- formerly known as the Bac-T plate, is a procedure for estimating the number of live heterotrophic bacteria and measuring changes during water treatment and distribution in water or in swimming pools.
A. True B. False

Heterotrophic Plate Count (Spread Plate Method)
79. Which of the following provides a technique to quantify the bacteriological activity of a sample?
A. Colonies C. Heterotrophic Plate Count
B. Agar D. None of the above

Total Coliforms

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

81. For systems that collect fewer than _____ samples per month, no more than one sample per month may be positive. In other words, the second positive result (repeat or routine) in a month or quarter results in a MCL violation.
A. 40 C. 200
B. 100 D. None of the above

The following are acute violations:

82. Which determines a violation of nitrate?
A. Presence C. MCLG
B. MCL D. None of the above

Revised Total Coliform Rule (RTCR) Summary

83. EPA published the Revised Total Coliform Rule (RTCR) in the Federal Register (FR) on February 13, 2013 (78 FR 10269). It is the revision to the 1989 Total Coliform Rule (TCR).
A. True B. False

84. The RTCR establishes criteria for systems to qualify for and stay on for special increased monitoring, which could reduce water system problems for better system operation.
A. True B. False

85. The water provider shall develop and follow a sample-siting plan that designates the PWS's collection schedule. This includes location of_____.
A. Routine and repeat water samples C. Microbial contamination
B. Reduced monitoring D. Repeat water samples

86. The RTCR requires public water systems that are vulnerable to microbial contamination to identify and fix problems.
A. True B. False

87. For PWSs on quarterly or annual routine sampling, collect additional routine samples (at least 3) in the month after a _____ .
A. CCR(s) C. Total coliform positive samples
B. PN D. TC+ routine or repeat sample

88. Community water systems (CWSs) must use specific language in their CCRs when they must conduct an assessment or if they incur_____.
A. CCR(s) C. An E. coli MCL violation
B. PN D. TC+ routine or repeat sample

89. The RTCR requires public water systems (PWSs) to meet a legal limit for E. coli, as demonstrated by required monitoring.
A. True B. False

90. The RTCR suggests the frequency and timing of required microbial testing based on public water type and source water type.
A. True B. False

Disinfection Key

91. The RTCR requires 99.99% or 4 log inactivation of _____ .
A. Enteric viruses C. Giardia lamblia cysts
B. Crypto D. None of the above

92. The RTCR requires 99% or 2 log inactivation of _____ .
A. Enteric viruses C. Giardia lamblia cysts
B. Crypto D. None of the above

93. The RTCR requires 99.9% or 3 log inactivation of _____.
A. Enteric viruses C. Giardia lamblia cysts
B. Crypto D. None of the above

94. The RTCR requires the chlorine residual leaving the plant must be = or _____ mg/L and measurable throughout the system.
A. > 0.2 C. 0.2
B. 2.0 D. None of the above

Waterborne Pathogen Section - Introduction
Pathogen Section

95. Most pathogens are generally associated with diseases that _____and affect people in a relatively short amount of time, generally a few days to two weeks.
A. Cause intestinal illness C. Will cause fatalities
B. Are mild in nature D. None of the above

How Diseases are Transmitted.

96. Waterborne pathogens are primarily spread by the?
A. Fecal-oral, or feces-to-mouth route C. Oral to fecal route
B. Dermal to fecal route D. None of the above

Protozoan Caused Diseases

97. Which of the following bugs is larger than bacteria and viruses but still microscopic; they invade and inhabit the gastrointestinal tract?
A. Hepatitis A C. Protozoan pathogens
B. E.coli D. None of the above

Giardia lamblia

98. All of these diseases, with the exception of _____, have one symptom in common: diarrhea. They also have the same mode of transmission, fecal-oral, whether through person-to-person or animal-to-person contact.
A. HIV infection C. Hepatitis A
B. Giardiasis D. None of the above

Primary Waterborne Diseases Section
Salmonella typhi

99. Humans are the reservoir for the Salmonella typhi pathogen, which causes diarrheal illness, and also known as?
A. Campylobacter C. Typhoid fever
B. Shigella dysenteriae D. None of the above

100. Shigella species, in the United States two-thirds of the shigellosis in the U.S. is caused by Shigella dysenteriae and the remaining one-third is caused by Shigella Campylobacter.
A. True B. False

101. Schistosomatidae, the basics. It is a parasite. It is acquired through dermal contact, cercarial dermatitis. It is commonly known as?
A. Swimmer's itch C. Hemorrhagic colitis
B. Beaver fever D. None of the above

Waterborne Bacterial Diseases
102. Campylobacteriosis outbreaks have most often been associated with food, especially chicken and un-pasteurized milk, as well as un-chlorinated water. These organisms are also an important cause of “travelers’ diarrhea.” Medical treatment generally is not prescribed for campylobacteriosis because recovery is usually rapid.
A. True B. False

103. Cholera, Legionellosis, salmonellosis, shigellosis, yersiniosis, are other bacterial diseases that can be transmitted through water. All bacteria in water are readily killed or inactivated with chlorine or other disinfectants.
A. True B. False

104. Campylobacteriosis is the most common diarrheal illness caused by bacteria. Other symptoms include abdominal pain, malaise, fever, nausea and vomiting; and begin three to five days after exposure. The illness is frequently over within two to five days and usually lasts no more than 10 days.
A. True B. False

Viruses
Coronavirus
105. It looks like the COVID-19 coronavirus is not able to live in water.
A. True B. False

Chain of Custody Procedures
106. If both parties involved in the transfer must sign, date and note the time on the chain of custody record, this is known as?
A. TC Plan C. Samples transfer possession
B. Sample siting plan D. None of the above

Factors in Chlorine Disinfection: Concentration and Contact Time
107. Based on the work of several researchers, CXT values [final free chlorine concentration (mg/L) multiplied by minimum contact time (minutes)], offer water operators guidance in computing an effective combination of chlorine concentration and _____required to achieve disinfection of water at a given temperature.
A. Chlorine concentration C. Higher strength chlorine solutions
B. Chlorine contact time D. None of the above

108. The CXT formula demonstrates that if an operator chooses to decrease the chlorine concentration, the required _____must be lengthened.
A. Chlorine concentration C. Contact time
B. Temperature D. None of the above

Water Treatment Section - Preliminary Treatment Process
Preliminary Treatment
109. 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 C. Change source
B. Super settling D. None of the above

Pre-Sedimentation

110. Sand and grit will damage plant equipment and pipes, so it must be removed with either rectangular or round shaped basin are called?

A. Filtration basin(s) C. Sedimentation basin(s)
B. Coagulation basin(s) D. None of the above

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

A. Filtration basin(s) C. Sedimentation basin(s)
B. Coagulation basin(s) D. None of the above

Flights and Chains

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

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

Circular Clarifiers

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

A. True B. False

114. Which of the following processes uses alum and cationic polymer to neutralize the charge of colloidal particles?

A. Filtration C. Flocculation
B. Reconditioning D. None of the above

115. Which of the following is often used to enhance filter performance?

A. Conventional technology C. Fast rinse
B. Chemical pretreatment D. None of the above

116. Water treatment systems use settling tanks unit to allow for_____.

A. Gravity C. Settling time
B. Particle(s) D. Sedimentation and settling

117. Water treatment is a major requirement both for raw water for drinking and wastewater management, both have particles that need to sediment in order to obtain clear water.

A. True B. False

118. Tube settler design reduces the depth significantly compared to the conventional clarifier. This helps in reduction of _____.

A. Gravity C. Settling time
B. Particle(s) D. Solids

Conventional Water Treatment Process Introduction

119. _____ along with pre-chlorination for removal of dissolved iron when present with small amounts relative of manganese

A. Disinfection C. Pre-treatment
B. Coagulation D. Aeration

120. _____ for killing bacteria viruses and other pathogens.

A. Disinfection C. Pre-treatment
B. Coagulation D. Aeration along with pre-chlorination

(S) Means the answer can be plural or singular in nature

121. Coagulant aids, also known as polyelectrolytes – to improve _____ and for more robust floc formation

A. Disinfection C. Pre-treatment
B. Coagulation D. Aeration along with pre-chlorination

Treatment Design and Plant Operation

122. SCADA (Supervisory Control and Data Acquisition) automation of water treatment is common in the US. Source water quality through the seasons, scale, and environmental impact can dictate capital costs and operating costs. End use of the treated water dictates the necessary quality monitoring technologies.

A. True B. False

SWTR Rule

123. Turbidity is caused by particles suspended in water. These particles scatter or reflect light rays, making the water appear cloudy.

A. True B. False

124. Turbidity is expressed in nephelometric turbidity units (ntu) and a reading in excess of 5 ntu is generally noticeable to water system customers.

A. True B. False

125. Turbidity changes in the distribution system can indicate developing problems. Increases in turbidity may also be caused by changes in velocity or inadequate flushing following main replacement.

A. True B. False

Zeta Potential Introduction

126. Zeta potential is a physical property exhibited by all solid-liquid and liquid-liquid colloidal systems. Surrounding the surface of all dispersed particles is a thick layer of ions that have the same charge of the particle's surface called the ATP layer.

A. True B. False

127. The zeta potential is defined as the voltage at the edge of the slipping (shear) plane with respect to the bulk-dispersing medium, where ions, molecules and other agents are no longer associated with a particle's surface.

A. True B. False

Solubility of Substances in Water

128. Water is an excellent solvent for many compounds. Some dissolve in it as molecules while others, called electrolytes, dissociate and dissolve not as neutral molecules but as charged species called ions.

A. True B. False

129. Compounds which exist as solid ionic crystals dissolve in water as ions, and most of them are highly soluble in water. "Highly soluble" is a somewhat elastic description, but generally means soluble to at least the extent of forming 0.1 to 1.0 molar aqueous solutions.

A. True B. False

Purpose of Coagulation

130. Chemical Coagulation in the water/wastewater treatment is the process of bringing suspended matter in untreated water together for the purpose of settling and for the preparation of the water for filtration.

A. True B. False

Turbidity Particles
131. The ability of particles to remain suspended in water is a function of hydrogen ion activity.
A. True B. False

Olation
132. Olation involves the bridging of two or more of these large molecules to form even larger, positively charged ions. A typical molecule can contain eight aluminum ions, twenty hydroxide ions, and will have a +4 charge.
A. True B. False

Zeta Potential
133. The Zeta Potential is reduced to zero in order for coagulation to occur, because the forces of attraction are predominant.
A. True B. False

Coagulants – Alum and Ferric
Aluminum Sulfate (Alum)
134. Aluminum Sulfate is also known as alum, filter alum, and alumina sulfate. Alum is the most widely used coagulant. Alum is available in dry form as a powder or in lump form. It can also be purchased and fed as a liquid.
A. True B. False

135. Carbon dioxide and sulfate are generally byproducts of these reactions. During the reactions, alum acts as _____to reduce the pH and alkalinity of the water supply. It is important that sufficient alkalinity be present in the water supply for the various reactions to occur.
A. Inorganic coagulant(s) C. Byproducts of these reactions
B. An acid D. None of the above

136. Alum can be effective in the pH range of 5.5 to 7.8, but seems to work best in most water supplies in a pH range of 6.8 to 7.5. Below a pH range of 5.5, alkalinity in the water supply is generally insufficient.
A. True B. False

137. The aluminum ions become soluble rather than insoluble and do not participate in the hydration and _____ necessary to make the alum effective as a coagulant. In these instances the plant may experience higher than normal filtered water turbidities, and much of the aluminum will pass through the filters.
A. Post filtration alum coagulation C. Byproducts of these reactions
B. Olation reaction(s) D. None of the above

Ferric Chloride (Ferric)
138. Ferric chloride is becoming more extensively used as a coagulant due partially to the fact that the material can be purchased as a liquid.
A. True B. False

139. _____are available, such as potash alum, ammonia alum, ferrous sulfate (copperas), and chlorinated copperas.
A. Other inorganic coagulants C. Byproducts of these reactions
B. Olation reaction(s) D. None of the above

140. Typical dosages of the inorganic coagulants range from 50 pounds per million gallons of water treated under ideal conditions to as high as 800 to 1000 pounds per million gallons of water treated under _____ conditions.
A. Worst case C. Increased
B. Decreased D. None of the above

Factors Influencing Coagulation
Effects of pH
141. The pH range in which a coagulation process occurs may be the single most important factor in _____coagulation. The vast majority of coagulation problems are related to improper pH levels.
A. Improper C. Proper
B. Optimum D. None of the above

142. In many plants, it is necessary to adjust the pH level in the coagulation process. In most cases, this involves the addition of lime, caustic soda, or soda ash to maintain a minimum pH level. In some cases, however, acids may be necessary to raise or lower the pH level to an _____ range.
A. Improper C. Little or no effect
B. Optimum D. None of the above

143. In some water plants, the acidic reactions of the inorganic salts are taken advantage of when the raw water pH levels are_____. In these instances, overfeed of the coagulant is intentionally induced in order for the coagulation process to occur in the optimum range.
A. Improper C. Higher than desired
B. Optimum D. None of the above

Effects of Salts
144. Since no natural waters are completely pure, each will have various levels of cations and anions such as calcium, sodium, magnesium, iron, manganese, sulfate, chloride, phosphate, and others. Some of these ions may affect the efficiency of _____.
A. All chemical reactions C. Collision between the colloids
B. The coagulation process D. None of the above

Nature of Turbidity
145. Generally, higher turbidity levels require higher coagulant dosages. However, seldom is the relationship between turbidity level and coagulant dosage linear. Usually, the additional coagulant required is _____when turbidities are much higher than normal due to higher collision probabilities of the colloids during high turbidities.
A. Improper C. Relatively small
B. Optimum D. None of the above

146. Organic colloids may be present in a water supply due to pollution, and these colloids can be difficult to remove in the coagulation process. In this situation, _____coagulant dosages are generally required.
A. Improper C. Slowly
B. Higher D. None of the above

Water Temperature

147. Cold water temperatures can cause two factors that add to the difficulty of the coagulation process. As water temperatures approach freezing, almost all chemical reactions occur more _____.

A. Improper
B. Higher
C. Slowly
D. None of the above

Mixing Effects

148. Poor or inadequate mixing results in an uneven dispersion of the coagulant. Unfortunately, many older plants were designed with mixing facilities that generally do not accomplish mixing in the most efficient manner. As a result, it becomes necessary to use higher than necessary dosages of coagulant to achieve an optimum level of efficiency in the process.

A. True B. False

Effect of the Coagulant

149. The choice of the proper coagulant for the given conditions is of critical importance in maintaining an efficient coagulation scheme under widely varying conditions. The chemicals most commonly used in the coagulation process are Aluminum Sulfate, Ferric Chloride, Ferric Sulfate, and Cationic Polymers.

A. True B. False

Corrosion Control Introduction

150. Corrosion is the deterioration of a substance by chemical action. Lead, cadmium, zinc, copper and iron might be found in water when metals in water distribution systems corrode. Drinking water contaminated with certain metals (such as _____) can harm human health.

A. Lead
B. Lead and copper
C. Lead and cadmium
D. None of the above

151. The EPA has banned the use of lead solders, fluxes and pipes in the installation or repair of any public water system. In the past, solder used in plumbing has been _____.

A. 60% lead and 40% tin
B. 50% tin and 50% lead
C. 50% copper and 50% lead
D. None of the above

Cathodic Protection

Sacrificial Anode Systems

152. Sacrificial anodes are pieces of metal more electrically active than the steel piping system. Because these anodes are more active, the corrosive current will exit from them rather than the piping system.

A. True B. False

Coagulation and Flocculation Summary

Rapid Sand Filtration

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

A. Conventional technology
B. Sedimentation process
C. Rapid Sand filtration
D. None of the above

Coagulation

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

A. True B. False

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

156. Which of the following terms are so small, their charge per volume is significant?
A. Aluminum Sulfate molecules C. Colloidal particles
B. Coagulant chemicals D. None of the above

157. Liquid _____is usually a 48.86% solution.
A. Cationic polymers C. Aluminum Sulfate
B. Soda ash D. None of the above

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

Pre-Sedimentation
159. Contingent on the quality of the source water, some plants have pre-sedimentation, which allows larger _____ in a reservoir or lake reducing solid removal loads.
A. Equalization of the basin C. Floc particles mix
B. Particles time to settle D. None of the above

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

161. In which process does the velocity of the water is decreased so that the suspended material, including flocculated particles, can settle out by gravity?
A. Sedimentation C. Rapid Sand filtration
B. Flocculation D. None of the above

Water Filtration Key Terms
Declining Rate Filters
162. The filter flow rate will vary with?
A. Head loss C. Effluent control
B. Uniform media D. None of the above

Detention Time
163. Detention time is actual time required for a small amount of water to pass through a Sedimentation basin at a given rate of flow, or the calculated time required for a small amount of liquid to pass through a tank at a given rate of flow.
A. True B. False

Disinfection
164. Chlorine kills or “inactivates” harmful microorganisms in water.
A. True B. False

Jar Testing
165. Jar testing traditionally has been done on an infrequent basis in most water treatment plants to control THMs.
A. True B. False

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

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

Polymer
168. Polymer is a water treatment chemical that when combined with other types of coagulants, aids in binding small suspended particles to larger particles to help in the settling and filtering processes.
A. True B. False

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

Pre-Chlorination
170. Before the filtration process, chlorination helps control fish and vegetation.
A. True B. False

Hydrofluosilicic Acid
171. H_2SiF_6 a clear fuming corrosive gas, with a pH ranging from 8 to 9 and used in water treatment to fluoridate drinking water.
A. True B. False

Taste and Odor Control
172. Which of the following is occasionally added for taste and odor control?
A. Turbidity powder C. Powdered activated carbon (PAC)
B. Fluoride D. None of the above

Water Quality
173. Water quality testing needs to be conducted throughout the water treatment process.
A. True B. False

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

Short-Circuiting
175. Short-Circuiting is usually undesirable, since it may result in shorter contact, reaction, or settling times in comparison with the?
A. Presumed detention times
B. Sedimentation/clarification process
C. Modification of the conventional process
D. None of the above

Tube Settlers
176. Tube settlers are a modification of the conventional process contains many metal “tubes” that are normally placed in?
A. Flocculation basin
B. Sedimentation basin or clarifier
C. An up-flow clarifier
D. None of the above

Adsorption Clarifiers
177. In the tube-settler type of package plant, the Sedimentation/clarification process is followed by mixed-media filtration and disinfection to complete the water treatment.
A. True B. False

Clearwell
178. The clearwell provides temporary storage for the treated water, which is the final step in the conventional treatment process.
A. True B. False

Sampling
179. Care should be taken not to disturb the bottom of the water source or along the sides. So as not to stir up any settled solids. This would create erroneous results. There are different techniques for both bacteriological and disinfection byproduct samplings. Collect the water sample 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. True B. False

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

Anthracite Coal or Activated Carbon
181. Water is normally filtered at a rate of between 10 and 2 gpm per square foot, the water is filtered through an approximate 36" depth of graded sand.
A. True B. False

182. For a filter which of the following should be conducted on a routine basis, at least once per day?
A. Filtration process performance
B. Effluent control measurement
C. Post-disinfection performance
D. None of the above

EPA Filter Backwash Rule- Introduction
183. The U.S. Environmental Protection Agency (EPA) has finalized the Long Term 1 Enhanced Surface Water Treatment Rule and Filter Backwash Rule (LT1FBR) to increase protection of finished drinking water supplies from contamination by Cryptosporidium and other microbial pathogens.
A. True B. False

LT1FBR Required
184. The LT1FBR provisions does not apply to public water systems using surface water or ground water under the direct influence of surface water systems.
A. True B. False

Turbidity
185. Which of the following must comply with specific combined filter effluent turbidity requirements?
A. Watershed C. Conventional and Direct filtration systems
B. Disinfection profile D. None of the above

Disinfection Benchmarking
186. Public water systems will be required to develop a _____unless they perform applicability monitoring which demonstrates their disinfection byproduct levels are less than 80% of the maximum contaminant levels.
A. Disinfection profile C. Disinfection benchmark
B. Direct filtration system D. None of the above

Filtration Process- Detailed
187. Removal of _____ plays an important role in the natural treatment of groundwater as it percolates through the soil.
A. Suspended solids by filtration C. Coagulation and flocculation processes
B. Serious problems in filter operation D. None of the above

Filtration Processes
188. The traditional design for many years is conventional filtration; this method provides effective treatment for just about any range of tastes and odors.
A. True B. False

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

Pressure Sand Filters
190. Filtration operation is divided into three steps: filtering, backwashing, and?
A. Filter run C. Return to waste
B. Filtering to waste D. None of the above

Declining Rate
191. According to the text, which of the following allows the filter head to increase until the filter becomes plugged with particles and the Head loss is too great to continue operation of the filter?
A. Declining Rate C. Fast sand
B. Gravity filters D. None of the above

Loss of Head Indicator
192. Which of the following is required to force the water through the filter?
A. Filter run C. Head loss
B. Force D. None of the above

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

Filtration Process
194. Which of the following is almost fully closed when a filter is clean so that the desired water level on top of the filter is maintained?
A. Headloss valve C. Flow restrictor
B. Constant rate flow valve D. None of the above

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

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

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

Filter to Waste
198. Which of the following terms should be done slowly after a backwash to prevent breakthrough of suspended material?
A. Daily flow C. Filtration should always be started
B. Backwash water D. None of the above

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

Control of Filter Flow Rate
200. If the plant is not operated continuously, and the start-up at the beginning of the day will potentially cause a?
A. Basin to catch the overflow C. Turbidity breakthrough
B. Surge to the filter(s) D. None of the above

When Finished with Your Assignment...

REQUIRED DOCUMENTS
Please scan the **Registration Page, Answer Key, Proctoring report, Survey and Driver's License** and email these documents to info@TLCH2O.com.

IPhone Scanning Instructions
If you are unable to scan, take a photo of these documents with your **iPhone** and send these photos to TLC, info@TLCH2O.com.