Registration form

WATER TREATMENT UTILIZATION COURSE

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_____

Class/Grade_____

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

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

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

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

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

State Approval Listing URL…
http://www.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.

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.

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

WT Utilization Answer Key

Name_____

Phone _____

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

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.

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 C D
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4. A B C D	22. A B C D	40. A B C D	58. A B C D
5. A B C D	23. A B C D	41. A B C D	59. A B C D
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 C D
8. A B C D	26. A B C D	44. A B C D	62. A B C D
9. A B C D	27. A B C D	45. A B C D	63. A B C D
10. A B C D	28. A B C D	46. A B C D	64. A B C D
11. A B C D	29. A B C D	47. A B C D	65. A B C D
12. A B C D	30. A B C D	48. A B C D	66. A B
13. A B C D	31. A B C D	49. A B C D	67. A B
14. A B C D	32. A B C D	50. A B C D	68. A B
15. A B C D	33. A B C D	51. A B C D	69. A B
16. A B C D	34. A B C D	52. A B C D	70. A B
17. A B C D	35. A B C D	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

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331. A B
332. A B
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336. A B C D

337. A B C D	353. A B	369. A B	385. A B C D
338. A B C D	354. A B	370. A B C D	386. A B C D
339. A B C D	355. A B C D	371. A B C D	387. A B C D
340. A B	356. A B C D	372. A B C D	388. A B
341. A B C D	357. A B C D	373. A B C D	389. A B C D
342. A B C D	358. A B C D	374. A B C D	390. A B
343. A B C D	359. A B C D	375. A B C D	391. A B
344. A B C D	360. A B C D	376. A B C D	392. A B
345. A B C D	361. A B C D	377. A B C D	393. A B
346. A B C D	362. A B C D	378. A B C D	394. A B
347. A B C D	363. A B C D	379. A B C D	395. A B C D
348. A B C D	364. A B C D	380. A B C D	396. A B C D
349. A B C D	365. A B	381. A B	397. A B C D
350. A B C D	366. A B C D	382. A B C D	398. A B
351. A B C D	367. A B C D	383. A B	399. A B C D
352. A B C D	368. A B	384. A B	400. A B

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.

I will contact TLC if I do not hear back from them within 2 days of assignment submission. I will forfeit my purchase costs and will not receive credit or a refund if I do not abide with TLC's rules.

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

_____

Signature

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

WATER TREATMENT UTILIZATION 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.

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

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

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

How did you hear about this Course? _____

What would you do to improve the Course?

_____

_____

Any other concerns or comments.

_____

_____

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.

FAX
If you are unable to scan and email, please fax these documents to TLC, if you fax, call to confirm that we received your paperwork. **(928) 468-0675**

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 permit and State and do not follow this course for proper compliance.

Water Treatment Utilization CEU Training Course Assignment

The Water Treatment Utilization 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. Approximately 85,000 systems
A. TNCWS C. NTNCWSs
B. CWSs D. None of the above

2. Approximately 52,000 systems serving the majority of the U.S. population
A. TNCWS C. NTNCWSs
B. CWSs D. None of the above

3. 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

Water Quality Key Words
4. Which of the following is manufactured from aluminum hydroxide by dehydroxylating it in a way that produces a highly porous material?
A. Activated alumina C. Aluminum salts
B. Fluoride D. None of the above

5. Which of the following substances has been processed to make it extremely porous and thus to have a very large surface area available for adsorption or chemical reactions?
A. Activated alumina C. Dissolved organic carbon
B. Activated carbon D. None of the above

6. The "dissolved" fraction of which compound is an operational classification?
A. Activated alumina C. Organic carbon
B. Activated carbon D. None of the above

Water Quality Section
Surface (Raw) Water Introduction
7. _____ 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

8. As operators, we 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

9. 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

Surface Water Properties
10. 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

11. Adjustments in the dissolved oxygen, algae, temperature, suspended solids, turbidity, and carbon dioxide will change because of _____.
A. Excess nutrients C. Discharge
B. Biological activities D. None of the above

Managing Water Quality at the Source
12. 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

13. Algae can be controlled in the water supply by using chemicals such as_____.
A. pH and alkalinity C. Powdered activated carbon and chlorine
B. Copper sulfate D. None of the above

14. 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

15. The _____ of the water will govern how these chemicals will react.
A. pH and alkalinity C. Powdered activated carbon and chlorine
B. Metals, and non-metals D. None of the above

Physical Characteristics of Water
16. 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

17. Total Dissolved Solids (TDS) is not a primary pollutant; it is a gauge of appealing water characteristics such as hardness and an indication of an assortment of chemical contaminants that might be present, such as?
A. Turbidity C. Arsenic
B. Colloids D. None of the above

18. 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

19. _____ is a substance that can give up a hydrogen ion (H^+); a base is a substance that can accept H^+.
A. Acid C. Acidic or alkaline
B. Base D. None of the above

20. 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
21. _____ 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

22. Alkalinity is a measure of _____and can be interpreted in terms of specific substances only when the chemical composition of the sample is known.
A. Hydrogen ion (H^+) C. An aggregate property of water
B. Alkaline earth metal D. None of the above

Turbidity Introduction
23. One physical feature of water is turbidity, is a measurement of the cloudiness of water caused by_____.
A. Suspended particles C. Temperature fluctuation
B. Variations D. None of the above

24. 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

25. 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

26. Usually, the extra coagulant required is relatively small when turbidities are much higher than normal due to higher collision probabilities of the _____ during high turbidities.
A. Turbidity C. Total Dissolved Solids (TDS)
B. Colloids D. None of the above

27. 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

28. _____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
29. 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

30. The temperature variation of a sample, a scratched or unclean sample tube in the nephelometer and selecting an incorrect wavelength of a light path may be conditions caused by an inaccurate _____ measurement.
A. Conductivity C. Temperature
B. Turbidity D. None of the above

Dissolved Oxygen
31. 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

32. At low temperatures, the _____is increased, so that in winter, concentrations as high as 20 ppm may be found in natural waters; during summer, saturation levels can be as low as 4 or 5 ppm.
A. Dissolved oxygen C. Solubility of oxygen
B. Thermal stratification D. None of the above

33. _____ 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

34. Thermal stratification is possible as water becomes less dense when heated, meaning water weighs less per unit volume. Therefore, warmer water will be lighter and colder water will be heavier. Due to this, there will always be a level of “self-induced” _____ in a water storage.
A. Saturation level(s) C. Permanent hardness
B. Thermal stratification D. None of the above

Objections to Hard Water
Scale Formation
35. 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
36. 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

Langelier Saturation Index
37. 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

38. The Langelier saturation level approaches the concept of saturation using pH as a main variable. The LSI can be interpreted as the pH change required to bring water to_____.
A. Saturation level(s) C. Equilibrium
B. Stratification D. None of the above

More on the Stage 2 DBP Rule
39. 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

40. 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

41. There are specific microbial pathogens, such as_____, which can cause illness, and are highly resistant to traditional disinfection practices.
A. Cryptosporidium C. Protozoa
B. E. coli host culture D. None of the above

42. 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

43. Which of the following rules will reduce potential cancer and reproductive and developmental health risks from disinfection byproducts?

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

What are Disinfection Byproducts (DBPs)?

44. Which of the following form when disinfectants used to treat drinking water react with naturally occurring materials in the water?

A. Chloramines
B. Humic and fulvic acids
C. Disinfection byproducts (DBPs)
D. None of the above

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

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

Disinfection Byproduct Research and Regulations Summary

46. _____is unquestionably the most important step in the treatment of water for drinking water supplies.

A. DBP(s)
B. Turbidity (particle)
C. Disinfection
D. None of the above

47. The _____should not be compromised because of concern over the potential long-term effects of disinfectants and DBPs.

A. DBP(s)
B. Turbidity (particle)
C. Microbial quality of drinking water
D. None of the above

48. 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
B. Turbidity (particle)
C. Natural organic matter precursors
D. None of the above

Controlling Disinfection Byproducts

49. 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
B. Turbidity (particle)
C. Disinfectants and DBPs
D. None of the above

50. Generally, the best approach to reduce _____is to remove natural organic matter precursors prior to disinfection.

A. DBP(s)
B. Turbidity (particle)
C. DBP formation
D. None of the above

The EPA guidance discusses three processes to effectively remove natural organic matter prior to disinfection:

Coagulation and Clarification

51. Coagulation processes can also be optimized for natural organic matter removal with higher doses of _____(such as alum or iron salts), and optimization of pH.

A. THMs and HAAs
B. Inorganic coagulants
C. Natural organic matter
D. None of the above

52. Most treatment plants optimize their coagulation process for _____removal.
A. Inorganic coagulants C. Turbidity (particle)
B. Most contaminants D. None of the above

Absorption
53. 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
54. Membranes, used historically to desalinate brackish waters, have also demonstrated excellent removal of _____.
A. THMs and HAAs C. Natural organic matter
B. Optimization of pH D. None of the above

55. 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

56. Other conventional methods of reducing DBP formation include changing the point of chlorination and using _____for residual disinfection.
A. Free residual disinfection C. Total residual disinfection
B. Chloramines D. None of the above

Organisms Descriptors and Meanings
57. Photo means...
A. Feed or nourish C. Light
B. Other (Organic carbon) D. None of the above

58. Chemo means...
A. Rock C. Chemical
B. Organic D. None of the above

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

60. 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:

61. Which of the following like salts and metals, which can be naturally occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming?

A. Radioactive contaminants C. Inorganic contaminants
B. Pesticides and herbicides D. Microbial contaminants

62. 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

63. 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

64. 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

65. 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

66. 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

67. 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

68. The sample sitting plan identifies sampling frequency and locations throughout the distribution system that are selected to be representative of conditions in the entire system.

A. True B. False

69. 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

70. 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

71. 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

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

73. 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

74. 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

75. 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
76. 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

77. 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

78. 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

79. 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

80. Which of the following can cause bacillary dysentery?
A. Fecal coliform bacteria C. Shigella
B. Cryptosporidium D. None of the above

Bacteriological Monitoring Introduction

81. 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

82. 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

83. 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

84. Water samples for _____must always be collected in a sterile container.

A. Amoebas C. Viruses
B. Bacteria tests D. None of the above

Methods

85. 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

The three (3) types of samples are:

86. 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

87. 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

88. 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

89. 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

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

90. 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

Noncommunity and nontransient noncommunity public water systems will sample at the same frequency as a like sized community public water system if:
91. It has more than 1,000 daily population and has ground water as a source, or 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

92. Noncommunity and nontransient, noncommunity water systems with less than 10,000 daily population and groundwater as a source will sample on an annual basis.
A. True B. False

Maximum Contaminant Levels (MCLs)
93. 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

94. The MCLs are based on extensive research on toxicological properties of the contaminants, risk assessments and factors, short-term (acute) exposure, and long-term (chronic) exposure. You conduct the monitoring to make sure your water is in compliance with the MCL.
A. True B. False

95. 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
96. 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

97. With a positive total coliform sample, 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
98. 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)

99. 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

100. 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

The following are acute violations:

101. Which determines a violation of nitrate?

A. Presence C. MCLG
B. MCL D. None of the above

Revised Total Coliform Rule (RTCR) Summary

102. 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

103. 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

104. 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

105. 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

106. 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

107. PN is required for violations incurred. Within required timeframes, the PWS must use the required health effects language and notify the public if they did not comply with certain requirements of the RTCR. The type of _____ depends on the severity of the violation.

A. CCR(s) C. MCL violation
B. PN D. TC+ routine or repeat sample

108. The RTCR requires public water systems that are vulnerable to microbial contamination to identify and fix problems.

A. True B. False

109. The water provider shall collect repeat samples (at least 3) for each TC+ positive routine sample.

A. True B. False

110. 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

111. 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

112. 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

113. 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. None of the above

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

115. 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
116. The RTCR requires 99.99% or 4 log inactivation of _____ .
A. Enteric viruses C. Giardia lamblia cysts
B. Crypto D. None of the above

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

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

119. 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
120. 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.

121 Waterborne pathogens are primarily spread by the?

A. Fecal-oral, or feces-to-mouth route
B. Dermal to fecal route
C. Oral to fecal route
D. None of the above

Protozoan Caused Diseases

122. Which of the following bugs is larger than bacteria and viruses but still microscopic; they invade and inhabit the gastrointestinal tract?

A. Hepatitis A
B. E.coli
C. Protozoan pathogens
D. None of the above

123. Some of the parasites enter the environment in a dormant form, with a protective cell wall, called a?

A. Lamblia
B. Shell
C. Cyst
D. None of the above

Giardia lamblia

124. 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
B. Cryptosporidiosis
C. Giardiasis
D. None of the above

125. 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
B. Giardiasis
C. Hepatitis A
D. None of the above

Primary Waterborne Diseases Section

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

A. Campylobacter
B. Shigella dysenteriae
C. Typhoid fever
D. None of the above

127. 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

128. Campylobacter, the basics. It's a bacterium. It causes diarrheal illness.

A. True B. False

129. Campylobacter is primarily associated with poultry, animals, and humans.

A. True B. False

130. Vibrio cholerae, the basics. It's a virus. It causes diarrheal illness, also known as cholera. It is typically associated with aquatic environments, shell stocks, and human. Vibrio cholerae has also been associated with ship ballast water.

A. True B. False

131. 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

132. 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

133. Cryptosporidium, prevention. Prevention strategies for this pathogen include source protection. A CT value of 50 is required when dealing with fecally accidents. CT equals a concentration, in parts per million, while time equals a contact time in minutes.
A. True B. False

134. Giardia prevention strategies for this pathogen include _____; filtration, coagulation, and halogenation of drinking water.
A. Internal protection C. Containment protection
B. Source protection D. None of the above

135. 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

136. Schistosomatidae prevention strategies for this pathogen include Placing boric acid on berms or interrupting the life cycle of the parasite by treating birds with a lead.
A. True B. False

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

138. Hepatitis A virus is resistant to combined chlorines, so it is important to have an adequate free chlorine residual. Fecal matter can shield Hepatitis A virus from chlorine.
A. True B. False

139. Humans are the reservoir for the Norovirus. Prevention strategies for this pathogen include?
A. Internal protection C. Containment protection
B. Source protection D. None of the above

Waterborne Bacterial Diseases

140. 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

141. 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

142. 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
143. It looks like the COVID-19 coronavirus is not able to live in water.
A. True B. False

Chain of Custody Procedures
144. 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
145. 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

146. 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

147. As _____ are used, contact times may be reduced.
A. Chlorine concentration C. Higher strength chlorine solutions
B. Temperature D. None of the above

Water Treatment Section - Preliminary Treatment Process
Preliminary Treatment
148. 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

149. According to the text, wire mesh screens need maintenance and require?
A. Manual cleaning C. No cleaning
B. PM cleaning D. None of the above

Pre-Sedimentation
150. 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

151. 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

152. Scrapers on the bottom move the settled sludge to one or more hoppers at the influent end of the tank, it may have a _____or traveling bridge used to collect the sludge.
A. Screw conveyor C. Manual skimmer
B. Conveyor belts D. None of the above

Flights and Chains
153. Flights and chains remove the scum from the _____ of the basin.
A. Scum box C. Armature
B. Surface D. None of the above

154. The flights are usually concrete flights mounted on parallel chains and the motor shaft is connected through a shaft that turns the gear.
A. True B. False

155. To prevent damage to the flights and chains due to overloads, a _____is used.
A. Bearing C. Shear pin
B. Reducer D. None of the above

Circular Clarifiers
156. The most common type of Circular Clarifier has a center pier or column.
A. True B. False

157. Which of the following systems use graded silica sand filter media?
A. Traditional filter systems C. Chemical pretreatment
B. Reconditioning cycle D. None of the above

158. 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

159. Which of the following systems uses a 30 to 50 mg/L alum dosage to form a large floc that requires extensive retention time to permit settling?
A. Conventional technology C. Slow Sand Filtration
B. Chemical pretreatment D. None of the above

160. Which of the following processes lasts about 5 to 10 minutes?
A. Filter-to-Waste C. Fast rinse
B. Reconditioning cycle D. None of the above

161. Which of the following terms is often used to enhance filter performance?
A. Conventional technology C. Fast rinse
B. Chemical pretreatment D. None of the above

162. Feeding chemicals such as alum, ferric chloride, or a cationic polymer neutralizes the particle charges, allowing the particles to cling to one another and be trapped by the filter media.
A. True B. False

163. Which of the following terms may increase filtered water clarity, measured in NTU, by 90% compared with filtration alone?
A. Chemical pretreatment C. Fast rinse
B. Reconditioning cycle D. None of the above

164. Water treatment systems use settling tanks unit to allow for_____.
A. Gravity C. Settling time
B. Particle(s) D. Sedimentation and settling

165. The main aim of tube settlers is to minimize the _____that a small floc particle must settle before agglomerating into larger particles.
A. Gravity C. Settling time
B. Vertical distance D. Solids

166. 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

167. 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

168. Tube settler collects solids into a compact mass and slides it down the tube channel. When using tube settlers water flow is upward through the tubes and the solids slide down against the current using _____.
A. Gravity C. Settling time
B. Pressure D. Filters

169. Tube settler design involves the use of _____ at an angle of 60 degrees and adjacent to each other. This helps in increasing the settling area effectively.
A. Weirs C. Multiple tubular channels sloping
B. Uptakes D. Filters

Conventional Water Treatment Process Introduction
170._____or slow-sand filtration
A. Disinfection C. Pre-treatment
B. Coagulation D. Coagulation or flocculation

171. _____ for algae control and arresting biological growth
A. Sodium hydroxide C. Pre-treatment
B. UV D. Ferric Chloride

172. _____ 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

173. _____to remove particles from water either by passage through a sand bed that can be washed and reused or by passage through a purpose- designed filter that is washable.
A. Disinfection C. Pre-treatment
B. Coagulation D. Filtration

174. _____ for killing bacteria viruses and other pathogens.
A. Disinfection C. Pre-treatment
B. Coagulation D. Aeration along with pre-chlorination

175. 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

176. _____for settling and the removal of suspended solids trapped in the floc
A. Disinfection C. Pre-treatment
B. Coagulation D. Sedimentation

Treatment Design and Plant Operation
177. 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
178. EPA regulations direct that, for most water systems, the turbidity of water entering the distribution system must be equal or less than 0.5 ntu in at least 95 percent of the measurements taken each month. At no time may the turbidity exceed 5 ntu.
A. True B. False

179. 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

180. Turbidity is caused by particles suspended in water. These particles scatter or reflect light rays, making the water appear cloudy.
A. True B. False

181. 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

182. Besides the appearance of turbidity being unpleasant to customers, turbidity in water is significant from a public health standpoint because suspended particles could shelter microorganisms from the disinfectant and allow them to still be viable when they reach the customer.
A. True B. False

Zeta Potential Introduction
183. 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

184. 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

185. If two adjacent particles have sufficiently high zeta potentials of the same sign, they will agglomerate due to repulsive electrostatic forces between particles with unlike charges.
A. True B. False

Solubility of Substances in Water
186. 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

187. 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

188. Salts which are very soluble in water than this at room temperature are called highly soluble salts.
A. True B. False

Purpose of Coagulation
189. 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
190. The ability of particles to remain suspended in water is a function of hydrogen ion activity.
A. True B. False

Olation
191. 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
192. The Zeta Potential is reduced to zero in order for coagulation to occur, because the forces of attraction are predominant.
A. True B. False

Aluminum Sulfate (Alum)
193. 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

194. Once in water, alum can react with hydroxides, carbonates, bicarbonates, and other anions to form _____.
A. pH C. Large, positively charged molecules
B. Alkalinity D. None of the above

195. 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

196. 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

197. 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

198. When the pH level of the water is above 7.8 after the addition of the alum, the aluminum ions again become soluble, and the efficiency of coagulation is decreased. Under these conditions, aluminum ions again penetrate the filters, and _____can occur in the clear well and in the distribution system in some cases.
A. Post filtration alum coagulation C. Byproducts of these reactions
B. Olation reaction(s) D. None of the above

Ferric Chloride (Ferric)
199. 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
200. 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

201. Whenever possible, coagulation should be conducted in_____ . When this is not done, lower coagulation efficiency results, generally resulting in a waste of chemicals and a lowered water quality.
A. The optimum pH zone C. Collision between the colloids
B. The coagulation process D. None of the above

202. Each of the inorganic salt coagulants has its own characteristic _____ pH range.
A. Improper C. Little or no effect
B. Optimum D. None of the above

203. 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

204. 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
205. 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

206. Generally, mono and divalent cations such as sodium, calcium, and magnesium have _____ on the coagulation process.
A. Improper C. Little or no effect
B. Optimum D. None of the above

207. Trivalent cations do not have an adverse effect on the process in most instances. In fact, significant concentrations of naturally occurring iron in a water supply has resulted in the ability to feed _____dosages of inorganic salt coagulants.
A. Improper C. Lower than normal
B. Optimum D. None of the above

Nature of Turbidity
208. 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

209. Conversely, low turbidity waters can be very difficult to coagulate due to the difficulty in inducing _____. In this instance, floc formation is poor, and much of the turbidity is carried directly to the filters.
A. All chemical reactions C. Collision between the colloids
B. The coagulation process D. None of the above

210. 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
211. 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 C. Slowly
B. Higher D. None of the above

Mixing Effects
212. 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
213. 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
214. 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 C. Lead and cadmium
B. Lead and copper D. None of the above

Cathodic Protection
Sacrificial Anode Systems
215. 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

216. Sacrificial anodes can be attached to the existing piping system or coated steel for a pre-engineered cathodic protection system. An asphalt coating is not considered a suitable dielectric coating.
A. True B. False

Coagulation and Flocculation Summary
Rapid Sand Filtration
217. Which terms is the most prevalent form of water treatment technology in use today?
A. Conventional technology C. Rapid Sand filtration
B. Sedimentation process D. None of the above

218. Rapid Sand filtration process employs a combination of _____in order to achieve maximum effectiveness.
A. Filtration C. Physical and chemical processes
B. Sedimentation process D. None of the above

Coagulation
219. 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

220. The alum and the water are mixed rapidly by the?
A. Cationic polymers C. Shaker
B. Flash mixer D. None of the above

221. What is the process of joining together particles in water to help remove organic matter called?
A. Cationic binding C. Flocculation
B. Coagulation D. None of the above

222. 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

223. Which of the following terms are required since colloidal particles by themselves have the tendency to stay suspended in water and not settle out?
A. Sedimentation chemicals C. Flocculation chemicals
B. Coagulant chemicals D. None of the above

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

225. Which of the following terms can be thought of as positively charged strings that attract the particles to them, and in the process, form a larger particle?
A. Cationic polymers C. Lime
B. Coagulation helpers D. None of the above

226. Which of the following is the most widely used coagulant in water treatment?
A. Cationic polymers C. Aluminum Sulfate
B. Salts D. None of the above

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

228. Flocculation is the process where the suspended particles can collide, _____, and form heavier particles called “floc”.
A. Equalization C. Destabilized or coagulated particles
B. Agglomerate D. None of the above

229. Gentle _____ and appropriate detention times (the length of time water remains in the basin) help facilitate the flocculation process.
A. Equalizing C. Settling
B. Agitation of the water D. None of the above

230. Inside the contact chambers, water is slowly mixed allowing the coagulated particles, called "floc," and the particles become larger and stronger.
A. True B. False

231. Which of the following happens in the water when bacteria and other microorganisms are caught in the floc structure?
A. Equalize the basin C. Agitate the water
B. Floc particles mix D. None of the above

Pre-Sedimentation
232. 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
233. Sedimentation is the process of destabilizing coagulated particles in water.
A. True B. False

234. 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
235. The filter flow rate will vary with?
A. Head loss C. Effluent control
B. Uniform media D. None of the above

236. Declining Rate Filters system often requires _____ to provide adequate media submergence.
A. Head loss C. Effluent control structure
B. Uniform media D. None of the above

Detention Time
237. 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
238. Chlorine kills or “inactivates” harmful microorganisms in water.
A. True B. False

239. Chlorine is added again after filtration for?
A. Residual C. Post-disinfection
B. Contact time D. None of the above

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

pH
241. 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

242. According to the text, which of the following has a pH between 6.0 and 8.5?
A. Acids C. Natural water
B. Disinfectants D. None of the above

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

Polymer
244. 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
245. The operator should make sure that the chlorinated water holds a residual in the distribution system.
A. True B. False

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

Hydrofluosilicic Acid
247. 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
248. 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
249. Water quality testing needs to be conducted throughout the water treatment process.
A. True B. False

250. Water quality testing procedures should analyze turbidity, pH, and chlorine residual continuously.
A. True B. False

251. Some water quality items are tested several times per day, some once per quarter and others once per year.
A. True B. False

Chemical Feed and Rapid Mix
252. To improve the subsequent treatment processes, chemicals may be added to the water, and may include pH adjusters and coagulants.
A. True B. False

253. 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
254. Short-Circuiting is a condition that occurs in tanks or basins when some of the water travels faster than the rest of the flowing water.
A. True B. False

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

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

257. The slope of the tube settlers facilitates gravity settling of the solids to the bottom of the basin, where they can be?
A. Adjusted for detention times C. Collected and removed
B. Modified D. None of the above

258. The large surface settling area also means that adequate clarification can be obtained with detention times of 45 minutes or more.
A. True B. False

Adsorption Clarifiers
259. In the sedimentation/clarification process, turbidity is _____ of the coagulated and flocculated solids.
A. Increased by adsorption C. Decreased by adsorption
B. Reduced by adsorption D. None of the above

260. Water scouring cleans adsorption clarifiers followed by air flushing is a must.
A. True B. False

261. Cleaning of the clarifier is initiated less often than filter backwashing because the clarifier removes less solids.
A. True B. False

262. 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
263. The clearwell provides temporary storage for the treated water, which is the final step in the conventional treatment process.
A. True B. False

Sampling
264. 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
265. 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
266. For a filter which of the following should be conducted on a routine basis, at least once per day?
A. Filtration process performance C. Post-disinfection performance
B. Effluent control measurement D. None of the above

267. The rapid sand filter or rapid gravity filter is a type of filter used in water purification and is commonly used in municipal drinking water facilities as part of a _____.
A. Rapid gravity filter(s) C. Multiple-stage treatment system(s)
B. Rapid sand filter(s) D. None of the above

EPA Filter Backwash Rule- Introduction
268. 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

Background
269. If finished water supplies contain microbiological contaminants, disease outbreaks may result. Disease symptoms may include diarrhea, cramps, nausea, possibly jaundice, headaches and fatigue.
A. True B. False

270. The EPA has set enforceable drinking water treatment requirements to reduce the risk of waterborne disease outbreaks. Treatment technologies such as filtration and disinfection remove or inactivate microbiological contaminants.
A. True B. False

LT1FBR Required
271. 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
272. 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
273. Public water systems will be required to develop a(n) _____unless they perform applicability monitoring which demonstrates their disinfection byproduct levels are less than 80% of the maximum contaminant levels.
A. Disinfection profile C. Disinfection benchmark
B. Direct filtration system D. None of the above

274. Which of the following recycling to the treatment process must provide detailed recycle treatment information to the State, which may require that modifications to the recycle practice be made?
A. Recycle systems C. Direct filtration systems
B. Conventional systems D. None of the above

Filtration Process- Detailed
275. 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

276. Groundwater that has been softened or treated through iron and manganese removal will require filtration to remove floc created by?
A. Suspended solids by filtration C. Coagulation or oxidation processes
B. Serious problems in filter operation D. None of the above

277. According to the text, since surface water sources are subject to run-off and do not undergo natural filtration, it must be filtered to?
A. Remove particles and impurities
B. Filtration process can be compared to a sieve or microstrainer
C. Suspended particles can easily pass
D. None of the above

278. Which of the following traps suspended material between the grains of filter media?
A. Remove particles and impurities
B. Filtration process can be compared to a sieve or microstrainer
C. Suspended particles can easily pass
D. None of the above

279. Which of the following will easily pass through the spaces between the grains of the filter media, making straining the least important process in filtration?
A. Remove particles and impurities
B. Filtration process can be compared to a sieve or microstrainer
C. Suspended particles can easily pass
D. None of the above

280. Adsorption is the process of particles sticking onto the surface of the individual filter grains or onto the previously deposited materials. The forces that attract and hold the particles to the grains are the same as those that work in _____.
A. Coagulation and flocculation C. Flocculation
B. Filter operation D. None of the above

281. Which of the following may occur in the filter bed will happen especially if coagulation and flocculation of the water before filtration was not properly controlled?
A. Coagulation and flocculation C. Flocculation
B. Filter operation D. None of the above

Direct Filtration Plant vs. Conventional Plant
282. The primary difference between Direct Filtration Plant vs. Conventional Plant is that the _____or step is omitted from the Direct Filtration plant.
A. Sedimentation process C. Fast rinse
B. Reconditioning cycle D. None of the above

Types of Filters
283. The oldest water filters developed were the slow sand filters, these have filter rates of around 0.05 gpm/ft^2 of surface area. This type of filter requires large filter areas.
A. True B. False

284. What is the term for the mass of growing material that collects on the surface of the filter?
A. Schmutzdecke C. Mud balls
B. Zoological growth D. None of the above

285. Most water filters are classified by filtration rate, type of _____, or type of operation.
A. Schmutzdecke C. Filter media
B. Backwash capabilities D. None of the above

Rapid Sand Filters
286. Rapid sand filters can accommodate filter rates 40 times more than?
A. Fixed film C. Mixed media
B. Slow sand filters D. None of the above

287. Filters in large water treatment plants are usually constructed next to each other in a row, allowing the piping from the Sedimentation basins to feed the filters from a central pipe gallery.
A. True B. False

Filter Sand
288. The filter sand used in rapid sand filters is normally play sand.
A. True B. False

289. In a filter the gravel supports the filter sand and is usually graded in three to five layers, each generally 6-18 inches in thickness, depending on the type of underdrain used.
A. True B. False

290. Which of the following will contain 24-30 inches of sand, but some newer filters are deeper?
A. Rapid sand filters C. Sedimentation basins
B. Slow rate filters D. None of the above

291. The coarser sand in the _____ has larger voids that do not fill as easily.
A. Rapid filters C. Sedimentation basin
B. Backwash trough D. None of the above

False floor
292. The false floor design of a _____ is used together with a porous plate design or with screens that retain the sand when there is no undergravel layer.
A. Backwash system C. Filter underdrain
B. Leopold system D. None of the above

Filtration Processes
293. 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

294. Conventional filtration success is due partially to the high quality raw water that precedes filtration steps.
A. True B. False

295. Many treatment plants have converted rapid sand filters in to multi-media filters in an attempt to?
A. Control raw-water turbidity C. Increase plant capacity
B. Lower capital cost D. None of the above

296. Direct filtration = no sedimentation follows the coagulation phase.
A. True B. False

297. According to the text, dual and multi-media filters are often used with Conventional Filtration.
A. True B. False

298. One of the benefits of this method is that it has a lower capital cost, but this method or process cannot handle large variations in raw water turbidity.
A. Direct Filtration C. Flocculation
B. Sand Filtration D. None of the above

High Rate Filters
299. High rate filters, which operate at a rate up to ten times that of a rapid sand filter.
A. True B. False

300. Multi-media or mixed-media filters use three or four different materials, sand, anthracite coal, and garnet.
A. True B. False

301. 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

302. The filter bed material forms layers in the filter, depending on their weight and specific gravities.
A. True B. False

Pressure Sand Filters
303. Filtration rates are twice as good as gravity filters.
A. True B. False

304. Which of the following terms or methods cracking of the filter bed can occur quite easily, allowing the iron and manganese particles to go straight through the filter?
A. Slow sand/RO C. Pressure filters
B. Gravity filters D. None of the above

305. Which of the following filtration types is contained under pressure in a steel tank?
A. Slow sand/RO C. Pressure sand filter
B. Gravity filters D. None of the above

306. In which of the following filtration types is the media usually sand or a combination of media?
A. Slow sand/RO C. Fast sand
B. Gravity filters D. None of the above

307. Which of the following filter types has a major disadvantage in that the backwash cannot be observed?
A. Slow sand/RO C. Pressure filters
B. Gravity filters D. None of the above

308. 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

309. Which of the following is a low-pressure membrane filtration process that removes suspended solids and colloids generally larger than 0.1-micron diameter?
A. Nanofiltration C. Semi-permeable
B. Microfiltration D. None of the above

310. Which of the following is a relatively recent membrane process used most often with low total dissolved solids water such as surface water and fresh groundwater?
A. Nanofiltration C. Semi-permeable
B. Microfiltration D. None of the above

Declining Rate
311. According to the text, which of the following methods of control is used where the largest head loss occurs in the filtration process?
A. Declining Rate C. Fast sand
B. Gravity filters D. None of the above

312. The rate through the declining filter is much greater in the beginning of a filter run than at the end when the?
A. Filter run C. Head loss is low
B. Filter is dirty D. None of the above

313. 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
314. 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

315. Which of the following should be continuously measured to help determine when the filter should be backwashed?
A. Filter run C. Head loss
B. Force D. None of the above

316. Which of the following is measured in the difference by a piezometer connected to the filter above the media and the effluent line?
A. Filter flow C. Head
B. Force D. None of the above

In-line Turbidimeter
317. 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
318. A rapid sand filter will have a flow of two-to-three gpm/square foot of filter area. The high rate filter may have four-to-six gpm/square foot applied to the surface.
A. True B. False

319. Water from the source or, more commonly, from pre-treatment processes is applied to the top of the filter; it then flows downward. The water level above the filter bed is usually kept at two-to-six feet.
A. True B. False

Back Washing
320. During filter backwash, the media expands upwards and around the washing arms.
A. True B. False

321. Which of the following terms needs two-to-five cubic feet of air per square foot of filter area?
A. Air washing C. Backwash cycle
B. Air scour D. None of the above

322. Which of the following if it is to high that the filter will no longer produce water at the desired rate?
A. Air washing C. Backwash rate
B. Air scour D. None of the above

323. Long filter runs can cause the filter media to pack down so that it is difficult to _____ during the backwash.
A. Control headloss C. Expand the bed
B. Control floc(s) D. None of the above

Backwashing Process
324. 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

325. The backwash valve is opened, allowing backwash water to start flowing into the filter and start carrying _____away from the filter.
A. Headloss C. Suspended material
B. Crust on the filter D. None of the above

326. When the surface wash is turned on it should be allowed to operate for several minutes to break up the ?
A. Headloss C. Suspended material away from the filter
B. Crust on the filter D. None of the above

327. The time elapsed from when the filter wash is started until full flow is applied to the filter should be greater than one minute.
A. True B. False

328. According to the text, with a multi-media filter, the rate must be high enough to scrub the interface between the coal and the sand, where the highest amount of suspended solids will be removed from the media.
A. True B. False

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

330. The supernatant is then pumped back to the head of the treatment plant at a rate not exceeding ten percent of the?
A. Daily flow C. Raw water flow entering the plant
B. Backwash water D. None of the above

331. According to the text, the spent backwash water must be stored in storage tanks and returned slowly to the treatment process.
A. True B. False

Filter to Waste
332. When filtration is started after backwash, suspended material remains in the filter media until the turbidity in the effluent meets standards. Depending on the type of filter, this may last from 20-40 minutes.
A. True B. False

333. Wasting is needed as some _____following the backwash.
A. Daily flow C. Suspended material remains in the filter media
B. Backwash water D. None of the above

334. 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
335. 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

336. Which of the following terms expresses that the polymer strengthens the bonds and prevents the shearing forces in the filter from breaking the floc apart when used?
A. Filter media C. Filter aid
B. Lime D. None of the above

Filter Operating Problems
337. According to the text, there are three major types of filter problems. They can be caused by chemical treatment before the filter, _____, and backwashing of filters.
A. Filter aid C. Coagulation and flocculation stages
B. Control of filter flow rate D. None of the above

Chemical Treatment before the Filter
338. Which of the following terms of the water treatment must be monitored continuously?
A. Filter aid C. Coagulation and flocculation stages
B. Backwash storage basin D. None of the above

339. Adjustments in the amount of coagulant added must be made as necessary to prevent the filter from becoming overloaded, this may cause the filter to prematurely reach its?
A. Maximum headloss C. Turbidity breakthrough
B. Control of filter flow rate D. None of the above

Control of Filter Flow Rate
340. When a filter is subjected to rapid changes in flow rate, the turbidity of the effluent will not be affected; the dirtier the coagulation and flocculation stages, the greater the effect.
A. True B. False

341. When backwashing a filter and therefore temporarily taking it out of service, the remaining filter(s) must pick up the additional flow, this can cause a change in flow that might cause?
A. Turbidity breakthrough C. Coagulation and flocculation stages
B. Filter media breakthrough D. None of the above

342. 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

343. The filters should be backwashed before putting them back into operation or operated to waste until the _____ meets the standards.
A. Basin water C. Coagulation
B. Effluent D. None of the above

Advanced Water Treatment Section

344. Water contains _____ of which impart a quality known as hardness?
A. TDS C. Various amounts of dissolved minerals
B. Conductivity D. None of the above

345. The precipitation process is generally known as the?
A. Softening C. Lime process or lime soda process
B. Chemical pretreating D. None of the above

346. Which of the following can be accomplished using membrane technology, electrodialysis, distillation, and freezing. Of these, the membrane methods seem to have the greatest use potential.
A. Alkalinity C. Softening
B. Precipitation D. None of the above

Occurrence of Hard Water

347. Which of the following is caused by soluble, divalent, metallic cations, (positive ions having valence of 2)?
A. Hard water C. Carbonate hardness
B. Permanent hardness D. None of the above

348. Water hardness varies considerably and is due to different geologic formations, and is also a function of the contact time between water and?
A. Low pH C. Limestone deposits
B. Carbonate-noncarbonate D. None of the above

349. Magnesium is dissolved as water passes over and through _____and other magnesium-bearing minerals.
A. Hardness ions C. Dolomite
B. Calcium and magnesium D. None of the above

Types of Hardness

350. Hardness can be categorized by either of two methods: calcium versus magnesium hardness and?
A. Carbonate hardness C. Carbonate versus non-carbonate hardness
B. Temporary hardness D. None of the above

351. Which of the following is caused by magnesium is called magnesium hardness?
A. Hardness C. Carbonate hardness
B. Permanent hardness D. None of the above

Carbonate-Noncarbonate Distinction

352. According to the text, the carbonate-noncarbonate distinction, is based on hardness from either the bicarbonate salts of calcium or the _____involved in causing water hardness.
A. $CaCO_3$ C. Normal salts of calcium and magnesium
B. Water hardness D. None of the above

Water Laboratory Analysis Section
pH Testing Section

353. 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

354. 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

355. Pure water has a pH very close to?
A. 7 C. 7.7
B. 7.5 D. None of the above

356. _____ are determined using a concentration cell with transference, by measuring the potential difference between a hydrogen electrode and a standard electrode such as the silver chloride electrode.
A. Primary pH standard values C. pH measurement(s)
B. Alkalinity D. None of the above

357. Mathematically, pH is the negative logarithm of the activity of the (solvated) hydronium ion, more often expressed as the measure of the?
A. Electron concentration C. Hydronium ion concentration
B. Alkalinity concentration D. None of the above

358. Which of the following terms for aqueous solutions can be done with a glass electrode and a pH meter, or using indicators?
A. Primary sampling C. Determining values
B. Measurement of pH D. None of the above

Disinfection Section
Chlorine's Appearance and Odor
359. Chlorine is a greenish-yellow gas it will condense to an amber liquid at approximately _____F or at high pressures.
A. -29.2 degrees C. 29 degrees
B. – 100 degrees D. None of the above

360. Prolonged exposures to chlorine gas may result in?
A. Moisture, steam, and water C. Olfactory fatigue
B. Odor thresholds D. None of the above

Chlorine Gas
Pathophysiology
361. As far as chlorine safety and respiratory protection, the intermediate _____of chlorine accounts for its effect on the upper airway and the lower respiratory tract.
A. Effects of Hydrochloric acid C. Water solubility
B. Vapor from Chlorine gas D. None of the Above

Early Response to Chlorine Gas
362. If you mix ammonia with chlorine gas, this compound reacts to form_____.
A. Chloramine gas C. Sulfuric gas
B. Chlorine gas D. None of the Above

Reactivity
363. Cylinders of chlorine may burst when exposed to elevated temperatures. When there is Chlorine in solution, this forms?
A. Hydrogen sulfide C. A corrosive material
B. Oxomonosilane D. None of the above

364. What is formed when chlorine is in contact with combustible substances (such as gasoline and petroleum products, hydrocarbons, turpentine, alcohols, acetylene, hydrogen, ammonia, and sulfur), reducing agents, and finely divided metals?
A. Fires and explosions C. Moisture, steam, and water
B. Odor thresholds D. None of the above

365. Contact between chlorine and arsenic, bismuth, boron, calcium, activated carbon, carbon disulfide, glycerol, hydrazine, iodine, methane, oxomonosilane, potassium, propylene, and silicon should be avoided.
A. True B. False

366. Chlorine reacts with hydrogen sulfide and water to form this substance?
A. Hydrogen sulfide C. Chlorinates
B. Hydrochloric acid D. None of the above

367. According to the text, chlorine is also incompatible with?
A. Air C. Hydrogen sulfide
B. Moisture, steam, and water D. None of the above

Flammability
368. When there is a fire that involves Chlorine, the firefight should be fought downwind from the minimum distance possible.
A. True B. False

Chlorination Chemistry
369. The hypochlorite ion is a much weaker disinfecting agent than Hypochlorous acid, about 100 times less effective.
A. True B. False

Chlorine DDBP
370. These term means that chlorine is present as Cl, HOCl, and OCl^- is called _____, and that which is bound but still effective is _____.
A. Free available chlorine and Total
B. Free and Residual
C. Free available chlorine and Combined Chlorine
D. None of the above

Ozone
371. When determining Ozone CT (contact time) values must be determined for the ozone basin alone; an accurate _____ must be obtained for the contact chamber, and residual levels.
A. Residual C. Contact time
B. T10 value D. None of the above

Pump and Motor Section
Common Hydraulic Terms
372. Which of the following definitions is the engineering science pertaining to liquid pressure and flow?
A. Hydraulics C. Hydrokinetics
B. Hydrology D. None of the above

373. Which of the following definitions is the pressure exported by the atmosphere at any specific location?
A. Pressure, Atmospheric C. Pressure, Gauge
B. Pressure, Static D. None of the above

374. Which of the following definitions is pressure above zero absolute, i.e. the sum of atmospheric and gauge pressure?
A. Pressure, Atmospheric C. Pressure, Gauge
B. Pressure, Static D. None of the above

375. Which of the following definitions is the force per unit area, usually expressed in pounds per square inch?
A. Pressure, Absolute C. Pressure, Gauge
B. Pressure D. None of the above

376. Which of the following definitions is the pressure differential above or below ambient atmospheric pressure?
A. Pressure, Absolute C. Pressure, Gauge
B. Pressure D. None of the above

377. Which of the following definitions is height of a column or body of fluid above a given point expressed in linear units?
A. Head, Friction C. Head
B. Head, Static D. None of the above

378. Which of the following definitions is required to overcome the friction at the interior surface of a conductor and between fluid particles in motion?
A. Head, Friction C. Head
B. Head, Static D. None of the above

379. Which of the following definitions is the pressure in a fluid at rest?
A. Head, Friction C. Head
B. Pressure, Static D. None of the above

380. Which of the following definitions is the height of a column or body of fluid above a given point?
A. Head, Friction C. Head
B. Head, Static D. None of the above

General Pumping Fundamentals

381. Here are the important points to consider about suction piping when the liquid being pumped is below the level of the pump: Sometimes suction lift is also referred to as ‘positive suction head’.
A. True B. False

382. According to the text, suction lift is when the level of water to be pumped is below the?
A. Impeller C. Centerline of the pump
B. Suction D. None of the above

383. The suction side of pipe should be one diameter smaller than the pump inlet.
A. True B. False

384. The required eccentric reducer should be turned so that the top is flat and the bottom tapered.
A. True B. False

Pumps
385. Pumps are excellent examples of?
A. Hydrostatics C. Multi-stage pumps
B. Quasi-static devices D. None of the above

Pump Categories
386. The key to understanding a pump's operation is that a pump is to move water and generate the _____ we call pressure.
A. Delivery force C. Diaphragm pressure
B. Impeller force D. None of the above

387. With a centrifugal pump, the pressure is not referred to in pounds per square inch but rather as the equivalent in elevation_____.
A. Inward force C. Delivery force
B. Head D. None of the above

388. According to the text, pumps may be classified based on the application they serve.
A. True B. False

Basic Water Pump
389. The centrifugal pumps work by spinning water around in a circle inside a?
A. Vortex C. Cylindrical pump housing
B. Cylinder D. None of the above

390. As the water slows down and its kinetic energy decreases, that water's pressure potential energy increases.
A. True B. False

391. As the water spins, the pressure near the outer edge of the pump housing becomes much lower than near the center of the impeller.
A. True B. False

392. The impeller blades cause the water to move faster and faster.
A. True B. False

393. The impellers may be of either a semi-open or closed type.
A. True B. False

Types of Water Pumps
394. The water production well industry almost exclusively uses Turbine pumps, which are a type of centrifugal pump.
A. True B. False

395. The most common type of water pumps used for municipal and domestic water supplies are?
A. Axial flow C. Rotary pumps
B. Variable displacement pumps D. None of the above

396. The shaft turns the impellers within the pump housing while the?
A. Desired pumping rate is obtained C. Water moves up the column
B. Horsepower turns the shaft D. None of the above

397. According to the text, column pipe sections can be threaded or coupled together while the drive shaft is coupled and suspended within the column by?
A. Column pipe C. Lantern ring
B. Spider bearings D. None of the above

398. The water passing through the column pipe serves as the lubricant for the bearings.
A. True B. False

399. Which of the following provide both a seal at the column pipe joints and keep the shaft aligned within the column?
A. Column pipe C. Lantern ring
B. Spider bearings D. None of the above

400. Careful operation of oil-lubricated turbines is needed to ensure that the pumping levels do not drop enough to allow oil to enter the pump.
A. True B. False

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.

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