

Registration form

**WATER/WASTEWATER SAMPLING TRAINING COURSE \$100.00**  
48 HOUR RUSH ORDER PROCESSING FEE ADDITIONAL \$50.00

Start and finish dates: \_\_\_\_\_  
*You will have 90 days from this date in order to complete this course*

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

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

Address: \_\_\_\_\_

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

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

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

Operator ID # \_\_\_\_\_ Exp. Date \_\_\_\_\_

Please circle/check which certification you are applying the course CEU's.

Distribution \_\_\_ Water Treatment \_\_\_ WWT \_\_\_ Other \_\_\_\_\_

*Your certificate will be emailed to you in about two weeks unless you pay for the rush service.*

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

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

Please invoice me, my PO# \_\_\_\_\_

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

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

## **DISCLAIMER NOTICE**

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

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

## **State Approval Listing URL...**

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

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

## **AFFIDAVIT OF EXAM COMPLETION**

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

## **Grading Information**

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

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

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

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

**All downloads are electronically tracked and monitored for security purposes.**

**Texas Students Only**  
**Acknowledgement of Notice of Potential Ineligibility for License**

*You are required to sign and return to TLC or your credit will not be reported.*

Name:

---

Date of Birth:

---

Email Address:

---

By signing this form, I acknowledge that Technical Learning College notified me of the following:

- the potential ineligibility of an individual who has been convicted of an offense to be issued an occupational license by the Texas Commission on Environmental Quality (TCEQ) upon completion of the educational program;
- the current TCEQ Criminal Conviction Guidelines for Occupational Licensing, which describes the process by which the TCEQ's Executive Director determines whether a criminal conviction:
  - renders a prospective applicant an unsuitable candidate for an occupational license;
  - warrants the denial of a renewal application for an existing license; or
  - warrants revocation or suspension of a license previously granted.
- the right to request a criminal history evaluation from the TCEQ under Texas Occupations Code Section 53.102; and
- that the TCEQ may consider an individual to have been convicted of an offense for the purpose of denying, suspending or revoking a license under circumstances described in Title 30 Texas Administrative Code Section 30.33.

Enrollee Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Name of Training Provider/Organization: Technical Learning College

Contact Person: Melissa Durbin Role/Title: Dean



# For Texas TCEQ Wastewater Licensed Operators Important Information

## Wastewater/Collections Rule Changes (Texas Only)

### Rule Changes and Updates for Domestic Wastewater Systems

On Nov. 4, 2014, TCEQ commissioners adopted revisions to 30 Texas Administrative Code (TAC), Chapter 217, Design Criteria for Domestic Wastewater Systems, and “re-adopted” previously repealed rules in 30 TAC, Chapter 317, Design Criteria Prior to 2008.

#### ***Some of the changes to Chapter 217 include:***

- Adding new definitions and clarifying existing definitions;
- Adding design criteria and approval requirements for rehabilitation of existing infrastructure;
- Adding design criteria for new technologies, including cloth filters and air lift pumps;
- Making changes to reflect modern practices, standards and trends;
- Modifying rule language to improve readability and enforceability; and
- Modifying the design organic loadings and flows for a new wastewater treatment facility.

### **SUBCHAPTER A: ADMINISTRATIVE REQUIREMENTS §§217.1 - 217.18**

Effective December 4, 2015 §217.1. Applicability. (a) Applicability. (1) This chapter applies to the design, operation, and maintenance of: (A) domestic wastewater treatment facilities that are constructed with plans and specifications received and approved by the executive director after the effective date of the amendments to this chapter; (B) treatment units that are altered, constructed, or re-rated with plans and specifications received and approved by the executive director after the effective date of the amendments to this chapter; (C) collection systems that are constructed with plans and specifications received and approved by the executive director after the effective date of the amendments to this chapter; (D) collection system units that are altered, constructed, or re-rated with plans and specifications received and approved by the executive director after the effective date of the amendments to this chapter; (E) existing domestic wastewater treatment facilities that do not have a current Texas Pollutant Discharge Elimination System permit or a Texas Land Application Permit and are required to have an active wastewater permit; (F) existing wastewater treatment facilities and collection systems that never received approval for plans and specifications from the executive director; and (G) collection system rehabilitation projects covered in §217.56(c) and §217.69 of this title (relating to Trenchless Pipe Installation; and Maintenance, Inspection, and Rehabilitation of the Collection System). (2) Domestic wastewater treatment facilities, treatment units, collection systems, and collection system units with plans and specifications approved by the executive director that were received on or after August 28,

2008 and before the effective date of this chapter must comply with the rules in this chapter, as they existed immediately before the effective date of the amendments to this chapter.

The rules in Texas Commission on Environmental Quality Page 2 Chapter 217 - Design Criteria for Domestic Wastewater Systems effect immediately before the effective date of the amendments to this chapter are continued in effect for that purpose. (3) This chapter does not apply to: (A) the design, installation, operation, or maintenance of domestic wastewater treatment facilities, treatment units, collection systems, or collection system units with plans and specifications that were approved by the executive director on or before August 27, 2008, which are governed by Chapter 317 of this title (relating to Design Criteria Prior to 2008) or design criteria that preceded Chapter 317 of this title; and (B) systems regulated by Chapter 285 of this title (relating to On-Site Sewage Facilities); or collection systems or wastewater treatment facilities that collect, transport, treat, or dispose of wastewater that does not have the characteristics of domestic wastewater, although the wastewater may contain domestic wastewater.

(b) The executive director may grant variances from new requirements added by the amendments of this chapter to a person who proposes to construct, alter, or re-rate a collection system or wastewater treatment facility if the plans and specifications for the project are submitted within 180 days after the date the amendments to this chapter are effective, provided the plans and specifications comply with the rules in effect immediately prior to the amendment. Adopted November 4, 2015 Effective December 4, 2015

**The link to the rules is available on the TCEQ website at <https://www.tceq.texas.gov/rules/indxpdf.html>**

***For Texas Students Only....***

Please sign and date this notice

Printed Name

---

Signature

Date

---

# WATER /WASTEWATER SAMPLING Answer Key

Name \_\_\_\_\_

Phone # \_\_\_\_\_

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

**Method of Course acceptance confirmation. Please fill this section**

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

Website \_\_ Telephone Call \_\_ Email \_\_ Spoke \_\_\_\_\_

Did you receive the approval number, if applicable? \_\_\_\_\_

PA DEP Students are required to complete the original version of the text. \_\_\_\_\_  
Please initial

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

*You can electronically complete this assignment in Adobe Acrobat DC.*

**Multiple Choice. Pick only one answer per question. Select answer according to text, exactly as in text. Circle, Mark off, underline or Bold the answer.**

- |                 |                 |                 |
|-----------------|-----------------|-----------------|
| 1. A B C D E F  | 15. A B C D E F | 29. A B C D E F |
| 2. A B C D E F  | 16. A B C D E F | 30. A B C D E F |
| 3. A B C D E F  | 17. A B C D E F | 31. A B C D E F |
| 4. A B C D E F  | 18. A B C D E F | 32. A B C D E F |
| 5. A B C D E F  | 19. A B C D E F | 33. A B C D E F |
| 6. A B C D E F  | 20. A B C D E F | 34. A B C D E F |
| 7. A B C D E F  | 21. A B C D E F | 35. A B C D E F |
| 8. A B C D E F  | 22. A B C D E F | 36. A B C D E F |
| 9. A B C D E F  | 23. A B C D E F | 37. A B C D E F |
| 10. A B C D E F | 24. A B C D E F | 38. A B C D E F |
| 11. A B C D E F | 25. A B C D E F | 39. A B C D E F |
| 12. A B C D E F | 26. A B C D E F | 40. A B C D E F |
| 13. A B C D E F | 27. A B C D E F | 41. A B C D E F |
| 14. A B C D E F | 28. A B C D E F | 42. A B C D E F |

- |                 |                 |                  |
|-----------------|-----------------|------------------|
| 43. A B C D E F | 70. A B C D E F | 97. A B C D E F  |
| 44. A B C D E F | 71. A B C D E F | 98. A B C D E F  |
| 45. A B C D E F | 72. A B C D E F | 99. A B C D E F  |
| 46. A B C D E F | 73. A B C D E F | 100. A B C D E F |
| 47. A B C D E F | 74. A B C D E F | 101. A B C D E F |
| 48. A B C D E F | 75. A B C D E F | 102. A B C D E F |
| 49. A B C D E F | 76. A B C D E F | 103. A B C D E F |
| 50. A B C D E F | 77. A B C D E F | 104. A B C D E F |
| 51. A B C D E F | 78. A B C D E F | 105. A B C D E F |
| 52. A B C D E F | 79. A B C D E F | 106. A B C D E F |
| 53. A B C D E F | 80. A B C D E F | 107. A B C D E F |
| 54. A B C D E F | 81. A B C D E F | 108. A B C D E F |
| 55. A B C D E F | 82. A B C D E F | 109. A B C D E F |
| 56. A B C D E F | 83. A B C D E F | 110. A B C D E F |
| 57. A B C D E F | 84. A B C D E F | 111. A B C D E F |
| 58. A B C D E F | 85. A B C D E F | 112. A B C D E F |
| 59. A B C D E F | 86. A B C D E F | 113. A B C D E F |
| 60. A B C D E F | 87. A B C D E F | 114. A B C D E F |
| 61. A B C D E F | 88. A B C D E F | 115. A B C D E F |
| 62. A B C D E F | 89. A B C D E F | 116. A B C D E F |
| 63. A B C D E F | 90. A B C D E F | 117. A B C D E F |
| 64. A B C D E F | 91. A B C D E F | 118. A B C D E F |
| 65. A B C D E F | 92. A B C D E F | 119. A B C D E F |
| 66. A B C D E F | 93. A B C D E F | 120. A B C D E F |
| 67. A B C D E F | 94. A B C D E F |                  |
| 68. A B C D E F | 95. A B C D E F |                  |
| 69. A B C D E F | 96. A B C D E F |                  |

Please fax or e-mail the answer key to TLC

Western Campus Fax (928) 272-0747.



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

**WATER / WASTEWATER SAMPLING CEU COURSE  
CUSTOMER SERVICE RESPONSE CARD**

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

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

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

1. Please rate the difficulty of your course.  
Very Easy    0    1    2    3    4    5    Very Difficult
2. Please rate the difficulty of the testing process.  
Very Easy    0    1    2    3    4    5    Very Difficult
3. Please rate the subject matter on the exam to your actual field or work.  
Very Similar    0    1    2    3    4    5    Very Different

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

5. What would you do to improve the Course?

---

---

Any other concerns or comments.

---

---

*This course contains general EPA's CWA/SDWA federal rule requirements. Please be aware that each state implements water/ wastewater/ safety/ environmental / building regulations that may be more stringent than EPA's regulations. Check with your state environmental/health agency for more information. These rules change frequently and are often difficult to interpret and follow. Be careful to be in full-compliance and do not follow this course for proper compliance.*

**Rush Grading Service**

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

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

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

## Water / Wastewater Sampling Course Assignment

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

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

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

### EPA Rules

1. The EPA set standard limits for the amount of which compound/element/substance in drinking water to 10 ppb?

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

### ICR

2. The ICR data will be used by EPA to support future regulation of microbial contaminants, disinfectants, and disinfection byproducts.

- A. True
- B. False

### Disinfection Byproduct Regulations

3. Which compound/element/substance are a group of chemicals that are formed along with other disinfection byproducts when chlorine or other disinfectants are used?

- A. Disinfectant residual
- B. Chlorite
- C. Haloacetic Acids (HAA5)
- D. Giardia and viruses
- E. Disinfection By-Products (DBPs)
- F. None of the Above

4. Which compound/element/substance is a chemical that is formed when ozone, used to disinfect drinking water, reacts with naturally occurring bromide found in source water?

- A. Bromate
- B. Counter pathogens
- C. Monobromoacetic acid
- D. From the results of coliform testing
- E. Bacteria, Virus and Intestinal parasites
- F. None of the Above

5. Under the \_\_\_\_\_, total trihalomethanes (TTHM) are regulated at a maximum allowable annual average level of 80 ppb for large surface water public water systems.

- A. Cryptosporidium Rules
- B. Disinfection Rules
- C. Disinfection byproduct
- D. Total Trihalomethane Rule
- E. Stage 1 DBPR
- F. None of the Above

6. The new TTHM standards in the \_\_\_\_\_ became effective in December 2001 for large surface water public water systems, and in December 2003 for small surface water and all ground water systems.

- A. Cryptosporidium Rules
- B. Disinfection Rules
- C. Disinfection byproduct
- D. Total Trihalomethane Rule
- E. Stage 1 DBPR
- F. None of the Above

7. The regulated \_\_\_\_\_ are monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid.

- A. Cryptosporidium
- B. Trihalomethanes
- C. Haloacetic Acids (HAA5)
- D. Organic compounds
- E. Maximum Contaminant Levels MCLs
- F. None of the Above

### Disinfection Rule Review

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

- A. True
- B. False

9. Chlorine and chlorine-based compounds (halogens) react with organics in water causing the chlorine atom to substitute other atoms resulting in \_\_\_\_\_.

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

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

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

### Public Health Concerns

11. While disinfectants are effective in controlling many microorganisms, they react with natural organic and inorganic matter in source water and distribution systems to form \_\_\_\_\_. Results from toxicology studies have shown several to be carcinogenic in laboratory animals.

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

12. Which Rule and Disinfection Byproduct Rule updates and supersedes the 1979 regulations for total trihalomethanes? In addition, it will reduce exposure to three disinfectants and many disinfection byproducts.

- A. DBPs
- B. The Stage 1 Disinfectant
- C. SDWA in 1996
- D. Stage 3 Disinfectant and Disinfection Byproduct
- E. The LT2 requirements
- F. None of the Above

### Stage 2 DBP Rule Federal Register Notices

13. The Microbial and Disinfection Byproducts Rules (MDBPs) are a set of interrelated regulations that address risks from microbial pathogens and disinfectants/disinfection byproducts. The \_\_\_\_\_ is one part of these rules.

- A. Groundwater Rule (GWR)
- B. Compliance Rule
- C. Stage 2 DBP Rule
- D. Total Coliform Rule
- E. ICR Rule
- F. None of the Above

14. The \_\_\_\_\_ limits exposure to DBPs, specifically total trihalomethanes (TTHM) and five haloacetic acids (HAA5).

- A. Disinfectant used
- B. DBP exposure
- C. Stage 2 DBP Rule
- D. LT2 Enhanced Surface Water Treatment Rule
- E. Traditional disinfection practices
- F. None of the Above

15. There are specific microbial pathogens, such as \_\_\_\_\_, which can cause illness, and are highly resistant to traditional disinfection practices.

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

### What does the rule require?

16. Which Rule also requires each system to determine if they have exceeded an operational evaluation level, which is identified using their compliance monitoring results?

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

### Who must comply with the rule?

17. A public water system that serves year-round residents of a community, subdivision, or mobile home park that has at least 15 service connections or an average of at least 25 residents is called \_\_\_\_\_.

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

### What are Disinfection Byproducts (DBPs)?

18. \_\_\_\_\_ form when disinfectants used to treat drinking water react with naturally occurring materials in the water.

- A. Disinfectants
- B. DBLs
- C. Humic
- D. Disinfection byproducts (DBPs)
- E. Sodium Thiosulfate
- F. None of the Above

### Are THMs and HAAs the only disinfection byproducts?

19. \_\_\_\_\_ act as indicators for DBP occurrence. They typically occur at higher levels than other known or unknown DBPs.

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

### Stage 2 DBP Rule Federal Register Notices

20. Chlorine and its \_\_\_\_\_ are neutrally charged and therefore easily penetrate the negatively charged surface of pathogens.
- A. Halogen
  - B. Water chlorination
  - C. Chlorine as a disinfectant
  - D. Hydrolysis product hypochlorous acid
  - E. Hypochlorous acid
  - F. None of the Above

### Microbial Regulations

21. The Surface Water Treatment Rule was implemented by USEPA to counter pathogens in drinking water.
- A. True
  - B. False
22. The \_\_\_\_\_ specifies treatment criteria that include turbidity limits, disinfectant residual, and disinfectant contact time conditions.
- A. Long Term 1 Rule
  - B. Maximum Contaminant Level Goal (MCLG)
  - C. Stage 1 Byproducts Rule
  - D. Surface Water Treatment Rule
  - E. Interim Enhanced Surface Water
  - F. None of the Above
23. The Total Coliform Rule (TCR) of 1989 and the \_\_\_\_\_ regulate microbial contamination of drinking water sources. The SWTR covers all water systems that use surface water or groundwater under the direct influence of surface water.
- A. Long Term 1 Enhanced Surface Water Treatment Rule
  - B. Maximum Contaminant Level Goal (MCLG)
  - C. Stage 1 Disinfectants/Disinfection Byproducts Rule
  - D. Surface Water Treatment Rule
  - E. Interim Enhanced Surface Water Treatment Rule
  - F. None of the Above
24. The EPA established a MCL of 0.0010 for all public water systems and a 99% removal requirement for Cryptosporidium in filtered public water systems that serve at least 100,000 people. The new rule tightened turbidity standards back in December 2001.
- A. True
  - B. False
25. Color is an indicator of the physical removal of particulates, including pathogens.
- A. True
  - B. False
26. The SWTR provides protection against Giardia intestinalis, viruses, and Legionella that can be present in surface water sources. The \_\_\_\_\_ provides additional protection against Cryptosporidium in surface water sources.
- A. Long Term 1 Enhanced Surface Water Treatment Rule
  - B. Maximum Contaminant Level Goal (MCLG)
  - C. Stage 1 Disinfectants/Disinfection Byproducts Rule
  - D. Surface Water Treatment Rule
  - E. Interim Enhanced Surface Water Treatment Rule
  - F. None of the Above

### Radionuclides

27. Some people who drink water containing which compound/element in excess of the EPA standard over many years could experience skin damage or problems with their circulatory system, and may have an increased risk of getting cancer?

- A. Lead
- B. Fluoride
- C. Copper
- D. Aluminum
- E. Arsenic
- F. None of the Above

28. Some people who consume water containing \_\_\_\_\_ over many years may have an increased risk of getting cancer.

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

29. The EPA standard for \_\_\_\_\_ in drinking water is 4 mg/L.

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

30. According to the text, \_\_\_\_\_ are spread by secretions that are coughed or sneezed into the air by an infected person.

- A. Fecal Coliform and E coli
- B. Giardia lamblia
- C. Microorganisms
- D. Influenza virus and tuberculosis bacteria
- E. Coliform bacteria
- F. None of the Above

### Safe Drinking Water Act (SDWA) Review

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

- A. True
- B. False

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

- A. True
- B. False

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

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

- A. True
- B. False

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

- A. True
- B. False

### Microbes

35. Coliform bacteria are common in the environment and are considered harmful.

- A. True
- B. False

36. The presence of coliform bacteria in drinking water indicates that the water may be contaminated with germs that can cause disease.

- A. True
- B. False

37. \_\_\_\_\_ in human or animal wastes can cause diarrhea, cramps, nausea, headaches, or other symptoms.

- A. Microbes
- B. Giardia lamblia
- C. Microorganisms
- D. Cryptosporidiosis
- E. Coliform bacteria
- F. None of the Above

38. The presence of \_\_\_\_\_ bacteria indicates that the water may be contaminated with fecal matter from humans or animals.

- A. Fecal Coliform and E coli
- B. Protozoa
- C. Thermophilic
- D. Bac-T
- E. Coliform bacteria
- F. None of the Above

39. \_\_\_\_\_ is a parasite that enters drinking water sources through sewage and animal waste. This parasite causes cryptosporidiosis.

- A. Fecal Coliform and E coli
- B. Giardia lamblia
- C. Microorganisms
- D. Cryptosporidiosis
- E. Cryptosporidium
- F. None of the Above

**Conclusion**

40. All of the following have been associated with waterborne illnesses: hepatitis viruses (including hepatitis E virus), Campylobacter jejuni, microsporidia, cyclospora, \_\_\_\_\_, calciviruses and environmental bacteria like Mycobacterium spp, aeromonads, Legionella pneumophila and multidrug-resistant Pseudomonas aeruginosa.

- A. Yersinia enterocolitica
- B. Legionella pneumophila
- C. Shigellosis
- D. Emergence of disinfection resistant variants
- E. Campylobacter
- F. None of the Above

41. Areas of water quality concerns include life cycles, mechanisms of infection, protective or dormant states, emergence of disinfection resistant variants, \_\_\_\_\_, regrowth in distribution lines.

- A. Optimal pathogen removal techniques
- B. Disinfection process
- C. Environmental and regulatory impact
- D. Primary methods used for the disinfection
- E. Extensive waterborne disease research
- F. None of the Above

42. Humans are the reservoir for the Salmonella typhi pathogen, which causes diarrheal illness, and also known as?

- A. Campylobacter
- B. Pathogen
- C. Pontiac fever
- D. Typhoid fever
- E. Shigella dysenteriae
- F. None of the Above

43. Salmonella typhi. Prevention strategies for this pathogen include source protection, halogenation of water, and?

- A. Adding chlorine
- B. Adding sodium chlorite
- C. Adding KNO4
- D. Adding NH4
- E. Boiling water for one minute
- F. None of the Above



44. *Shigella* species, in the United States two-thirds of the shigellosis in the U.S. is caused by *Shigella sonnei*, and the remaining one-third is caused by *Shigella flexneri*.  
 A. True      B. False
45. *Campylobacter*, the basics. It's a bacterium. It causes diarrheal illness. *Campylobacter* is primarily associated with poultry, animals, and humans.  
 A. True      B. False
46. Hepatitis A, the basics. It's a virus. It causes inflammation of the liver, and the reservoir for \_\_\_\_\_ is humans.  
 A. Hepatitis A virus      D. Hepatitis B  
 B. Diarrheal illness      E. Waterborne outbreaks  
 C. *Cryptosporidium*      F. None of the Above
47. Humans are the reservoir for the Norovirus, prevention strategies for this pathogen include ?  
 A. Maintaining water systems      D. Containment protection  
 B. Source protection      E. Internal protection  
 C. Chlorine monoxide      F. None of the Above
48. Filtration with an "absolute" pore size of one micron or smaller can eliminate?  
 A. Pathogen      D. *Pseudomonas*  
 B. *Cryptosporidium*      E. Salmonellosis  
 C. Hepatitis A virus      F. None of the Above
49. *Giardia* prevention strategies for this pathogen include \_\_\_\_\_; filtration, coagulation, and halogenation of drinking water.  
 A. Maintaining hot water systems      D. Primary protection  
 B. Source protection      E. Secondary measurements  
 C. Sulfur dioxide      F. None of the Above

### **Viral-Caused Diseases**

50. \_\_\_\_\_ is a viral disease that may be spread through water.  
 A. Pathogen      D. *Campylobacteriosis*  
 B. Yersiniosis      E. Incubation period  
 C. Hepatitis A      F. None of the Above
51. Chlorine inactivates most \_\_\_\_\_ in drinking water.  
 A. Illnesses      D. Pathogens  
 B. Giardiasis      E. Infections  
 C. Viruses      F. None of the Above

### **Protozoan Caused Diseases**

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

53. A few of the parasites enter the environment in a dormant form, with a protective cell wall, called a?

- A. Lamblia      D. Cyst
- B. Shell          E. Infection
- C. Case          F. None of the Above

**Giardia lamblia**

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

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

**Cryptosporidiosis**

55. The mode of transmission of which bug is fecal-oral, either by person-to-person or animal-to-person, there is no specific treatment?

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

56. Which of the following usually come and go, and end in fewer than 30 days in most cases, the incubation period is 1-12 days, with an average of about seven days?

- A. HIV infections      D. Hepatitis A
- B. Symptoms            E. Cryptosporidiosis
- C. Giardiasis            F. None of the Above

**Bacteriological Monitoring Section**

57. \_\_\_\_\_ are usually harmless, occur in high densities, and are easily cultured.

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

58. Commonly used indicators for routine monitoring of drinking water include total coliforms, fecal coliforms, and \_\_\_\_\_.

- A. Sample container                  D. Escherichia coli (E. coli)
- B. Bacteria tests                        E. Iron bacteria
- C. Coliform bacteria                  F. None of the Above

59. The routine microbiological analysis of drinking water is for \_\_\_\_\_, which is an indicator organism used to determine the biological quality of the water.

- A. Indicator bacteria      D. Coliform bacteria
- B. Bacteria tests          E. Presence of an indicator
- C. Contamination        F. None of the Above

60. Which of the following terms is used as an indicator organism to determine the biological quality of your water?

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

61. The presence of an indicator or \_\_\_\_\_ in drinking water is an important health concern because of the risk of waterborne diseases and illnesses.

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

62. If \_\_\_\_\_ are present, the water may be contaminated with fecal material and, therefore, pathogens.

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

### Laboratory Procedures

63. One of four methods approved by the USEPA may be used by the laboratory to perform the \_\_\_\_\_.

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

### Methods

64. The MMO-MUG test, marketed as \_\_\_\_\_, is the most common method used for total coliform analysis.

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

65. If coliforms are present, the laboratory will analyze the sample further for \_\_\_\_\_.

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

### Types of Water Samples

66. The type of \_\_\_\_\_ you are collecting must be properly identified on the laboratory form.

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

### The three (3) types of samples are:

67. Repeat samples must be collected following a 'coliform present' routine sample. The number of repeat samples required is based on the number of \_\_\_\_\_ samples the water system normally collects.

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

68. A sample collected after repairs to the system and before it is placed back in operation is an example of a \_\_\_\_\_ sample.

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

69. \_\_\_\_\_ samples are collected routinely in accordance with an approved sampling plan to monitor for contamination.
- A. Repeat
  - B. Special
  - C. Sample
  - D. Total coliform analysis
  - E. Routine
  - F. None of the Above

### Repeat Sampling

70. If a \_\_\_\_\_ is total coliform- or fecal coliform-positive, a set of repeat samples must be collected within 24 hours after being notified by the laboratory.
- A. MCL compliance
  - B. Distribution system
  - C. Routine sample
  - D. Original sampling location
  - E. Repeat sample(s)
  - F. None of the Above

### The follow-up for repeat sampling is:

71. One of the repeat samples must be collected from within five (5) service connections upstream from the \_\_\_\_\_.
- A. MCL compliance
  - B. Distribution system
  - C. Routine sample
  - D. Original sampling location
  - E. Repeat sample(s)
  - F. None of the Above

72. One of the repeat samples must be collected from within five (5) service connections downstream from the \_\_\_\_\_.
- A. Special Sample
  - B. Routine sample
  - C. Repeat sample(s)
  - D. Coliform present
  - E. Original sampling location
  - F. None of the Above

73. The \_\_\_\_\_ must be collected from the same sampling location over a four-day period, or on the same day, for water systems that have only one service connection.
- A. Special Samples
  - B. Routine samples
  - C. Repeat samples
  - D. Coliform present
  - E. Original sampling location
  - F. None of the Above

74. The results of all \_\_\_\_\_ are included in the MCL compliance calculation.
- A. Special Samples
  - B. Routine samples
  - C. Repeat samples
  - D. Coliform present
  - E. Original sampling location
  - F. None of the Above

### Sampling Procedures

75. What must be followed and all operating staff must be clear on how to follow the sampling plan?
- A. Seal individual samples
  - B. Chain of custody
  - C. Distribution system
  - D. Sample siting plan
  - E. Positive for total coliform
  - F. None of the Above

76. In order to properly implement the sample siting plan, staff must understand the required sampling frequency and the \_\_\_\_\_ to be used for collecting the samples.
- A. Multiple sources
  - B. Sample siting plan
  - C. Total coliform rule
  - D. Proper procedures and sampling containers
  - E. Laboratory containers
  - F. None of the Above

77. In addition, proper procedures must be followed for repeat sampling whenever a routine sample result is?

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

### Chain of Custody Procedures

78. A \_\_\_\_\_ begins when the sample containers are obtained from the laboratory. After that, a chain of custody record will accompany the sample containers.

- A. Multiple sources
- B. Sample siting plan
- C. Total coliform
- D. Chain of custody record
- E. Sampling containers
- F. None of the Above

79. In addition to a \_\_\_\_\_, each custody sample may require a seal.

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

80. Because a sample is physical evidence, \_\_\_\_\_ procedures are used to maintain and document sample possession from the time the sample is collected until it is introduced as evidence.

- A. Multiple sources
- B. Sample siting plan
- C. Total coliform
- D. TCR
- E. Chain of custody
- F. None of the Above

81. Any time \_\_\_\_\_, both parties involved must sign, date, and note the time on the chain of custody record.

- A. Multiple sources are used
- B. The sample siting plan is used
- C. Total coliform is positive
- D. Samples transfer possession
- E. Sampling containers are lost
- F. None of the Above

82. If a sample must be split and sent to more than one laboratory, a separate \_\_\_\_\_ is required for each part of the sample.

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

83. The chain of custody record must be locked with the sealed samples inside sealed boxes if the samples are delivered to an after-hours night drop-off box.

- A. True
- B. False

### Protozoan Diseases

84. Which of the following can survive in the environment for long periods of time and be extremely resistant to conventional disinfectants such as chlorine?

- A. Paramecium
- B. Host
- C. Cyst
- D. Protozoan pathogen
- E. Cytoplasm
- F. None of the Above

85. Symptoms include chronic diarrhea, abdominal cramps, bloating, frequent loose and pale greasy stools, fatigue and weight loss.

- A. Giardia lamblia
- B. Cytoplasm disease
- C. Paramecium disease
- D. Giardiasis
- E. Protozoan-caused disease
- F. None of the Above

86. The mode of transmission is fecal-oral, either by person-to-person or animal-to-person. There is no specific treatment for?

- A. Giardia lamblia treatment
- B. Incubation period
- C. Animal-to-person contact
- D. Major symptom
- E. Cryptosporidium infections
- F. None of the Above

87. Which bug/creature/organism/disease is is a flagellated protozoan parasite that colonizes and reproduces in the small intestine?

- A. Giardia trophozoites
- B. Incubations
- C. Animal-to-person contact
- D. Giardia lamblia
- E. Cryptosporidium infections
- F. None of the Above

### **Maximum Contaminant Levels (MCLs)**

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

- A. True
- B. False

89. EPA had developed standards which are known as maximum contaminant levels (MCL). When a particular contaminant exceeds which term a potential health threat may occur?

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

90. Which acronym generally expresses properties of the contaminants, risk assessments and factors, short-term exposure and long-term exposure?

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

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

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

92. The first type of MCL violations is for total coliform; the second is \_\_\_\_\_ violation characterized by the confirmed presence of fecal coliform or E. coli.

- A. Coliform bacteria
- B. MCLs
- C. Standards
- D. MCL violations
- E. An acute risk to health
- F. None of the Above

### **Heterotrophic Plate Count HPC**

93. Heterotrophic Plate Count (HPC) is a procedure for estimating the number of live heterotrophic bacteria and measuring changes during water treatment and distribution.

- A. True      B. False

94. Which term " \_\_\_\_\_ " refers to the chains, clusters, or single cells that form colonies of bacteria?

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

### **Spread Plate Method**

95. During the Spread Plate Method, all colonies are on the \_\_\_\_\_ where they can be distinguished readily from particles and bubbles.

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

96. During the Spread Plate Method, \_\_\_\_\_ can easily be discerned and compared to published descriptions.

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

### **Membrane Filter Method**

97. Large volumes of \_\_\_\_\_ can be tested by the Membrane Filter Method, and this method is preferred for low-count waters.

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

### **Heterotrophic Plate Count (Spread Plate Method)**

98. \_\_\_\_\_ use inorganic carbon sources as their substrate. The Heterotrophic Plate Count provides a technique to quantify the bacteriological activity of a sample.

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

99. Which term provides a technique to quantify the bacteriological activity of a sample?

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

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

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

### Total Coliforms

101. 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

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

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

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

103. A(n) \_\_\_\_\_ requires the water system to provide public notice via radio and television stations in the area.

- A. Routine analysis violation      D. Human health violation  
B. Drinking water rule violation      E. Acute health risk violation  
C. MCL violation      F. None of the Above

104. According to the text, the type of contamination can pose an immediate threat to human health and notice must be given as soon as possible, but no later than 24 hours after notification from your laboratory of the test results.

- A. True      B. False

### Public Notice

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

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

### The following are acute violations:

106. Violation of the \_\_\_\_\_ for nitrate is an acute violation.

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

107. Any violation of the \_\_\_\_\_ for total coliforms, when fecal coliforms or E. coli are present, is an acute violation.

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

108. Any outbreak of \_\_\_\_\_ is an acute violation.

- A. Total coliforms      D. Radioactive bacteria  
B. MCL      E. Acute violations  
C. Waterborne disease      F. None of the Above



## pH Section

109. What is the term associated with a charged species, an atom or a molecule, that has lost or gained one or more electrons?

- A. A proton
- B. Ion
- C. Anti-matter
- D. An electron
- E. A cation
- F. None of the Above

110. What is a substance that has the ability to reduce other substances and is said to be reductive in nature?

- A. Protons
- B. An electron donor
- C. Anti-matter
- D. Electrons
- E. Cations
- F. None of the Above

111. According to the manual, which of the following parameter/methods/measurements determine a parameter using a concentration cell with transference by measuring the potential difference?

- A. Primary pH standard values
- B. Alkalinity
- C. pH
- D. pH measurement(s)
- E. Measurement of pH
- F. None of the Above

112. Mathematically speaking, pH is the negative logarithm of the activity of the (solvated) hydronium ion, often expressed as the measurement of?

- A. Electrons
- B. Alkalinity
- C. Hydronium ion concentration
- D. Cation measurement(s)
- E. Ions
- F. None of the Above

113. With respect to standard buffer values, when more than two buffer solutions are used the electrode can be calibrated by fitting observed pH values to a straight line.

- A. True
- B. False

114. Commercial standard buffer solutions usually comes with information about value and a correction factor to be applied for what temperatures?

- A. 4 °C
- B. 25 °C
- C. 39 °F
- D. 10 °C
- E. 70 °F
- F. None of the Above

115. According to the manual, under normal circumstances, strong acids and bases are compounds that, for practical purposes, are completely dissociated in water; this means that the concentration of hydrogen ions in acidic solution can be taken to be equal to the concentration of the acid. The pH is then equal to minus the logarithm of \_\_\_\_\_.

- A. The concentration value
- B. The pH
- C. The Spectrophotometer
- D. End-point pH
- E. A set of non-linear simultaneous equations
- F. None of the Above

116. If the pH of a solution contains a weak base, this may require?

- A. The solution of a cubic equation
- B. The solution of a linear equation
- C. The solution of a squared equation
- D. A set of linear simultaneous equations
- E. A set of non-linear simultaneous equations
- F. None of the Above

117. While the general case requires the pH solution of?

- A. The solution of a cubic equation
- B. The solution of a linear equation
- C. The solution of a squared equation
- D. A set of linear simultaneous equations
- E. A set of non-linear simultaneous equations
- F. None of the Above

118. The calculation of the pH of a solution containing acids and/or bases is an example of a \_\_\_\_\_ calculation, that is, a mathematical procedure for calculating the concentrations of all chemical species that are present in the solution

- A. Universal indicator
- B. Colorwheel measurement
- C. Spectrophotometer
- D. Visual comparison
- E. Chemical speciation
- F. None of the Above

119. Since pH is a logarithmic scale, a difference of one pH unit is equivalent to a \_\_\_\_\_ difference in hydrogen ion concentration

- A. 1
- B. 2
- C. 5
- D. 10
- E. 100
- F. None of the Above

120. According to the manual, this key water measurement is used in the interpretation and control of water and wastewater treatment processes.

- A. Acid
- B. Alkalinity
- C. pH
- D. Chemical ion
- E. Hydrogen bond formation
- F. None of the Above