Registration form

WATER TREATMENT PRIMER 1 $100.00
48 HOUR RUSH ORDER PROCESSING FEE ADDITIONAL $50.00

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

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

Name_____Signature_____
I have read and understood the disclaimer notice on page 2. Digitally sign XXX

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Operator ID #_____Exp. Date_____

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

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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.

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

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

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

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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.

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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 Primer 1 Answer Key **Name**_____

Phone _____

Did you check with your State agency to ensure this course is accepted for credit?
No refunds.
You are responsible to ensure this course is accepted for credit.
Method of Course acceptance confirmation. Please fill this section

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You can electronically complete this assignment in Adobe Acrobat DC.

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

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149. A B
150. A B

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

WATER TREATMENT PRIMER 1 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.

_____

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Please write down any question you may had problems with here.

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
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Rush Grading Service
If you need this assignment graded and the results mailed to you within a 48-hour period, prepare to pay an additional rush service handling fee of $50.00.

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

Water Treatment Primer 1 CEU Training Course Assignment

The Water Treatment Primer 1 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 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 where people do not remain for long periods of time (for example: gas stations, campgrounds).
A. TNCWS C. NTNCWSs
B. CWSs D. None of the above

4. Provides water to the same population year-round for example: homes, apartment buildings.
A. TNCWS C. NTNCWSs
B. CWSs D. None of the above

5. Approximately 18,000 water systems.
A. TNCWS C. NTNCWSs
B. CWSs D. None of the above

6. 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
7. 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

8. 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

9. 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
10. _____ 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

11. Raw water generally contains varying amounts of dissolved minerals including calcium, magnesium, sodium, chlorides, sulfates and bicarbonates, depending on its source.
A. True B. False

12. 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

13. 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
14. 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

15. Depending on the region, some lakes and rivers receive _____ from sewer facilities or defective septic tanks.
A. Excess nutrients C. Discharge
B. Biological actions D. None of the above

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

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

17. 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

18. 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

19. Algae growth is supplied by the energy of the sun. As algae absorbs this energy, it converts carbon dioxide to oxygen. Algae and rooted aquatic plants are essential in the food chain of fish and birds. Algae growth is the result of photosynthesis.
A. True B. False

20. The absence of dissolved oxygen in water is known as aerobic conditions.
A. True B. False

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

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

23. 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

24. 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

25. 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

26. 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

27. 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

28. 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

29. _____ 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

30. 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

31. Alkalinity is substantial in many uses and treatments of natural waters and wastewaters. Because the alkalinity of many surface waters is primarily a function of carbonate, bicarbonate, and hydroxide content, it is taken as an indication of the concentration of these constituents. The measured values also may include contributions from borates, phosphates, silicates or other bases if these are present.

A. True B. False

32. _____ 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

33. Alkalinity measurements are used in the interpretation and control of water and wastewater treatment processes

A. True B. False

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

A. True B. False

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

35. 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^+)
B. Alkaline earth metal
C. An aggregate property of water
D. None of the above

Turbidity Introduction

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

37. High levels of turbidity may inhibit with proper water treatment and monitoring. If high quality raw water is low in turbidity, there will be a reduction in water treatment costs. Turbidity is unwanted because it causes health hazards.
A. True
B. False

38. 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
B. Manmade
C. Temperature
D. None of the above

39. When heavy rains transpire, runoff into streams, rivers, and reservoirs occurs, causing turbidity levels to increase. In most cases, the particle sizes are relatively large and settle relatively quickly in both the water treatment plant and the source of supply. However, in some instances, fine, colloidal material may be present in the supply, which may cause some difficulty in the coagulation process.
A. True
B. False

40. Generally, higher turbidity levels require higher coagulant dosages. However, seldom is the relationship between turbidity level and _____linear.
A. Coagulant dosage
B. Total Dissolved Solids (TDS)
C. Temperature
D. None of the above

41. 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
B. Colloids
C. Total Dissolved Solids (TDS)
D. None of the above

42. Low _____waters can be very difficult to coagulate due to the difficulty in inducing collision between the colloids.
A. Turbidity
B. Colloids
C. Total Dissolved Solids (TDS)
D. None of the above

43. _____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
B. Organic colloids
C. Total Dissolved Solids (TDS)
D. None of the above

Turbidity MCL

44. 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

45. 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

46. 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

47. 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

48. _____ 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

49. 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

50. 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

51. 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

52. The Environmental Protection Agency (EPA), which is responsible for drinking water regulations in the United States, has identified TDS as a secondary standard, meaning that it is a voluntary guideline. While the United States set legal standards for many harmful substances, TDS, along with other contaminants that cause aesthetic, cosmetic, and technical effects, has only a guideline.
A. True B. False

Langelier Saturation Index
53. 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

54. 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
55. 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

56. Safe Drinking Water Act (SDWA) has been highly effective in protecting public health and has evolved to respond to new and emerging threats to safe drinking water.
A. True B. False

57. 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

58. 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

59. 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

60. Which of the following rules will reduce potential cancer and reproductive and developmental health risks from disinfection byproducts?
A. Stage 1 DBPR C. Long Term 2 Enhanced Surface Water Rule
B. Stage 2 DBPR D. None of the above

What are Disinfection Byproducts (DBPs)?

61. 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

62. 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

Are THMs and HAAs the only disinfection byproducts?

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

A. True B. False

All disinfectants form DBPs in one of two reactions:

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

A. True B. False

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

A. True B. False

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

A. True B. False

Public Health Concerns

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

A. True B. False

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

A. True B. False

Disinfection Byproduct Research and Regulations Summary

69. _____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

70. 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

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

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

73. Generally, the best approach to reduce _____is to remove natural organic matter precursors prior to disinfection.
A. DBP(s) C. DBP formation
B. Turbidity (particle) D. None of the above

Coagulation and Clarification
74. 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 C. Natural organic matter
B. Inorganic coagulants D. None of the above

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

Absorption
76. 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
77. 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

78. 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

79. 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

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

Water Treatment Section - Preliminary Treatment Process
Preliminary Treatment
81. 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

82. 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
83. 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

84. Which of the following treatment terms is used after the flocculation process?
A. Filtration basin(s) C. Sedimentation basin(s)
B. Coagulation basin(s) D. None of the above

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

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

87. 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

88. Which of the following compounds combines with alkalinity in the raw water to form a white precipitate that neutralizes suspended particles' electrical charge?
A. Activated sodium C. Alum
B. PAC D. None of the above

89. 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

90. 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

91. 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

92. 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

93. 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

94. 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

95._____or slow-sand filtration
A. Disinfection C. Pre-treatment
B. Coagulation D. Coagulation or flocculation

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

97. _____ 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

98. _____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

Treatment Design and Plant Operation

99. 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

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

A. True B. False

101. 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

102. 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

103. 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

104. 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

105. 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

106. 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

107. 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

108. Salts which are very soluble in water than this at room temperature are called highly soluble salts.

A. True B. False

Purpose of Coagulation

109. 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

110. The ability of particles to remain suspended in water is a function of hydrogen ion activity.

A. True B. False

111. Turbidity particles can range in size from molecular to 50 microns (a tremendous range).

A. True B. False

112. Particles that are greater than one micron in diameter are considered silt, and settle out due to their relatively large size and density in a matter of days with the need to coagulation.

A. True B. False

Olation

113. 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

Aluminum Sulfate (Alum)

114. 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

115. 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

116. 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)

117. Ferric chloride is becoming more extensively used as a coagulant due partially to the fact that the material can be purchased as a liquid.

A. True B. False

118. 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
119. 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

120. 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

121. 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

Effects of Salts
122. 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

Nature of Turbidity
123. 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

124. 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

125. 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
126. 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

127. It can be difficult to evenly disperse the coagulants into the water. In addition, floc settling characteristics become poor due to the higher density of the water during near freezing temperatures. As a result, the coagulant process becomes less efficient, and higher coagulant dosages are generally used to compensate for these effects.
A. True B. False

Mixing Effects
128. Poor or inadequate mixing results in an uneven dispersion of the coagulant. Unfortunately, many older plants were designed with mixing facilities which 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

129. The effects of high turbidity and warm water temperatures can tend to aggravate the lack of adequate mixing facilities in some plants.
A. True B. False

Effect of the Coagulant
130. 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
131. 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

132. Corrosion also reduces the useful life of water distribution systems and can promote the growth of microorganisms, resulting in disagreeable tastes, odors, slimes and further corrosion. Because it is widespread and highly toxic, lead is the corrosion product of greatest concern.
A. True B. False

133. The EPA has banned the use of lead solders, fluxes and pipes in the installation or repair of any public water system. In the past, solder used in plumbing has been _____.
A. 60% lead and 40% tin C. 50% copper and 50% lead
B. 50% tin and 50% lead D. None of the above

134. Using lead-free solders, such as _____is a key factor in lead corrosion control.
A. 20% lead and 80% tin C. Lead and cadmium
B. Silver-tin and antimony-tin D. None of the above

Coagulation and Flocculation Summary
Rapid Sand Filtration
135. 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

136. Rapid Sand filtration process employs a combination of _____in order to achieve maximum effectiveness.

A. Filtration
B. Sedimentation process
C. Physical and chemical processes
D. None of the above

Coagulation

137. 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

138. 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
B. Coagulant chemicals
C. Flocculation chemicals
D. None of the above

139. Which of the following terms are so small, their charge per volume is significant?

A. Aluminum Sulfate molecules
B. Coagulant chemicals
C. Colloidal particles
D. None of the above

Flocculation

140. 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

141. Flocculation is the process where the suspended particles can collide, _____, and form heavier particles called “floc”.

A. Equalization
B. Agglomerate
C. Destabilized or coagulated particles
D. None of the above

Pre-Sedimentation

142. 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
B. Particles time to settle
C. Floc particles mix
D. None of the above

Sedimentation

143. Sedimentation is the process of destabilizing coagulated particles in water.

A. True B. False

Water Filtration Key Terms

Declining Rate Filters

144. The filter flow rate will vary with?

A. Head loss
B. Uniform media
C. Effluent control
D. None of the above

Detention Time

145. 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
146. Chlorine kills or “inactivates” harmful microorganisms in water.
A. True B. False

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

pH
148. 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
149. A strong chemical - NaOH is used in the treatment process to neutralize acidity, and to lower the pH value.
A. True B. False

Polymer
150. 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

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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