

Registration form

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

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

Water Treatment ___ Water Distribution ___ Other _____

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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 \$89.95 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

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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.

BACTERIOLOGICAL SAMPLING Answer Key

Name _____

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

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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.

- | | | | |
|-------------|-------------|-------------|-------------|
| 1. A B C D | 19. A B C D | 37. A B C D | 55. A B C D |
| 2. A B C D | 20. A B C D | 38. A B C D | 56. A B |
| 3. A B C D | 21. A B C D | 39. A B C D | 57. A B |
| 4. A B C D | 22. A B C D | 40. A B C D | 58. A B |
| 5. A B C D | 23. A B C D | 41. A B C D | 59. A B |
| 6. A B C D | 24. A B C D | 42. A B C D | 60. A B C D |
| 7. A B C D | 25. A B C D | 43. A B C D | 61. A B |
| 8. A B C D | 26. A B | 44. A B C D | 62. A B C D |
| 9. A B C D | 27. A B | 45. A B C D | 63. A B |
| 10. A B C D | 28. A B | 46. A B | 64. A B C D |
| 11. A B C D | 29. A B | 47. A B | 65. A B C D |
| 12. A B C D | 30. A B | 48. A B | 66. A B |
| 13. A B C D | 31. A B | 49. A B C D | 67. A B |
| 14. A B C D | 32. A B | 50. A B C D | 68. A B |
| 15. A B C D | 33. A B | 51. A B C D | 69. A B C D |
| 16. A B C D | 34. A B | 52. A B C D | 70. A B C D |
| 17. A B C D | 35. A B | 53. A B C D | 71. A B |
| 18. A B C D | 36. A B C D | 54. A B C D | 72. A B |

73. A B C D
74. A B C D
75. A B C D
76. A B C D
77. A B
78. A B
79. A B C D

80. A B C D
81. A B C D
82. A B C D
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86. A B C D

87. A B C D
88. A B C D
89. A B C D
90. A B C D
91. A B
92. A B
93. A B

94. A B
95. A B C D
96. A B C D
97. A B C D
98. A B
99. A B
100. A B C D

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

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

**BACTERIOLOGICAL SAMPLING CEU COURSE
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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.

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

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How did you hear about this Course? _____

What would you do to improve the Course?

Any other concerns or comments.

**Please fax the answer key to TLC Western Campus
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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 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.

Bacteriological Sampling CEU Training Course Assignment

The Bacteriological Sampling 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.

Hyperlink to the Glossary and Appendix

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

Three Types of Public Water Systems

1. Provides water to the same people at least six months a year, but not all year (for example: schools, factories, churches, office buildings that have their own water system)

- A. TNCWS C. NTNCWSs
B. CWSs D. None of the above

2. Provides water where people do not remain for long periods of time (for example: gas stations, campgrounds)

- A. TNCWS C. NTNCWSs
B. CWSs D. None of the above

3. Approximately 52,000 systems serving the majority of the U.S. population

- A. TNCWS C. NTNCWSs
B. CWSs D. None of the above

4. Approximately 18,000 water systems

- A. TNCWS C. NTNCWSs
B. CWSs D. None of the above

Water Quality Section

Surface (Raw) Water Introduction

5. Water passes runoffs and infiltrates the ground during precipitation; this runoff acquires a wide variety of _____ that intensely alters its usefulness.

- A. Excess nutrients C. Dissolved or suspended impurities
B. Biological actions D. None of the above

6. _____ 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

7. 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

Turbidity Introduction

8. One physical feature of water is turbidity. A measure of the cloudiness of water caused by _____. The cloudy appearance of water caused by the presence of tiny particles.

- A. Suspended particles C. Temperature fluctuation
B. Variations D. None of the above

9. _____ may be existing in a water supply due to pollution, and these colloids can be difficult to remove in the coagulation process. In this situation, higher coagulant dosages are generally required.

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

Turbidity MCL

10. 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

More on the Stage 2 DBP Rule

11. 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

Disinfection Byproduct Research and Regulations Summary

12. _____ 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

13. 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

Organisms Descriptors and Meanings

14. Chemo means...

- A. Rock C. Chemical
B. Organic D. None of the above

15. Hetero means...

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

16. Anaerobic means...
- A. Without air C. Self (Inorganic carbon)
 B. With air D. None of the above
17. Photo means...
- A. Feed or nourish C. Light
 B. Other (Organic carbon) D. None of the above
18. Troph means...
- A. Feed or nourish C. Light
 B. Other (Organic carbon) D. None of the above
19. Litho means...
- A. Rock C. Light
 B. Organic D. None of the above
20. Organo means...
- A. Rock C. Light
 B. Organic D. None of the above
21. Auto means...
- A. Without air C. Self (Inorganic carbon)
 B. With air D. None of the above
22. Facultative means...
- A. Without air C. Self (Inorganic carbon)
 B. With air or without air D. None of the above
23. Aerobic 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:

24. Which of the following can be synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can come from gas stations, urban stormwater run-off, and septic systems?
- A. Organic chemical contaminants C. Inorganic contaminants
 B. Pesticides and herbicides D. Microbial contaminants
25. 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

Background

26. 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

27. 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

28. Coliform contamination may occur anywhere in the system, possibly due to problems such as; high-pressure conditions, line fluctuations, or wells, and therefore routine monitoring is required.

- A. True B. False

Routine Sampling Requirements

29. 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

30. If any routine sample is TC+, repeat samples are required. – PWSs on quarterly or annual monitoring must take a minimum of one additional routine samples (known as additional routine monitoring) the quarter following a TC+ routine or repeat sample.

- A. True B. False

31. 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

32. 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

34. For PWSs collecting more than one sample per month, collect total coliform samples at regular intervals throughout the month, except that ground water systems serving 4,900 or fewer people may collect all required samples on a single day if the samples are taken from different sites.

- A. True B. False

35. Each total coliform-positive (TC+) routine sample must be tested for the presence of heterotrophic bacteria.

- A. True B. False

Dangerous Waterborne Microbes

36. Which of the following are not necessarily agents of disease may indicate the presence of disease-carrying organisms?

- A. Fecal coliform bacteria C. Shigella dysenteriae
B. Cryptosporidium D. None of the above

37. 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

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

38. 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
39. Which of the following can cause bacillary dysentery?
 A. Fecal coliform bacteria C. *Shigella*
 B. *Cryptosporidium* D. None of the above
40. Which of the following are Gram-negative, non-spore-forming, facultatively anaerobic, non-motile bacteria.
 A. Fecal coliform bacteria C. *Shigellae*
 B. *Cryptosporidium* D. None of the above
41. 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

Bacteriological Monitoring Introduction

42. 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
43. Indicators in common use today for routine monitoring of drinking water include total coliforms, fecal coliforms, and?
 A. *Cryptosporidium* C. *Escherichia coli* (*E. coli*)
 B. Protozoa D. None of the above
44. 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

Methods

45. 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

46. 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
47. Among Surface Water Treatment Rule provisions, the rule requires that a public water system, using surface water (or ground water under the direct influence of surface water) as its source, have sufficient treatment to reduce the source water concentration of protozoa and coliform bacteria by at least 99.9% and 99.99%, respectively.
 A. True B. False

48. The Surface Water Treatment Rule suggests treatment criteria to assure that these performance recommendations are met; they may include turbidity limits, disinfectant residual and disinfectant contact time conditions.
A. True B. False

The three (3) types of samples are:

49. 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

50. 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

51. 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

52. 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

53. 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

54. 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

55. 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

56. Noncommunity and nontransient noncommunity public water systems will sample at the same frequency as a like sized community public water system if:
1. It has more than 1,000 daily population and has ground water as a source, or
2. It serves 25 or more daily population and utilizes surface water as a source or ground water under the direct influence of surface water as its source.
A. True B. False

Maximum Contaminant Levels (MCLs)

57. 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

58. There are two types of MCL violations for coliform bacteria. The first is for total coliform; the second is an acute risk to health violation characterized by the confirmed presence of fecal coliform or E. coli.
A. True B. False

Positive or Coliform Present Results

59. 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

60. With a positive total coliform sample and after 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

61. 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)

62. 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

63. 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

64. For systems which 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:

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

Revised Total Coliform Rule (RTCR) Summary

66. 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

67. The RTCR upholds the purpose of the 1989 TCR to protect public health by ensuring the duplicity of the drinking water distribution system and monitoring for the absence of microbial contamination.
A. True B. False
68. 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
69. 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
70. The water provider shall collect _____ on a regular basis (monthly, quarterly, annually). Have samples tested for the presence of total coliforms by a state certified laboratory.
A. Routine water samples C. Microbial contamination
B. Reduced monitoring D. Repeat water samples
71. The RTCR requires public water systems that are vulnerable to microbial contamination to identify and fix problems.
A. True B. False
72. The water provider shall collect repeat samples (at least 3) for each TC+ positive routine sample.
A. True B. False
73. 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
74. PWSs incur violations if they do not comply with the requirements of the RTCR. The violation types are essentially the same as under the TCR with few changes. The biggest change is no acute or monthly MCL violation for _____ only.
A. CCR(s) C. Total coliform positive samples
B. PN D. TC+ routine or repeat sample
75. 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
76. The water provider shall analyze all _____ that are total coliform positive (TC+) for E. coli.
A. Routine or repeat water samples C. Microbial contamination
B. Reduced monitoring D. Repeat water samples
77. The RTCR requires public water systems (PWSs) to meet a legal limit for E. coli, as demonstrated by required monitoring.
A. True B. False

78. 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

79. The RTCR requires 99.99% or 4 log inactivation of _____ .
A. Enteric viruses C. Giardia lamblia cysts
B. Crypto D. None of the above
80. 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
81. The RTCR requires 99% or 2 log inactivation of _____ .
A. Enteric viruses C. Giardia lamblia cysts
B. Crypto D. None of the above
82. The RTCR requires 99.9% or 3 log inactivation of _____ .
A. Enteric viruses C. Giardia lamblia cysts
B. Crypto D. None of the above

Waterborne Pathogen Section - Introduction Pathogen Section

83. 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

Protozoan Caused Diseases

84. 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
85. Some of the parasites enter the environment in a dormant form, with a protective cell wall, called a?
A. Lamblia C. Cyst
B. Shell D. None of the above

Giardia lamblia

86. Which of the following bugs has been responsible for more community-wide outbreaks of disease in the U.S. than any other, and drug treatment are not 100% effective?
A. Giardia lamblia C. Giardiasis
B. Cryptosporidiosis D. None of the above
87. 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

88. Legionnaire's disease, which causes a severe pneumonia, and the second, _____, which is a non-pneumonia illness; it's typically an influenza-like illness, and it's less severe.
A. Pontiac fever C. Typhoid fever
B. Yellow fever D. None of the above

89. Legionella, prevention. Legionella in water systems. Hot water in tanks should be maintained between _____ degrees Centigrade.
A. 81 to 100 C. 71 and 77
B. 110 to 210 D. None of the above

90. Which of the following is typically associated with soil and water?
A. Hepatitis A virus C. Pseudomonas
B. Legionella D. None of the above

Waterborne Bacterial Diseases

91. 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

92. 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

93. 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

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

Chain of Custody Procedures

95. 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

96. The recipient will then attach the _____ showing the transfer dates and times to the custody sheets. If the samples are split and sent to more than one laboratory, prepare a separate chain of custody record for each sample.

A. Shipping invoices C. Sample siting plan
B. Chain of custody release D. None of the above

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

Water Laboratory Analysis Section

pH Testing Section

97. When an atom loses _____ and thus has more protons than electrons, the atom is a positively-charged ion or cation.

- A. A proton
- B. Charge
- C. An electron
- D. None of the above

98. Measurement of pH for aqueous solutions can be done with a glass electrode and a pH meter, or using indicators like strip test paper.

- A. True
- B. False

99. In chemistry, pH is a measure of the acidity or basicity of an aqueous solution. Solutions with a pH greater than 7 are said to be acidic and solutions with a pH less than 7 are basic or alkaline.

- A. True
- B. False

100. Pure water has a pH very close to?

- A. 7
- B. 7.5
- C. 7.7
- D. None of the above