Registration form

Wastewater Treatment Water Quality Training Course $250.00
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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Please circle/check which certification you are applying the course CEU's.

Wastewater Treatment_____ Other _____

Your certificate will be emailed to you in about two weeks.

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

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

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

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

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

Do not solely depend on TLC's Approval list for it may be outdated.

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Some States and many employers require the final exam to be proctored.
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Wastewater Treatment WQ CEU Course Answer Key

Name*_____*Telephone # _____

You are solely responsible that this course is accepted for credit by your State. Did you check with your State agency to ensure this course is accepted for credit?

Method of Course acceptance confirmation. Please fill this section

Website __ Telephone Call___ Email____ Spoke to_____
Do not solely depend on TLC's Approval list for it may be outdated. <u>No refunds.</u>

What is the course approval number, if applicable? _____

PA DEP Students are required to complete the original version of the text. _____
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Please circle, underline, bold or X only one correct answer

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

Please fax the answer key to TLC
(928) 272-0747
Always call to confirm that we received your paperwork.

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

WASTEWATER TREATMENT WATER QUALITY
CEU TRAINING COURSE
CUSTOMER SERVICE RESPONSE CARD

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

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

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.
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Wastewater Treatment Water Quality
CEU Course Assignment

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

We would prefer that you utilize the enclosed answer sheet in the front, but if you are unable to do so, type out your own answer key. Please include your name and address on your answer sheet and make copy for yourself.

Multiple Choice, please select only <u>one answer</u> per question. There are no intentional trick questions.

Basic Wastewater Treatment Processes

1. In wastewater treatment, particles with which of the following terms, float to the top of water and can also be removed?

A. Biosolid(s)
B. Activated Sludge
C. Chemical(s)
D. Organic material
E. Entrapped air
F. None of the Above

2. Wastewater treatment levels beyond secondary treatment are referred to as _____.

A. Thirdary
B. Finished
C. Gravity
D. Advanced Treatment
E. Physical separation step
F. None of the Above

3. Bacteria and other small organisms in water consume organic matter in sewage, turning it into new bacterial cells, _____, and other by-products.

A. Oxygen
B. Carbon dioxide
C. Gravity
D. Secondary treatment
E. Physical separation step
F. None of the Above

4. In the 1920s, scientists figured out how to contain and accelerate _____ to remove organic material from wastewater.

A. These natural biological processes
B. Activated sludge
C. Chemical(s)
D. Organic material
E. Entrapped air
F. None of the Above

5. Masses of microorganisms grow and rapidly metabolized organic pollutants because of the addition of _____ to wastewater.

A. Oxygen
B. Carbon dioxide
C. Gravity
D. Secondary treatment
E. Physical separation step
F. None of the Above

6. Alum, lime, or iron salts are _____ that can be added to wastewater to cause certain pollutants to floc or bunch together. The resulting large, heavier masses can be removed faster through physical processes.

A. Biosolid(s)
B. Activated Sludge
C. Simple chemicals
D. Organic materials
E. Entrapped air
F. None of the Above

7. Polymers are _____ that have been developed to further improve the physical separation step in wastewater treatment.

A. Biosolids
B. Activated crystals
C. Simple chemicals
D. Organic materials
E. Synthetic inert chemicals
F. None of the Above

8. _____ are added to improve the settling of excess microbiological growth or biosolids in the later stages of treatment.

A. Biosolid(s)
B. Activated Sludge
C. Chemical(s)
D. Organic material
E. Polymers
F. None of the Above

9. Chemicals can be added to change pollutants into new forms that can be removed by physical processes.

A. True B. False

Organic Matter

10. _____, such as proteins, carbohydrates, or fats, can cause pollution of receiving waters.

A. Long chained compounds
B. Organics
C. Inorganic materials
D. Wastewater-related sources
E. Oxygen compounds
F. None of the Above

11. Organisms use dissolved oxygen in the water to break down biodegradable materials. This process is dangerous to aquatic life because the _____ in the water is reduced or depleted.

A. Sediment
B. Supply of oxygen
C. Hydrogen
D. Graywater and blackwater
E. Nitrogen
F. None of the Above

12. The _____ of wastewater is the amount of oxygen that organisms need to break down the biodegradable materials in the wastewater.

A. Biochemical oxygen demand (**BOD**)
B. Biodegradable material(s)
C. Organic material(s)
D. Smell
E. Oxygen
F. None of the Above

13. Many _____ used by agriculture and industries cannot be quickly broken down by organisms, making treatment more difficult.

A. Inorganic substances
B. Organic materials
C. Organic compounds
D. Graywater and blackwater
E. Synthetic organic compounds
F. None of the Above

14. Certain synthetic organics, such as _____, are toxic to humans, fish, and aquatic plants.

A. BOD
B. Most inorganic substances
C. Nitrogen and phosphorus
D. Pesticides and herbicide(s)
E. Turbidtity
F. None of the Above

15. Solvents and pesticides contain toxic _____ such as benzene and toluene.

A. Nutrients from wastewater
B. Inorganic materials
C. Inorganic minerals
D. Excessive grease
E. Organic compounds
F. None of the Above

Oil and Grease

16. Fatty organic materials from animals, vegetables, and petroleum are quickly broken down by bacteria and therefore are not a source of pollution.

A. True B. False

17. _____ adds to the scum layer in a septic tank, which in turn requires that the tank be pumped more often.

A. Nutrients from wastewater
B. Inorganic materials
C. Inorganic minerals
D. Excessive grease
E. Nitrogen and phosphorus
F. None of the Above

18. Hazardous wastes such as _____ should be collected and disposed of separately from wastewater.

A. BOD
B. Most inorganic substances
C. Nitrogen and phosphorus
D. Pesticides and herbicide(s)
E. Petroleum-based waste oil(s)
F. None of the Above

19. The _____ of receiving waters is increased when large amounts of oils and greases are discharged from community systems.

A. BOD
B. Inorganic substances
C. Nitrogen and phosphorus
D. Bacteria
E. Petroleum-based waste oils
F. None of the Above

Inorganics

20. Organisms in wastewater cannot easily break down _____, since these substances are relatively stable.

A. Most organic substances
B. Most inorganic substances
C. Nitrogen and phosphorus
D. Pesticides and herbicides
E. Petroleum-based waste oils
F. None of the Above

21. The removal of _____ from industrial wastewater sources often requires additional treatment steps.

A. Nutrients from wastewater
B. Inorganic materials
C. Organic materials
D. BOD
E. DON
F. None of the Above

22. Heavy metals in industrial wastewater discharges are difficult to remove by conventional treatment methods.

A. True b. False

23. Residential and nonresidential sources both contribute inorganic minerals, metals, and compounds to wastewater.

A. True B. False

Nutrients

24. Normally, excessive nutrients in receiving waters cause algae and other plants to grow quickly adding oxygen in the water, because of this additional of oxygen, fish and other aquatic life thrive.

A. True B. False

25. _____ have also been linked to ocean "red tides" that poison fish and cause illness in humans.
A. Nutrients from wastewater
B. Inorganic materials
C. Inorganic minerals
D. Excessive grease
E. Nitrogen and phosphorus
F. None of the Above

26. _____ in drinking water may contribute to miscarriages and is the cause of a serious illness in infants called methemoglobinemia or "blue baby syndrome."
A. BOD
B. Most inorganic substances
C. Phosphorus
D. Pesticides and herbicide(s)
E. Nitrogen
F. None of the Above

27. According to the text, wastewater often contains large amounts of this term in the form of nitrate and phosphate, which promote plant growth.
A. Nutrients from wastewater
B. Inorganic materials
C. Inorganic minerals
D. Nutrients nitrogen and phosphorus
E. Nitrogen and phosphorus
F. None of the Above

28. Organisms only require small amounts of _____in biological treatment, so there normally is an excess available in treated wastewater.
A. BOD
B. Most inorganic substances
C. Nitrogen and phosphorus
D. Microorganisms
E. Nutrients
F. None of the Above

Solids

29. Settleable solids: Certain substances, such as sand, grit, and oxygen-demanding substances settle out from the rest of the wastewater stream during the preliminary stages of treatment.
A. True B. False

30. On the bottom of settling tanks and ponds, _____ makes up a biologically active layer of sludge that aids in treatment.
A. BOD
B. Organic material
C. The solids
D. Heavier organic and inorganic materials
E. Suspended solids in wastewater
F. None of the Above

31. _____must be treated, or they will clog soil absorption systems or reduce the effectiveness of disinfection systems?
A. BOD
B. Organic material
C. The solids
D. Microorganisms
E. Suspended solids in wastewater
F. None of the Above

32. _____represents small particles of certain wastewater materials can dissolve, like salt in water.
A. Suspended solids
B. Organic material
C. The solids
D. Microorganisms
E. Dissolved solids
F. None of the Above

33. Solid materials in wastewater can consist of this term and organisms.
A. BOD
B. Organic material
C. The solids
D. Microorganisms
E. Organic and/or inorganic materials
F. None of the Above

34. The solids must be reduced by treatment or they can increase _____w hen discharged to receiving waters.
A. Suspended solids D. Microorganisms
B. Organic material E. Dissolved solids
C. BOD F. None of the Above

35. _____represents materials that resist settling may remain suspended in wastewater?
A. Suspended solids D. Microorganisms
B. Organic material E. Dissolved solids
C. The solids F. None of the Above

36. Some dissolved materials are consumed by _____ in wastewater.
A. BOD D. Microorganisms
B. Organic material E. Suspended solids in wastewater
C. The solids F. None of the Above

37. Excessive amounts of dissolved solids in wastewater can have adverse effects on the environment.
A. True B. False

Gases
38. Certain gases in wastewater can cause odors, affect treatment, or are potentially dangerous.
A. True B. False

39. Methane gas is a byproduct of this wastewater term and is highly combustible.
A. Dissolved oxygen D. Biochemical oxygen demand or BOD
B. Oxygen-demanding E. Anaerobic biological treatment
C. Magnesium hydroxide F. None of the Above

Hydrogen Sulfide and Ammonia
40. Salts of zinc and iron may precipitate this term?
A. Dissolved oxygen D. Biochemical oxygen demand, or BOD
B. Sulfides E. Wastewater odor(s)
C. Magnesium hydroxide F. None of the Above

41. The lack of oxygen causes _____ conditions to occur in the sewer system.
A. Slime bacteria D. The lack of oxygen
B. Wastewater odor(s) E. Less oxygen
C. Hydrogen sulfide F. None of the Above

42. The mental well-being and _____ of residents can be affected by uncontained wastewater odors.
A. Attitude D. Political views
B. Income E. Social activities
C. Quality of life of residents F. None of the Above

43. _____ are very common in the collection and wastewater system.
A. Slime bacteria D. High DO
B. Wastewater odor(s) E. Lack of turbidity
C. Hydrogen sulfide or H_2S problem(s) F. None of the Above

44. Hydrogen sulfide and _____ are gasses that can be toxic and pose asphyxiation hazards.
A. Ammonia
B. Wastewater odors
C. Air
D. Oxygen
E. Less oxygen
F. None of the Above

45. Ammonia as a dissolved gas in wastewater is dangerous to fish.
A. True B. False

46. Cleaner sewers will produce less hydrogen sulfide because they will harbor _____.
A. Fewer slime bacteria
B. Wastewater odors
C. Hydrogen sulfide or H_2S problem(s)
D. BOD
E. Less oxygen
F. None of the Above

47. These chemicals or compounds are utilized in the treatment of hydrogen sulfide problems: Salts of zinc, lime, hydrogen peroxide, _____and magnesium hydroxide.
A. Dissolved oxygen
B. Oxygen
C. Chlorine
D. Ammonina
E. Carbon dioxide
F. None of the Above

48. Hydrogen dioxide production in collection systems can cause a number of problems such as corrosion of the pipes, manholes, and creation of hazardous atmospheres and foul odors.
A. True B. False

Pollutants, Oxygen-Demanding Substances

49. Aquatic life needs _____ in the water to survive.
A. Dissolved oxygen
B. Oxygen-demand
C. Magnesium hydroxide
D. Biochemical oxygen demand or BOD
E. Sunlight
F. None of the Above

50. The biochemical oxygen demand (BOD) of the effluent is not an indicator of how well a sewage treatment plan is working.
A. True B. False

51. If the wastewater treatment plant effluent has a high content of organics or ammonia, more _____ will be demanded from the receiving water. This will leave less oxygen to support fish and aquatic plants.
A. Slime bacteria
B. Wastewater odors
C. Hydrogen sulfide
D. Nitrogen
E. Oxygen
F. None of the Above

52. Both organic matter and _____ are called “oxygen-demanding” substances.
A. Dissolved oxygen
B. Ammonia
C. Magnesium hydroxide
D. Biochemical oxygen demand or BOD
E. Wastewater odor(s)
F. None of the Above

53. Domestic sewage and _____ all contribute oxygen-demanding substances to wastewater.
A. Slime bacteria
B. Wastewater odors
C. Hydrogen sulfide or H_2S problem(s)
D. The lack of oxygen
E. Agricultural and industrial wastes
F. None of the Above

54. If there is sufficient oxygen present in the water, oxygen-demanding substances are usually destroyed or converted to other compounds by the _____ in the water.

A. Dissolved oxygen
B. Nitrogen
C. Magnesium hydroxide
D. Biochemical oxygen demand, or BOD
E. Bacteria
F. None of the Above

Pathogens

55. Sewage from cities and institutions, industrial wastes from tanning and meat packing plants, and storm water runoff containing animal wastes can all be sources of pathogens in surface and ground water

A. True B. False

Nutrients

56. The chief nutrients present in natural water that are essential to living organisms are _____.

A. Oxygen
B. Ecology
C. Nutrient enrichment
D. Carbon, nitrogen, and phosphorus
E. Phosphorus and nitrogen
F. None of the Above

57. Aquatic plants and animals are harmed when uncontrolled algae growth blocks out the sunlight, thereby depleting _____ in the water at night.

A. Pathogen(s)
B. Dissolved oxygen
C. Nutrient enrichment
D. Excessive growth of algae
E. Phosphorus and nitrogen
F. None of the Above

58. When a waterbody cannot assimilate all of the nutrients, the resulting condition is called _____.

A. Toxic
B. Ecology
C. Nutrient enrichment
D. Eutrophication or cultural enrichment
E. Oxygen and organic waste
F. None of the Above

59. Phosphorous and nitrogen cannot be substantially removed by conventional _____.

A. Biofilm
B. Contaminants
C. Secondary treatment
D. Secondary biological treatment processes
E. Oxygen and organic waste
F. None of the Above

60. Wastewater normally contains an excess of available nutrients since organisms only require small amounts of nutrients during biological treatment.

A. True B. False

61. An excess of nitrogen and phosphorous causes water plants to grow slowly.

A. True B. False

62. Large amounts of nutrients, primarily _____ but sometimes nitrogen, cause nutrient enrichment that leads to excessive algae growth.

A. Phosphorus
B. Heavy metals
C. Nutrient enrichment
D. Excessive growth of algae
E. Nitrogen
F. None of the Above

Inorganic and Synthetic Organic Chemicals

63. Some inorganic and synthetic organic chemicals are _____ at very low concentrations.

A. Highly poisonous
B. Ecology
C. Nutrient rich
D. Safe for aquatic life
E. Non-toxic to humans
F. None of the Above

Thermal

64. The capacity of water to retain oxygen is reduced by _____.

A. Heat
B. Heavy metals
C. Nutrient enrichment
D. Excessive growth of algae
E. Phosphorus and nitrogen
F. None of the Above

65. The ecology of a lake or stream can be seriously altered by uncontrolled discharges of _____.

A. Toxics
B. Waste heat
C. Nutrients
D. Oxygen
E. Phosphorus and nitrogen
F. None of the Above

66. According to the text, even discharges from wastewater treatment plants and storm water retention ponds affected by winter can be released at temperatures below that of the receiving water, and lower the stream temperature.

A. True B. False

Primary Treatment

67. The initial stage in the wastewater treatment process is primary treatment.

A. True B. False

68. The primary treatment stage removes coarse solids from the wastewater. In some treatment plants, the _____ are combined into one operation.

A. Solid(s)
B. Finer debris
C. Grit and gravel
D. Suspended growth process(es)
E. Primary and secondary stages
F. None of the Above

69. There are two basic stages in the treatment of wastes, RAS and WAS.

A. True B. False

70. _____ are used in the secondary treatment stage to further purify wastewater.

A. Very fine solids
B. Biological processes
C. Pollutant(s)
D. Primary sludge
E. Grit and screenings
F. None of the Above

Preliminary Treatment

71. The _____ from the collection system enters into the coarse screening process.

A. Solid material
B. Finer debris
C. Grit and gravel
D. Raw wastewater
E. Dissolved organic and inorganic constituents
F. None of the Above

72. After the wastewater has been screened, it may flow into a grit chamber where sand, grit, cinders, and small stones settle to the bottom

A. True B. False

73. It is very important to remove _____ that washes off city streets or land during storms, especially in cities with combined sewers.

A. Very fine solids
B. Grit and gravel
C. Pollutant(s)
D. Primary sludge
E. Grit and screenings
F. None of the Above

74. Treatment plant pumps and other equipment can be damaged by large amounts of _____ entering the plant.
A. Solids D. Grit and sand
B. Finer debris E. Dissolved organic and inorganic constituents
C. Inorganics F. None of the Above

75. Preliminary treatment includes coarse screening, raw influent pumping, static fine screening, grit removal, and selector tanks.
A. True B. False

76. In some plants, another finer screen is placed after the grit chamber to remove any additional material that might damage equipment or interfere with later processes.
A. True B. False

77. After the raw influent pumping process, the _____ passes into the static fine screening process to remove finer debris not captured by the coarse screens.
A. Solid(s) D. Flow
B. Finer debris E. Dissolved organic and inorganic constituents
C. Grit and gravel F. None of the Above

78. The wastewater passes into the _____process that consists of two vortex grit separators that produce a whirlpool action to force the finest debris to the outside perimeter.
A. Very fine solids D. Primary sludge
B. De-gritted wastewater E. Grit and screenings
C. Grit Removal F. None of the Above

79. _____ removed by these processes, must be periodically collected and trucked to a landfill for disposal or are incinerated.
A. Very fine solids D. Primary sludge
B. Wastewater E. Grit and screenings
C. Pollutant(s) F. None of the Above

80. The coarse screening is provided by a basket shaped bar screen. The screen collects larger debris which are then removed and sent to a landfill for disposal.
A. True B. False

81. The _____ removed by the preliminary treatment processes must be collected and disposed of in a landfill or incinerated.
A. Liquids D. Debris
B. Finer debris E. Dissolved organic and inorganic constituents
C. Compounds F. None of the Above

82. _____ passes into the raw influent pumping process that consists of submersible centrifugal pumps.
A. Wastewater D. Dissolved organic and inorganic constituents
B. Split samples E. Grit and gravel
C. Duplicate samples F. None of the Above

Primary Sedimentation
83. Pollutants that are dissolved in the wastewater are effectively removed by gravity settling.
A. True B. False

84. When the wastewater flow is slowed down in a sedimentation tank, the suspended solids gradually sink to the bottom. The resulting mass of solids is called _____.

A. Very fine solids
B. Wastewater pollution
C. Pollutants
D. Primary sludge
E. Grit and screenings
F. None of the Above

85. When the screening completed and the grit removed, wastewater is clear of dissolved organic and inorganic constituents along with suspended solids.

A. True B. False

86. Primary treatment processes, such as sedimentation or gravity settling, chemical coagulation, or filtration, are used to remove _____ from the wastewater.

A. Suspended solids
B. Sewage
C. Pollutants
D. Primary sludge
E. Grit and screenings
F. None of the Above

Secondary Treatment

87. The wastewater enters from preliminary treatment into the clarifier process which is a biological process consisting of large oval shaped basins that are capable of removing finer solids.

A. True B. False

88. The _____ are consumed by microorganisms within the oxidation basins. The microorganisms also adhere to the solids themselves.

A. Total Solids
B. TDS
C. Very fine solids
D. Grit and screenings
E. Sludges
F. None of the Above

89. The microorganisms in the oxidation basins consume and adhere to the finer solids. This causes _____ to form, which can be physically separated.

A. Solids
B. Finer debris
C. Grit and gravel
D. Larger and heavier aggregates
E. Dissolved organic and inorganic constituents
F. None of the Above

90. After the primary treatment processes, the _____ flows to the secondary treatment processes.

A. Very fine solids
B. Wastewater
C. Pollutant load
D. Primary sludge
E. Grit
F. None of the Above

91. The _____ and the suspended growth processes are the most common conventional methods used to achieve secondary treatment.

A. Solid(s)
B. Finer debris
C. Attached growth processes
D. Unsuspended growth process(es)
E. Organic matter
F. None of the Above

92. The secondary treatment stage includes a biological process, such as _____, and a physical process known as secondary clarification.

A. Wildlife habitat
B. Oxidation Ditches
C. Denitrification
D. Phosphorus-reduction system(s)
E. Excessive sludge production
F. None of the Above

93. After preliminary treatment, the _____ are still present in the wastewater, since they cannot be removed by physical processes.
A. Very fine solids D. Suspended growth processes
B. Coarse debris E. Larger debris
C. Grit and gravel F. None of the Above

Secondary Clarification Process
94. The Secondary Clarification process consists of four rectangular tanks that provide quiescent (or calm) conditions which allow the larger aggregates of solids and microorganisms to settle out for collection.
A. True B. False

95. The clear overflow (or upper layer) is collected at the end of the tank and passed onto the Tertiary process for additional treatment if available.
A. True B. False

96. The majority of microorganism-rich underflow (or lower layer) is re-circulated to tanks as Return Sludge to help sustain the microorganism population in the Oxidation Ditches process.
A. True B. False

97. If all the underflow was returned the plant would soon become overloaded with solids, therefore, a small portion of this mixture termed Waste Sludge is removed from the system for disposal.
A. True B. False

Wastewater and Pretreatment Compliance Monitoring
98. There are two types of _____that are performed as part of compliance monitoring for permitted industries: unscheduled and demand.
A. Discharge concentrations D. Sampling activities
B. Pollutants of concern E. Manual collection of grab samples
C. Plant sampling activity F. None of the Above

99. _____is used to determine the compliance status of the user?
A. Flow-proportional sampling D. Composite and grab samples
B. POTW samples E. Unannounced monitoring visits
C. Unscheduled sampling F. None of the Above

100. Instances of noncompliance are often identified during unannounced monitoring visits. No notice is given for this type of sampling. This type of sampling is performed two to four times a year, at each industrial user site, over a two to five-day period to obtain sampling data
A. True B. False

101. _____ is usually initiated in response to a known or suspected violation?
A. An analysis D. Taste test
B. Split samples E. Demand sampling
C. Duplicate samples F. None of the Above

102. The length of the sampling program depends on the flow, nature of the wastes, and type of samples, typically, _____ are collected at each user site.
A. Flow-proportional sampling D. Composite and grab samples
B. POTW samples E. Unannounced smell tests
C. BOD and SS levels F. None of the Above

Nutrient Removal for Small Communities and Decentralized Wastewater Treatment Systems

103. _____– treat and dispose of effluent on the same property that produces the wastewater?

A. Groundwater recharge
B. Community drainfield(s)
C. High-aluminum mud(s)
D. Onsite septic systems
E. Small volumes of wastewater
F. None of the Above

104. According to the text, wastewater from several homes is pretreated onsite by individual septic tanks before being transported through alternative sewers to _____treatment unit that is relatively simple to operate and maintain.

A. An offsite decentralized
B. Wastewater
C. Denitrification
D. Phosphorus-reduction system(s)
E. Excessive sludge production
F. None of the Above

105. Wastewater systems such as community drainfields, irrigation systems, and _____ are being installed to reduce infrastructure investment and minimize adverse environmental impacts.

A. Wildlife habitat
B. Package plants
C. Denitrification
D. Phosphorus-reduction system(s)
E. Excessive sludge production
F. None of the Above

106. Additional alternatives that include_____, sand filters, and constructed wetlands can be used to reduce nutrient pollution?

A. Groundwater recharge
B. Community drainfield(s)
C. High-aluminum mud(s)
D. Aerobic tanks
E. Small volumes of wastewater
F. None of the Above

Phosphorus Removal

107. Few phosphorus removal processes are well developed for _____application.

A. Onsite wastewater systems
B. Wastewater
C. Denitrification
D. Phosphorus-reduction system(s)
E. Excessive sludge production
F. None of the Above

108. The controlled addition of chemicals such as aluminum, iron, and calcium compounds with subsequent flocculation and sedimentation has had only limited success because of inadequate operation and maintenance of mechanical equipment and excessive sludge production.

A. True B. False

109. Studies of high-iron sands and _____ indicate that 50 to 95 percent of the phosphorus can be removed?

A. Groundwater recharge
B. Community drainfield(s)
C. High-aluminum mud(s)
D. Nitrogen and phosphorus pollution
E. Small volumes of wastewater
F. None of the Above

Nitrogen Removal

110. Processes that remove 75 to 100 percent of total nitrogen include aerobic biological systems and media filters, especially recirculating filters.

A. True B. False

111. The vast majority of on-site and cluster nitrogen-removal systems employ nitrification and?

A. Groundwater recharge
B. Community drainfield(s)
C. High-aluminum mud(s)
D. Denitrification biological reactions
E. Small volumes of wastewater
F. None of the Above

112. SBRs, and an array of _____ combined with an anoxic/anaerobic process to perform denitrification.

A. Trickling filter(s)
B. Oxidation Ditches
C. Nitrogen removal system(s)
D. Aerobic nitrification processes
E. Recirculating sand filters (RSFs)
F. None of the Above

113. There are systems that utilize membrane solids separation following _____ are capable of removing total nitrogen down to very low concentrations (i.e. 3 – 4 mg/L TN).

A. Nitrogen removal system(s)
B. Tertiary process
C. Biological nitrification and denitrification
D. Suspended film system(s)
E. Recirculating sand filters (RSFs
F. None of the Above

114. _____are located last in the treatment train prior to subsurface wastewater infiltration system (SWIS) disposal or surface water disposal.

A. Trickling filter(s)
B. Oxidation Ditches
C. Nitrogen removal system(s)
D. Aerobic nitrification processes
E. Recirculating sand filters (RSFs)
F. None of the Above

Secondary Clarification Process

115. The SCP provides quiescent (or calm) conditions that allow the larger aggregates of solids and microorganisms to settle out for collection.

A. True B. False

116. In the SCP, the majority of microorganism-rich underflow (or lower layer) is re-circulated to Tanks as Return Sludge to help sustain the microorganism population in the?

A. Trickling filter(s)
B. Oxidation Ditches
C. Nitrogen removal system(s)
D. Aerobic nitrification processes
E. Recirculating sand filters (RSFs)
F. None of the Above

Fixed Film Systems

117. _____grow microorganisms on substrates such as rocks, sand or plastic?

A. Mature biofilm
B. Activated sludge system
C. Advanced treatment technologies
D. Application-specific microbiology
E. Fixed film systems
F. None of the Above

118. The wastewater is spread over the substrate, allowing the wastewater to flow past the film of microorganisms fixed to the substrate.

A. True B. False

119. _____and rotating biological contactors, and sand filters are examples of fixed film systems?

A. Trickling filter(s)
B. Oxidation Ditches
C. Nitrogen removal system(s)
D. Aerobic nitrification processes
E. Recirculating sand filters (RSFs)
F. None of the Above

Suspended Film Systems

120. As the microorganisms absorb organic matter and nutrients from the wastewater, they grow in size and number. After the microorganisms have been suspended in the wastewater for several hours, they are settled out as sludge.

A. True B. False

121. _____stir and suspend microorganisms in wastewater?

A. Nitrogen removal system(s)
B. Tertiary process
C. Microorganism(s)
D. Suspended film system(s)
E. Recirculating sand filters (RSFs
F. None of the Above

122. Activated sludge, _____, oxidation ditch, and sequential batch reactor systems are all examples of suspended film systems.

A. Trickling filter(s)
B. Extended aeration
C. Nitrogen removal system(s)
D. Aerobic nitrification processes
E. Recirculating sand filters (RSFs)
F. None of the Above

Lagoon Systems

123. Lagoon systems are shallow basins that hold the wastewater for several months to allow for the natural degradation of sewage.

A. True B. False

124. Lagoon systems take advantage of _____and microorganisms in the wastewater to renovate sewage.

A. Nitrogen removal system(s)
B. Tertiary process
C. Natural aeration
D. Suspended film system(s)
E. Recirculating sand filters (RSFs
F. None of the Above

Other Important Wastewater Characteristics

125. Wastewater characteristics can affect public health, the environment, and the design, cost, and _____.

A. Treatment processes
B. Total dissolved solids (TDS)
C. Quality of the water
D. The environment
E. Effectiveness of treatment
F. None of the Above

Temperature

126. Temperatures ranging from 77 to 95 degrees Fahrenheit are probably best for wastewater treatment.

A. True B. False

127.Biological treatment activity accelerates in warm temperatures and slows in cool temperatures, but _____can stop treatment processes altogether.

A. Oxygen
B. High TSS
C. Settling sediments
D. Total Suspended Solids (TSS)
E. Extreme hot or cold
F. None of the Above

128. Hot water is a byproduct of many manufacturing processes, is not a pollutant. When discharged in large quantities, it can raise the temperature of receiving streams improving the natural balance of aquatic life.

A. True B. False

pH

129. Treatment processes and the environment are both affected by the acidity or alkalinity of the wastewater.

A. True B. False

130. Low pH indicates increasing acidity while a low pH indicates increasing alkalinity.

A. True B. False

131. In order to protect organisms in the biological process, the _____ of the wastewater needs to remain between 6 and 9.
A. Total Solids
B. TDS
C. pH
D. Elevated Hardness, Salty Taste, or Corrosiveness
E. Wastewater temperature
F. None of the Above

132. Industrial or commercial discharges containing acids and other substances can alter the _____ of the wastewater and inactivate treatment processes.
A. Total Solids
B. TDS
C. pH
D. Elevated Hardness, Salty Taste, or Corrosiveness
E. Wastewater temperature
F. None of the Above

Total Dissolved Solids

133. Pure water is tasteless, colorless, and odorless and is often called “the universal solvent”.
A. True B. False

134. _____ is often called the universal solvent because it picks up impurities easily.
A. Treatment processes
B. Total dissolved solids (TDS)
C. Quality of the water
D. Wastewater
E. Water
F. None of the Above

135. Any minerals, salts, metals, cations or anions dissolved in water are referred to as _____.
A. Total Solids
B. TDS
C. pH
D. Elevated Hardness, Salty Taste, or Corrosiveness
E. Dissolved solids
F. None of the Above

136. Inorganic salts and some small amounts of organic matter that are dissolved in water are referred to as _____.
A. Treatment processes
B. Total dissolved solids (TDS)
C. Quality of the water
D. Both treatment and the environment
E. Universal solvent
F. None of the Above

137. TDS in drinking water originate from natural sources, sewage, urban run-off, industrial wastewater, and chemicals used in the water treatment process.
A. True B. False

138. The TDS test provides only a qualitative measure of the amount of dissolved ions. The test does not provide the nature or ion relationships.
A. True B. False

139. Natural environmental features causing elevated _____ include mineral springs, carbonate deposits, salt deposits, and seawater intrusion.
A. Total Solids
B. TDS
C. pH
D. Hardness, Salty Taste, or Corrosiveness
E. Wastewater temperature
F. None of the Above

140. The sum of the cations (positively charged ions) and anions (negatively charged ions) in the water is the definition of _____.
A. Treatment processes
B. Total dissolved solids (TDS)
C. Quality of the water
D. Both treatment and the environment
E. Universal solvent
F. None of the Above

141. The TDS test does not provide us insight into the specific water quality issues, such as: Elevated Hardness, Salty Taste, or?
A. Total Solids D. Corrosiveness
B. TDS E. Wastewater temperature
C. pH F. None of the Above

Total Solids
142. _____ refers to matter suspended or dissolved in water or wastewater, and is related to both specific conductance and turbidity?
A. Total Solids D. Elevated Hardness, Salty Taste, or Corrosiveness
B. TDS E. Wastewater temperature
C. pH F. None of the Above

143. _____ is used for material left in a container after evaporation and drying of a water sample.
A. Treatment processes D. Total solids
B. Total dissolved solids (TDS) E. pH
C. Quality of the water F. None of the Above

144. _____ includes both total suspended solids, the portion of total solids retained by a filter and total dissolved solids.
A. Total Solids D. Elevated Hardness, Salty Taste, or Corrosiveness
B. TDS E. Wastewater
C. pH F. None of the Above

145. _____can be measured by evaporating a water sample in a weighed dish, and then drying the residue in an oven at 103 to 105° C.
A. Treatment processes D. Total Suspended solids
B. Total dissolved solids (TDS) E. Wastewater
C. Quality of the water F. None of the Above

146. The increase in weight of the dish represents the total solids. Instead of total solids, laboratories often measure total suspended solids and/or total dissolved solids.
A. True B. False

Total Suspended Solids (TSS)
147. Silt, decaying plant and animal matter, industrial wastes, and sewage are all included in _____.
A. Total Solids D. TSS
B. TDS E. Wastewater
C. pH F. None of the Above

148. _____ can reduce the amount of light passing through the water to reach submerged vegetation, slowing down photosynthesis.
A. Total Solids D. Hydrogen sulfide
B. TDS E. High TSS
C. pH F. None of the Above

149. Wastewater treatment plants are designed to function as "microbiology farms," where bacteria and other microorganisms are fed oxygen and organic waste.
A. True B. False

150. If high TSS completely blocks the light, bottom dwelling plants will stop producing oxygen and die.
A. True B. False

151. Solids in water that can be trapped by a filter are called Total Suspended Solids or TSS.
A. True B. False

152. Because the suspended particles absorb heat and light, _____ can raise the surface water temperature. Warmer water can hold less dissolved oxygen, which in turn can harm aquatic life.
A. Oxygen D. Hydrogen sulfide
B. High TSS E. Suspended sediment
C. Settling sediments F. None of the Above

153. The eggs of fish and aquatic insects can be smothered when suspended solids settle to the bottom of a water body.
A. True B. False

154. _____ can damage the aquatic habitat by filling in spaces between rocks that could have been homes to aquatic organisms.
A. Oxygen D. Hydrogen sulfide
B. Organic material E. Suspended sediments
C. Settling sediments F. None of the Above

155. Estimating this term for centralized treatment systems is a complicated task, especially when designing a new treatment plant in a community where one has never existed previously.
A. Peak flow(s) D. This can increase flow(s)
B. Flow volume(s) E. Original design load
C. Additional flows F. None of the Above

156. Engineers must allow for this term during wet weather due to inflow and infiltration of extra water into sewers.
A. Peak flow(s) D. This can increase flow(s)
B. Flow volume(s) E. Original design load
C. Additional flows F. None of the Above

157. _____ can enter sewers through leaky manhole covers and cracked pipes and pipe joints, diluting wastewater.
A. Peak flow(s) D. Excess water
B. Flow volume(s) E. Original design load
C. Additional flows F. None of the Above

158. The focus of wastewater treatment plants is to reduce this term in the effluent discharged to natural waters, meeting state and federal discharge criteria.
A. BOD and COD D. Soluble nutrients
B. Some contaminants E. Oxygen and organic waste
C. Secondary treatment effluent F. None of the Above

159. Treatment of wastewater usually involves this term such as the activated sludge system in the secondary stage after preliminary screening.
A. Biological processes D. Application-specific microbiology
B. Activated sludge system E. Pretreatment and pollution prevention
C. Advanced treatment technologies F. None of the Above

160. These secondary treatment steps that harness natural self-purification processes contained in bioreactors for the biodegradation of organic matter and bioconversion of _____ in the wastewater.

A. Biofilm
B. Some contaminants
C. Secondary treatment effluent
D. Soluble nutrients
E. Oxygen and organic waste
F. None of the Above

Application Specific Microbiology

161. Wastewater treatment plants use a methodology known as _____ to achieve the most efficient biological nutrient removal.

A. Mature biofilm
B. Activated sludge system
C. Advanced treatment technologies
D. Application-specific microbiology
E. Pretreatment and pollution prevention
F. None of the Above

162. Application-specific microbiology involves using the right laboratory prepared bugs in the right growth environment to maximize the efficiency of organics removal.

A. True B. False

163. When starting up an activated sludge process, _____ can be purchased to reduce the time for growing a mature biofilm.

A. Mature biofilms
B. Activated sludge system
C. Advanced treatment technologies
D. Application specific bacterial cultures
E. Pretreatment and pollution prevention
F. None of the Above

Advanced Methods of Wastewater Treatment

164. As our country and the demand for clean water have grown, it has become more important to produce cleaner wastewater effluents, yet _____ are more difficult to remove than others.

A. Biofilm
B. Some contaminants
C. Secondary treatment effluent
D. Soluble nutrients
E. Oxygen and organic waste
F. None of the Above

165. Pretreatment and pollution prevention which helps limit _____discharged to the sanitary sewer system.

A. Types of wastes
B. Activated sludge system
C. Advanced treatment technologies
D. Application-specific microbiology
E. Pretreatment and pollution prevention
F. None of the Above

166. All WWTPs provide a minimum of _____ .

A. Biofilm
B. Secondary treatment
C. Secondary treatment effluent
D. Pretreatment and pollution prevention
E. Oxygen and organic waste
F. None of the Above

Advanced Treatment Technologies

167. Treatment levels beyond secondary are called “advanced treatment”.

A. True B. False

168. _____ can be extensions of conventional secondary biological treatment to further stabilize oxygen-demanding substances.

A. Mature biofilm
B. Activated sludge system
C. Advanced treatment technologies
D. Application-specific microbiology
E. Pretreatment and pollution prevention
F. None of the Above

169. Advanced treatment may include physical-chemical separation techniques such as adsorption, flocculation/precipitation, membranes for advanced filtration, _____, and reverse osmosis.
A. Denitrification process D. Aeration in the reactor
B. Organic material E. Application-specific microbiology
C. Ion exchange F. None of the Above

Nitrogen Control
170. Nitrogen in one form or another is present in municipal wastewater and is usually not removed by secondary treatment.
A. True B. False

171. Ammonia in wastewater is not toxic to aquatic life.
A. True B. False

172. Nitrogen in the form of _____ can consume oxygen or stimulate algae growth.
A. Nitrification D. Nitrogen in the nitrate form
B. Ammonia E. Ammonia to the non-toxic nitrate
C. Nitrogen F. None of the Above

173. A biological treatment process beyond the secondary stage uses nitrifying bacteria to convert ammonia to non-toxic nitrate. This process is called _____.
A. Nitrification D. Nitrogen in the nitrate form
B. Denitrification E. Biological treatment
C. Nitrogen F. None of the Above

174. To remove nitrate from wastewater effluent, another _____ process can be added to convert nitrate to nitrogen gas.
A. Nitrification D. Primary
B. Chemical E. Biological
C. Nitrogen F. None of the Above

Conversion of Nitrate to Nitrogen Gas
175. Nitrate can be converted to _____ by bacteria in a process known as denitrification.
A. Nitrogen gas D. Nitrate nitrogen
B. Phosphorus E. Methanol
C. Nitrogen F. None of the Above

176. Which of the following wastewater treatment terms are added or a small stream of raw wastewater is mixed in with the nitrified effluent?
A. Nitrogen gas D. Nitrate nitrogen
B. Phosphorus E. Methanol
C. Nitrogen F. None of the Above

177. Which of the following wastewater treatment terms comprises almost 80 percent of the air in the earth's atmosphere?
A. Phosphorus D. Nitrate nitrogen
B. Phosphorus E. Methanol
C. Nitrogen F. None of the Above

Biological Phosphorus Control
178. Like nitrogen, phosphorus is also a necessary nutrient for the growth of algae.
A. True B. False

179. One way to remove _____ is the addition of chemicals and a coagulation-sedimentation process.
A. Nitrification
B. Phosphorus
C. Nitrogen
D. Nitrate nitrogen
E. Oxygen
F. None of the Above

180. Biological nutrient removal processes can remove _____.
A. Both nitrogen and phosphorus
B. Phosphorus
C. Nitrogen
D. Nitrate nitrogen
E. Oxygen
F. None of the Above

181. BNR processes involve modifications of suspended growth treatment systems in that the bacteria in these systems also convert this compound to inert nitrogen gas.
A. Both nitrogen and phosphorus
B. Phosphorus
C. Nitrogen
D. Nitrate nitrogen
E. Oxygen
F. None of the Above

Coagulation-Sedimentation Process

182. Solids heavier than water settle out of wastewater by gravity. With the addition of specific chemicals, solids can become heavier than water and will settle.
A. True B. False

183. _____ is used to increase the removal of solids from effluent after primary and secondary treatment.
A. Carbon adsorption
B. An advanced process
C. A form of stabilization
D. Chemical coagulation-sedimentation
E. Processed wastewater solids (“sewage sludge”)
F. None of the Above

184. _____ added to the wastewater to remove phosphorus.
A. Other alkaline materials
B. A form of stabilization
C. Sewage solids, or sludge
D. Alum, lime, or iron salts are chemicals
E. Phosphate
F. None of the Above

185. _____ is considered an advanced process because it is not routinely applied to the treatment of municipal wastewater.
A. Carbon adsorption
B. An advanced process
C. Coagulation-sedimentation
D. A form of stabilization
E. Processed wastewater solids (“sewage sludge”)
F. None of the Above

Carbon Adsorption

186. Carbon adsorption technology can remove organic materials from wastewater that resist removal by?
A. Denitrification process
B. Biological treatment
C. Bulking sludge
D. Insufficient aeration in the reactor
E. Anaerobic sludge
F. None of the Above

187. _____consists of passing the wastewater effluent through of activated carbon granules or powder.
A. Carbon adsorption
B. An advanced process
C. Carbonic dioxide
D. A form of stabilization
E. Super treatment
F. None of the Above

The Use or Disposal of Wastewater Residuals and Biosolids

188. When pollutants are removed from water, there may be the _____ that settle to the bottom of sedimentation tanks.

A. Other alkaline materials
B. Solids
C. Sewage solids, or sludge
D. Biosolids
E. Rags and sticks
F. None of the Above

189. The utilization and disposal of the residual process solids is addressed by the CWA, Resource Conservation and Recovery Act (RCRA), and other federal laws.

A. True B. False

Processed Wastewater Solids

190. _____are considered biosolids and need to meet rigorous standards allowing safe reuse for beneficial purposes.

A. Other alkaline materials
B. A form of stabilization
C. Sewage solids, or sludge
D. Processed wastewater solids
E. Rags and sticks
F. None of the Above

Biosolids Stabilization

191. Prior to utilization or disposal, _____ are stabilized to control odors and reduce the number of disease-causing organisms.

A. Biosolids
B. An advanced process
C. Sewage solids, or sludge
D. Other alkaline materials
E. Processed wastewater solids (“sewage sludge”)
F. None of the Above

192. Which of the following wastewater treatment terms when separated from the wastewater contains around 98 percent water?

A. Biosolids
B. An advanced process
C. Sewage solids, or sludge
D. Other alkaline materials
E. Processed wastewater solids (“sewage sludge”)
F. None of the Above

Dewatering Processes

193. To improve dewatering effectiveness, the solids can be pretreated with chemicals such as lime, ferric chloride, or polymers to produce larger particles that are easier to remove.

A. True B. False

194. _____include drying beds, belt filter presses, plate and frame presses, and centrifuges?

A. Dewatering processes
B. A form of stabilization
C. Sewage solids, or sludge
D. Stabilization of solids
E. Digestion
F. None of the Above

Digestion

195. Digestion is a form of _____where the volatile material can decompose naturally and the potential for odor production is reduced.

A. Dewatering processes
B. Release
C. Sewage solids, or sludge
D. Stabilization of solids
E. Stabilization
F. None of the Above

196. _____ in an enclosed tank has the added benefit of producing methane gas which can be recovered and used as a source of energy.

A. Dewatering processes
B. Digestion without air
C. Sewage solids, or sludge
D. Stabilization of solids
E. Digestion
F. None of the Above

197. _____ may also be accomplished by composting, heat treatments, drying or the addition of lime or other alkaline materials.

A. Dewatering processes
B. A form of stabilization
C. Sewage solids, or sludge
D. Stabilization of solids
E. Digestion
F. None of the Above

Water Quality Criteria

198. According to the Clean Water Act, water quality criteria developed by the EPA must accurately reflect the latest scientific knowledge about the effects of pollutants on aquatic life and human health.

A. True B. False

199. The Clean Water Act and the EPA includes specific information on the concentration and dispersal of pollutants through biological, physical, and chemical processes as well as the effects of pollutants on biological communities as a whole.

A. True B. False

Human Health Criteria

200. EPA scientists determine the levels for specific chemicals that are not likely to adversely affect human health.

A. True B. False

Aquatic Life Criteria

201. The aquatic life criteria developed by EPA are numeric limits on the amounts of chemicals that can be present in the water without harming aquatic life.

A. True B. False

202. Aquatic life criteria do not provide protection for saltwater aquatic organisms.

A. True B. False

203. _____ protect aquatic organisms from death, slower growth, reduced reproduction, and the accumulation of toxic chemicals in their tissues.

A. Aquatic life criteria
B. Water pollutants
C. Water quality standards
D. Concentrations of pollutants
E. Pollutant levels
F. None of the Above

Sediment Quality Criteria Guidance

204. In a healthy aquatic community, _____ provide a habitat for worms, plants, and tiny microorganisms.

A. Pollutants
B. Water quality
C. Sediments
D. Aquatic plants
E. Human health and aquatic life criteria
F. None of the Above

Pollutants in the Sediment

205. Bottom dwelling species can be protected by controlling the _____ in the sediment. This prevents harmful toxins from accumulating in animals at higher levels in the food chain.

A. Nitrogen level
B. Phosphorous level
C. Oxygen level
D. Concentration of pollutants
E. Bacteria
F. None of the Above

206. _____in the sediment that does not harm snails of small fish may bioaccumulate in the food chain.

A. Aquatic life criteria
B. Water pollutant(s)
C. Water quality standard(s)
D. Concentration of pollutant(s)
E. A pollutant level
F. None of the Above

207. _____- The EPA develops on the concentrations or amounts of individual chemicals that can be present in river, lake, or stream sediments

A. Toxic quality criteria guidance
B. Food chain quality guidance
C. Biological integrity guidance
D. Biological treatment(s) quality criteria guidance
E. Sediment quality criteria guidance
F. None of the Above

Biological Criteria

208. The natural condition of a water body is to be free from _____, habitat loss, and other negative stressors.

A. Allowable concentrations
B. The harmful effects of pollution
C. Water quality standards
D. Human activity
E. Aquatic life criteria
F. None of the Above

209. States can use methodologies developed by EPA to develop protective _____ for their waters.

A. Toxic pollutants
B. Food chains
C. Biological integrity
D. Biological treatments
E. Water quality standards
F. None of the Above

210. These methodologies will describe scientific methods for determining a particular aquatic community's health and for maintaining optimal conditions in?

A. Allowable concentrations
B. Water quality
C. A healthy aquatic community
D. Various bodies of water
E. Human health and aquatic life criteria
F. None of the Above

Summary

211. Biological wastewater treatment goals are to remove the non-settling solids and the dissolved organic load from the effluents by using microbial populations.

A. True B. False

212. Biological treatments are generally part of secondary treatment systems.

A. True B. False

213. The microorganisms used are responsible for the degradation of this term and the stabilization of organic wastes.

A. Allowable concentrations
B. Water quality
C. In a healthy aquatic community
D. Organic matter
E. Human health and aquatic life criteria
F. None of the Above

214. Some of the microorganisms present in wastewater treatment systems use the _____ of the wastewater as an energy source to grow.
A. Toxic pollutant(s) D. Biological treatment(s)
B. Food chain E. Organic content
C. Biological integrity F. None of the Above

Genera
215. In a single aerobic system, members of the genera Pseudomonas, Nocardia, Flavobacterium, Achromobacter and Zooglea may be present, together with filamentous organisms.
A. True B. False

216. In a well-functioning system, protozoas and rotifers are usually present and are useful in consuming dispersed _____or non-settling particles.
A. Bacteria D. Suspended growth processes
B. Attached growth processes E. Food-to-microorganism ratio, F/M
C. Protozoas and rotifers F. None of the Above

217. The organic load present is incorporated in part as represented by this term by the microbial populations, and almost all the rest is liberated as gas.
A. Biological denitrification D. Biomass
B. Organic load E. Aerobic and facultative microorganisms
C. Bacteria F. None of the Above

218. Unless the cell mass formed during the biological treatment is removed from the wastewater the treatment is largely incomplete, because the biomass itself will appear as organic load in the effluent and the only pollution reduction accomplished is that fraction liberated as gases.
A. True B. False

219. The biological treatment processes used for wastewater treatment are broadly classified as aerobic in which aerobic and facultative microorganisms predominate or anaerobic which use?
A. Biological denitrification D. Nitrogen and phosphorus
B. Organic load E. Aerobic and facultative microorganisms
C. Anaerobic microorganism F. None of the Above

220. _____means the microorganisms that are attached to a surface over which they grow are called "attached growth processes".
A. Carbonaceous BOD D. Suspended growth processes
B. Attached growth processes E. Food-to-microorganism ratio, F/M
C. Protozoans and rotifers F. None of the Above

Nonpermitted Industrial Users (User Rate Charge Program) Policy Example
221. On a periodic basis (i.e., once every two to three years), commercial and minor industrial users are sampled to determine?
A. Discharge concentrations D. Discharge concentrations of various pollutants
B. Pollutants of concern E. Manual collection of grab samples
C. Plant sampling activity F. None of the Above

222. Typical types of users which may be sampled include: restaurants, photo processing laboratories, laundries, car washes, and printing shops. A three- to four-day sampling program is usually conducted at each assigned site.
A. True B. False

Wastewater Treatment Plant Sampling

223. POTW samples are collected in accordance with the National Pollutant Discharge Elimination System (NPDES) permit which sets discharge limits for certain pollutants and specifies sampling frequencies and?

A. An analysis
B. Split samples
C. Duplicate samples
D. Taste test
E. Sample types
F. None of the Above

224. The POTW is responsible for coordinating the plant sampling activity with laboratory personnel who prepare any special sampling bottles and laboratory appurtenances necessary to complete the?

A. Flow-proportional sampling
B. POTW samples
C. BOD and SS levels
D. Composite and grab samples
E. Sampling objectives
F. None of the Above

225. Control Authorities should estimate flow to allow for collection of grab samples, which are required, unless flow-proportional sampling is not feasible.

A. True B. False

226. _____ are preferred over time composite samples particularly where the monitored discharge is intermittent or variable.

A. Flow-proportional sampling
B. POTW samples
C. BOD and SS levels
D. Composite and grab samples
E. Flow-proportional composite samples
F. None of the Above

227. Desired analyses dictate the preparation protocols, equipment, and collection bottles to use to avoid contamination of samples or loss of pollutants through improper collection.

A. True B. False

228. Sampling for such pollutants as_____, flashpoint, and volatile organic compounds require manual collection of grab samples.

A. The sampling point(s)
B. Sample preservation
C. Duplicate samples
D. Routine QA/QC measures
E. pH, cyanide, oil and grease
F. None of the Above

229. _____ is similar to composite samples, and must be representative of the monitored discharge and are to be collected from actively flowing wastestreams?

A. Discharge concentrations
B. Pollutants of concern
C. Plant sampling activity
D. Grab samples
E. Manual collection of grab samples
F. None of the Above

230. Fluctuations in flow or the nature of the discharge may require collection of and hand-compositing of this term to accurately access compliance.

A. Flow-proportional sampling
B. POTW samples
C. BOD and SS levels
D. Composite and grab samples
E. More than one grab sample
F. None of the Above

231. Control Authorities should develop and implement standard operating procedures and policies detailing _____and handling protocols in accordance with 40 CFR Part 136.

A. An analysis
B. Split samples
C. Duplicate samples
D. Sample collection
E. Blanks
F. None of the Above

232. _____with the adherence to proper sample collection can be verified through review of field measurement records, chain of custodies, and lab reports.
A. Discharge concentrations D. Handling protocols
B. Pollutants of concern E. Manual collection of grab samples
C. Plant sampling activity F. None of the Above

233. Field measurement records may require information regarding sample location, condition of and programmed settings for sampling equipment, wastewater meter readings, and information for such parameters as this missing term that requires analysis in the field.
A. The sampling point(s) D. Routine QA/QC measures
B. Sample preservation E. Blanks
C. pH and temperature F. None of the Above

234. Lab reports should contain the minimum information (e.g., analytical methodology, _____, time of analysis).
A. Discharge concentrations D. Sample preparation date and time
B. Pollutants of concern E. Manual collection of grab samples
C. Plant sampling activity F. None of the Above

235. _____will prompt recording of information necessary for demonstrating compliance with applicable requirements.
A. Flow-proportional sampling D. Composite and grab samples
B. POTW samples E. Unannounced monitoring visits
C. Standardized forms F. None of the Above

Emerging Contaminants
236. Two groups of emerging poluutants that are not a threat to the systems are Endocrine disrupting chemicals (EDCs) and pharmaceutical and personal care products (PPCPs).
A. True B. False

237. _____ may interfere with the endocrine systems by damaging hormone-producing tissues.
A. PPCPs D. Longer activated sludge SRTs
B. EDCs E. Slower growing bacteria
C. Ammonia oxidizing bacteria F. None of the Above

238. _____ comprise a diverse collection of thousands of chemical substances, including prescriptions.
A. SRTs D. Any microbiological organisms
B. PPCPs E. Endocrine disrupting chemicals (EDCs)
C. Nitrifying bacteria F. None of the Above

239. _____ refers broadly to those synthetic or naturally occurring chemicals, or to any microbiological organisms.
A. SRTs D. Emerging contaminants
B. PPCPs E. Endocrine disrupting chemicals (EDCs)
C. Nitrifying bacteria F. None of the Above

240. _____can fall into a wide range of groups defined by their effects, uses, or by their key chemical or microbiological characteristics?
A. PPCPs
B. Emerging contaminants
C. Ammonia oxidizing bacteria
D. Longer activated sludge SRTs
E. Slower growing bacteria
F. None of the Above

Removal of Emerging Contaminants by Nutrient Removal Technologies
241. Removal efficiencies were enhanced for several investigated contaminants at longer SRTs, with critical _____ for some beyond which removal rates did not improve.
A. SRTs
B. PPCPs
C. Nitrifying bacteria
D. Any microbiological organisms
E. Endocrine disrupting chemicals (EDCs)
F. None of the Above

242. _____allow for the establishment of slower growing bacteria, which in turn provide a more diverse community of microorganisms with broader physiological capabilities?
A. PPCPs
B. Longer SRTs
C. Ammonia oxidizing bacteria
D. Longer activated sludge SRTs
E. Slower growing bacteria
F. None of the Above

243. _____ may play a key role in biodegradation but the role of heterotrophic bacteria may also play a significant role?
A. SRTs
B. PPCPs
C. Nitrifying bacteria
D. Any microbiological organisms
E. Endocrine disrupting chemicals (EDCs)
F. None of the Above

244. Reverse osmosis has been found to effectively remove _____below detection limits.
A. PPCPs
B. Nitrification
C. Ammonia oxidizing bacteria
D. Longer activated sludge SRTs
E. Slower growing bacteria
F. None of the Above

Role of Solids Retention Time in Removal Efficiency
245. _____ allow for the establishment of slower growing bacteria that in turn provide a more diverse community of microorganisms with broader physiological capabilities.
A. Ammonia oxidation
B. Phosphorus removal
C. Longer activated sludge SRTs
D. An aerobic wastewater treatment facility
E. Oxygen demand of wastewater
F. None of the Above

246. _____ that are routinely detected in influent were not well removed by secondary treatment?
A. SRTs
B. PPCPs
C. Six compounds
D. Any microbiological organisms
E. Endocrine disrupting chemicals (EDCs)
F. None of the Above

Hand Compositing
247. Hand compositing is a series of time proportional grab samples that are collected and composited by hand.
A. True B. False

POTW's Wastewater Samples
General
248. Generally, there are four types of samples that are collected by the POTW's Sampling Section: grab, time proportional composites, flow proportional composites, and hand composites.
A. True B. False

249. _____ used depends largely on the types of analyses to be run, and the nature of the wastestream being sampled.
A. An analysis D. Taste test
B. The sampling method E. Blanks
C. Duplicate samples F. None of the Above

250. Which of the following sampling terms is an individual sample collected in less than 15 minutes without regard for flow or time of day?
A. Entire batch discharge D. An individual sample
B. The volume of sample E. Proportional composite sampling
C. A grab sample F. None of the Above

251. pH, cyanide, oil and grease, sulfide, and volatile organics must be collected as composite samples.
A. True B. False

252. _____would then be taken by means of time proportional composite sampling methods or by hand composite will provide a representative sample of the effluent being discharged.
A. An analysis D. Samples
B. Split samples E. Blanks
C. Duplicate samples F. None of the Above

253. _____to be collected by any of these methods is dependent on the number and types of analyses that must be performed.
A. Entire batch discharge D. An individual sample
B. The volume of sample E. Proportional composite sampling.
C. Concentration of pollutants F. None of the Above

Wastewater Grab Samples
254. Grab samples are individual samples collected in less than 3 minutes without regard to flow or time of day.
A. True B. False

255. _____are normally taken manually, but can be pumped.
A. Quantify the pollutants D. Time proportional composite sampling methods
B. Grab samples E. Flow proportional composites
C. Hand composites F. None of the Above

A grab sample is usually taken when a sample is needed to:
256. Provide information about _____of pollutants at a specific time.
A. Entire batch discharge D. An individual sample
B. The volume of sample E. An instantaneous concentration
C. Concentration of pollutants F. None of the Above

257. According the text, quantify the _____in a non-continuous discharge?
A. Pollutants D. Taste test
B. Split samples E. Blanks
C. Duplicate samples F. None of the Above

258. According the text, corroborate _____ if the waste is not highly variable.
A. Entire batch discharge D. An individual sample
B. The volume of sample E. Proportional composite sampling
C. Composite samples F. None of the Above

259. _____ not amenable to compositing such as pH, temperature, dissolved oxygen, chlorine, purgeable organics and sulfides, oil and grease, coliform bacteria, and sulfites.
A. Quantify the pollutants D. Monitor parameters
B. Grab samples E. Flow proportional composites
C. Hand composites F. None of the Above

Timed Composites
260. Which of the following sampling terms - are usually taken in instances where the intention is to characterize the wastes over a period of time without regard to flow?
A. Timed samples D. Time proportional composite sampling methods
B. Grab samples E. Flow proportional composites
C. Hand composites F. None of the Above

261. _____ consist of a series of equal volume grab samples taken at regular intervals.
A. Timed composite samples D. Time proportional composite sampling methods
B. Grab samples E. Flow proportional composites
C. Hand composites F. None of the Above

Flow Proportional Composites
262. _____ consist of: a series of grab samples whose volumes are equal in size and proportion to the flow at the time of sampling.
A. The sampling point(s) D. Routine QA/QC measures
B. Sample preservation E. Flow proportional composite samples
C. Duplicate samples F. None of the Above

263. _____ are taken at varying time intervals, or continuous samples taken over a period of time based on the flow?
A. Entire batch discharge D. An individual sample
B. The volume of sample E. Samples
C. Concentration of pollutants F. None of the Above

264. Wherever possible, grab sampling is recommended because it most accurately reflects the nature of the wastestream.
A. True B. False

265. _____taken at varying time intervals are most often collected by the sampling inspectors?
A. Entire batch discharge D. An individual sample
B. The volume of sample E. Proportional composite sampling
C. Equal volume samples F. None of the Above

Industrial Users - Permitted/Non-permitted Example
266. _____within an industry vary with each industry depending on the nature of the process and location of pretreatment facilities.
A. The sampling point(s) D. Routine QA/QC measures
B. Sample preservation E. Blanks
C. Duplicate samples F. None of the Above

267. Exact sampling locations must be identified on a case by case basis. The following general principles apply in all cases: A permanent sampling location(s) must be identified for use by the collection system.
A. True B. False

Wastewater Sample Preservation
268. One or more unstable pollutants that require immediate analysis or preservation until _____ can be made.
A. An analysis D. Taste test
B. Split samples E. Blanks
C. Duplicate samples F. None of the Above

269. According the text, sample preservation is needed for_____, for example, which may be stored for as long as 24 hours prior to transferring them to the laboratory.
A. Nitrified effluent D. Nitrogen and phosphorus levels
B. Composite samples E. Activated sludge
C. Total Nitrogen (TN) F. None of the Above

Quality Assurance/Quality Control Policy Example
270. According the text, Quality Assurance/Quality Control (QA/QC) measures taken by the sampling crew include equipment blanks, trip blanks, split samples and duplicate samples.
A. True B. False

271. Equipment blanks and _____are routine QA/QC measures.
A. The sampling point(s) D. Routine QA/QC measures
B. Sample preservation E. Trip blanks
C. Duplicate samples F. None of the Above

272. _____are taken for Local Limits (pretreatment) sampling and when requested by an industry or laboratory.
A. An analysis D. Taste test
B. Split samples E. Blanks
C. Duplicate samples F. None of the Above

273. _____ should be run when requested by a Supervisor or Project Leader.
A. An analysis D. Taste test
B. Split samples E. Blanks
C. Duplicate samples F. None of the Above

274. The laboratory needs to prepare _____used by the sampling crews.
A. The sampling point(s) D. Routine QA/QC measures
B. Sample preservation E. All trip blanks/travel blanks
C. Duplicate samples F. None of the Above

275. Any contamination detected in the _____ would result from field exposure that could in turn affect collected samples.
A. An analysis D. Taste test
B. Split samples E. Blanks
C. Duplicate samples F. None of the Above

Chain-of-Custody

276. Documentation of all pertinent data concerning the collection, preservation and transportation of samples is critical to the overall success of the Wastewater Sampling Program.
A. True B. False

277. If sampling is performed for the Pretreatment program, any sampling data may be used as evidence in court proceedings in this case _____ becomes critical.
A. Sampling crew D. Documentation
B. Duplicate samples E. Noncompliant industrial user
C. Pre-preserved bottles F. None of the Above

278. Laboratory personnel sign and date the chain of custody form, and return it to the sampling crew who makes two copies of the form. One copy is for the sampling crew files and the other is for data entry.
A. True B. False

Proper Sample Handling

279. The proper handling of _____also includes wearing gloves.
A. Other parameters D. Some samples
B. Pre-preserved bottles E. Water quality samples
C. Preservatives F. None of the Above

280. _____ are received from the laboratory, check to see that none has leaked.
A. Other parameters D. Some samples
B. Pre-preserved bottles E. Containers and preservatives
C. Preservatives F. None of the Above

281. _____should be labeled with type of preservative used, type of analysis to be done and be accompanied by a Safety Data Sheet (SDS).
A. Sampling crew D. Sampling bottles
B. Duplicate samples E. Noncompliant industrial user
C. Pre-preserved bottles F. None of the Above

282. Make sure you can tell if containers are pre-preserved, because you do not to overfill them when collecting samples in the field.
A. True B. False

283. Check with the laboratory about _____when using pre-preserved bottles.
A. Other parameters D. Some samples
B. Quality control procedures E. Organics
C. Preservatives F. None of the Above

284. If necessary, obtain extra coolersand never store coolers and containers near solvents, fuels or other sources of contamination or combustion. In warm weather, keep coolers and samples in the shade.
A. True B. False

285. Nitrile gloves are appropriate for?
A. Other parameters D. Some samples
B. Pre-preserved bottles E. Organics
C. Preservatives F. None of the Above

286. _____ use this procedure when coolers and containers are prepared, sealed and shipped?
A. Chain-of-custody
B. Duplicate samples
C. Pre-preserved bottles
D. Safety Data Sheet (SDS)
E. Noncompliant industrial user
F. None of the Above

287. _____are hydrochloric, nitric, sulfuric and ascorbic acids, sodium hydroxide, sodium thiosulfate, and biocides.
A. Other parameters
B. Pre-preserved bottles
C. Preservatives
D. Some samples
E. Organics
F. None of the Above

288. Many laboratories provide this term filled with measured amounts of preservatives.
A. Sampling crew
B. Duplicate samples
C. Pre-preserved bottles
D. Safety Data Sheet (**SDS**)
E. Noncompliant industrial user
F. None of the Above

Field Parameters
289. Be sure to measure and record the field parameters of temperature, electrical conductivity, pH and _____in an undisturbed section of stream flow.
A. Nitrified effluent
B. Nitrogen
C. Total Nitrogen (TN)
D. Dissolved oxygen
E. Activated sludge
F. None of the Above

Dissolved Oxygen
290. Aerobic means without air and some bacteria thrive under these conditions and utilize the nutrients and chemicals available to exist.
A. True B. False

291. At least two general forms of bacteria act in balance in a wastewater digester: Saprophytic organisms and?
A. Methane Fermenters
B. DO fermenters
C. Carbon dioxide fermenters
D. Butyric acid fermenters
E. Aerobic fermenters
F. None of the Above

292. The saprophytes exist on dead or decaying materials.
A. True B. False

293. The methane fermenting bacteria require a pH range of 6.6 to 7.6 to be able to live and reproduce.
A. True B. False

294. Aerobic bacteria do not require oxygen to live and thrive.
A. True B. False

295. Aerobes decompose inorganics in the water; the result is carbon dioxide and H_2SO_4.
A. True B. False

296. Dissolved oxygen (DO) in water is considered a contaminant.
A. True B. False

297. Dissolved oxygen level is important because too much or not enough dissolved oxygen can create?
A. Unfavorable conditions D. Frequent dissolved oxygen measurement
B. DO analysis E. Aerobic conditions
C. Carbon dioxide F. None of the Above

298. A lack of Dissolved oxygen in natural waters creates?
A. Anaerobic conditions D. Phosphorus-reduction system(s)
B. Methane fermenters E. Excessive sludge production
C. Denitrification F. None of the Above

299. _____ live on the volatile acids produced by these saprophytes.
A. Wildlife habitat D. Phosphorus-reduction system(s)
B. Methane fermenters E. Excessive sludge production
C. Denitrification F. None of the Above

300. _____ indicate that dissolved oxygen is present.
A. Sample(s) D. Frequent dissolved oxygen measurement
B. DO analysis E. Aerobic conditions
C. Carbon dioxide F. None of the Above

301. _____ in a water sample can be detrimental to metal pipes in high concentrations because oxygen helps accelerate corrosion.
A. Winkler Method D. Anaerobic conditions
B. Dissolved Oxygen E. The iodometric (titration) test
C. Only molecular oxygen F. None of the Above

302. Oxygen's primary value is to oxidize iron and manganese into forms that will precipitate out of the water, it also removes excess carbon dioxide.
A. True B. False

303. _____ in a water sample will affect the taste of drinking water.
A. Sample(s) D. Dissolved oxygen
B. DO analysis E. Aerobic conditions
C. Carbon dioxide F. None of the Above

Methods of Determination
304. Temperature, atmospheric pressure, salinity, biological activity and pH all have an effect on the (DO) content.
A. True B. False

305. _____ procedure is based on the rate of diffusion of molecular oxygen across a membrane.
A. Membrane electrode method D. Anaerobic conditions
B. Dissolved Oxygen E. Iodometric (titration) test
C. Only molecular oxygen F. None of the Above

306. Many factors determine the _____in a water sample.
A. Solubility of oxygen D. Frequent dissolved oxygen measurement
B. DO analysis E. Aerobic conditions
C. Carbon dioxide F. None of the Above

Iodometric Test

307. The iodometric (titration) test is not a very precise and reliable for (DO) analysis of samples.
A. True B. False

308. Reactions take place with the addition of certain chemicals that liberate iodine equivalent to the?
A. Original (DO) content D. Anaerobic conditions
B. Dissolved Oxygen E. Iodometric (titration) test
C. Only molecular oxygen F. None of the Above

309. _____ can liberate iodine from iodides, and some reducing agents reduce iodine to iodide.
A. Ammonia oxidation D. An aerobic wastewater treatment facility
B. Phosphorus removal E. Oxygen demand of wastewater
C. Certain oxidizing agents F. None of the Above

310. _____ effectively removes interference caused by nitrates in the water sample, so a more accurate determination of (DO) can be made.
A. Winkler Method D. The alkaline Iodide-Azide reagent
B. Dissolved Oxygen E. The iodometric (titration) test
C. Only molecular oxygen F. None of the Above

311. _____ are highly dependent on the source and characteristics of the sample.
A. Methods of analysis D. Frequent dissolved oxygen measurement
B. DO analysis E. Aerobic conditions
C. Carbon dioxide F. None of the Above

312. The magnetic method involves an oxygen permeable plastic membrane that serves as a diffusion barrier against impurities.
A. True B. False

313. The effect of oxidation wastes on streams, the suitability of water for fish and other organisms and the progress of self-purification can all be measured or estimated from the dissolved oxygen content.
A. True B. False

314. _____ passes through the membrane and is measured by the meter.
A. Carbon dioxide D. H_2S
B. Dissolved Oxygen E. Carbon
C. Only molecular oxygen F. None of the Above

315. According to the text, membrane electrodes provide an excellent method for _____in polluted, highly colored turbid waters and strong waste effluents.
A. Sample(s) D. Frequent dissolved oxygen measurement
B. DO analysis E. Aerobic conditions
C. Carbon dioxide F. None of the Above

316. Proper samples must be taken in _____bottles where agitation or contact with air is at a minimum.
A. Sample(s) D. Frequent dissolved oxygen measurement
B. DO analysis E. Aerobic conditions
C. BOD F. None of the Above

317. _____ is the one of the most important analyses in determining the quality of natural waters.

A. Winkler Method
B. Dissolved Oxygen
C. The dissolved oxygen test
D. Anaerobic conditions
E. The iodometric (titration) test
F. None of the Above

318. _____ measurement is essential for adequate process control.

A. Sample(s)
B. DO analysis
C. Carbon dioxide
D. Dissolved oxygen
E. Aerobic conditions
F. None of the Above

Sludge Volume Index (SVI)

319. The higher the (SVI), the better is the settling quality of the aerated mixed liquor, low (SVI) of 50 or less is considered a good settling sludge.

A. True B. False

320. The Sludge Volume Index (SVI) of activated sludge is defined as the volume in milliliters occupied by _____ after settling for 30 minutes.

A. A closed loop
B. 1g of activated sludge
C. Optimal DO levels
D. Trickling filter FFSs
E. A portion of the denitrified effluent
F. None of the Above

Microorganisms in Lagoons

321. Swimming and _____engulf bacteria or other prey.

A. Strict aerobes
B. Predators
C. Bacteria
D. Heterotrophic bacteria
E. Gliding ciliates
F. None of the Above

322. _____ attach to the biomass and vortex suspended bacteria into their gullets, while crawlers break bacteria loose from the floc surface.

A. Treatment organism(s)
B. Aerobic bacteria
C. Stalked ciliate(s)
D. Floc-forming bacteria
E. Filamentous bacteria
F. None of the Above

323. The omnivores, such as most of these bugs, eat whatever is readily available, while which missing terms feed on the floc or prey on larger organisms?

A. Strict aerobes
B. Worms
C. Swimming ciliates
D. Heterotrophic bacteria
E. Many bacterial species
F. None of the Above

324. The following changes in food, dissolved oxygen, temperature, pH, total dissolved solids, sludge age, presence of toxins, and other factors create a dynamic environment for the?

A. Treatment organism(s)
B. Aerobic bacteria
C. Stalked ciliate(s)
D. Floc-forming bacteria
E. Filamentous bacteria
F. None of the Above

325. Food (organic loading) regulates?

A. Strict aerobes
B. Predators
C. Microorganism numbers
D. Heterotrophic bacteria
E. Many bacterial species
F. None of the Above

Aerobic Bacteria

326. Three functional groups of aerobic bacteria found in the activated sludge process are: freely dispersed, single bacteria; floc-forming bacteria; and filamentous bacteria.
A. True B. False

327. All groups of aerobic bacteria oxidize organic carbon (BOD) to produce CO_2 and new bacteria.
A. True B. False

328. _____ that degrade wastes grow as single bacteria dispersed in the wastewater.
A. Strict aerobes D. Heterotrophic bacteria
B. Predators E. Many bacterial species
C. Bacteria F. None of the Above

329. _____ grow in a large aggregate (floc).
A. Treatment organism(s) D. Floc-forming bacteria
B. Aerobic bacteria E. Filamentous bacteria
C. Stalked ciliate(s) F. None of the Above

330. The floc-forming bacteria degrade _____ and settle at the end of the process, resulting in a low TSS effluent.
A. Anaerobic bacteria D. Aerobic bacteria
B. Dissolved oxygen E. Application-specific bacteria
C. BOD F. None of the Above

331. _____occur in lagoons, usually at specific growth environments.
A. Anaerobic action D. Aerobic bacteria
B. Absence of free oxygen E. Application-specific bacteria
C. A number of filamentous bacteria F. None of the Above

332. Filamentous bacteria do not cause operational problems in lagoons, but cause filamentous bulking and _____ in activated sludge processes.
A. Strict aerobes D. Poor sludge settling
B. Predators E. Many bacterial species
C. Bacteria F. None of the Above

333. Aerobic BOD removal does not work very well from pH 6.5 to 9.0 and at temperatures from 3-4°C to 60-70°C.
A. True B. False

334. BOD removal decreases rapidly below 3-4°C and ceases at 1-2°C
A. True B. False

335. Ammonia can be oxidized to nitrate by _____.
A. Strict aerobes D. Heterotrophic bacteria
B. Predators E. Many bacterial species
C. Nitrifying bacteria F. None of the Above

Aerated Lagoons

336. The aerated lagoons are basins, normally excavated in earth and operated without solids recycling into the system. This is the major difference with respect to activated sludge systems.
A. True B. False

337. Two types are the most common: The Aerobic-anaerobic or partially suspended lagoon in which the concentration of solids and dissolved oxygen are maintained uniform and neither the incoming solids nor the biomass of microorganisms' settle, and the completely mixed lagoon.
A. True B. False

338. In the facultative lagoons, the power input is reduced causing accumulation of solids in the bottom which undergo_____, while the upper portions are maintained aerobic.
A. Facultative lagoon(s) D. Odors
B. Anaerobic decomposition E. Complete nitrification
C. Aerated lagoon(s) F. None of the Above

339. Lagoons which are exposed to low temperatures can cause _____ and eventually the formation of ice.
A. Non-biodegradable fraction D. Reduced biological activity
B. Substantial alkalinity E. Suspended solids in the effluent
C. Completely mixed lagoon F. None of the Above

340. If excavated basins are used for settling, care should be taken to provide a residence time long enough for the?
A. Facultative lagoon(s) D. Odors
B. Sludge E. Complete nitrification
C. Solids to settle F. None of the Above

341. _____might develop in the upper layers contributing to an increased content of suspended solids in the effluent.
A. Non-biodegradable fraction D. Settled sludge, and algae
B. Substantial alkalinity E. Suspended solids in the effluent
C. Completely mixed lagoon F. None of the Above

342. _____can be minimized by using minimum depths of up to 2 m.
A. Facultative lagoon(s) D. Odors
B. Sludge E. Complete nitrification
C. Aerated lagoon(s) F. None of the Above

343. According to the text, accumulated solids will, overall?
A. Non-biodegradable fraction D. Decompose in the bottom
B. Substantial alkalinity E. Suspended solids in the effluent
C. Completely mixed lagoon F. None of the Above

Nitrification
344. Nitrosomonas europaea, which oxidizes ammonia to nitrite, and Nitrobacter winogradskyi, which oxidizes nitrite to nitrate.
A. True B. False

345. Which of the following bugs require a neutral pH and substantial alkalinity?
A. Nitrifying bacteria D. Aerobic bacteria
B. Methane forming bacteria E. Anaerobic, heterotrophic bacteria
C. Two bacteria F. None of the Above

346. Nitrification ceases at pH values above pH 9 and declines markedly at pH values below 7.
A. True B. False

347. Nitrification is a major pathway for nitrogen removal in lagoons.
A. True B. False

348. Nitrifying bacteria exists in low numbers in lagoons, they prefer attached growth systems and/or?
A. Nitrifying bacteria
B. Methane forming bacteria
C. High MLSS sludge systems
D. Aerobic bacteria
E. Anaerobic, heterotrophic bacteria
F. None of the Above

Anaerobic Bacteria
349. Which of the following bugs or related terms commonly occur in lagoons are involved in methane formation and in sulfate reduction?
A. Nitrifying bacteria
B. Methane forming bacteria
C. Only two bacteria
D. Aerobic bacteria
E. Anaerobic, heterotrophic bacteria
F. None of the Above

350. Anaerobic methane formation involves _____bacteria.
A. Three different groups of anaerobic
B. Methane fermentation
C. Methane bacteria
D. Organic overloading conditions
E. Acid-forming bacteria
F. None of the Above

351. Which of the following bugs or related terms many genera of anaerobic bacteria hydrolyze proteins, fats, and polysaccharides present in wastewater to amino acids?
A. Nitrifying bacteria
B. Methane forming bacteria
C. General anaerobic degraders
D. Aerobic bacteria
E. Anaerobic, heterotrophic bacteria
F. None of the Above

Photosynthetic Organisms
352. Which of the following bugs or related terms - this diverse group of bacteria converts products from above under anaerobic conditions to simple alcohols and organic acids?
A. BOD and sulfate
B. Methane fermentation
C. Methane bacteria
D. Organic overloading and anaerobic conditions
E. Acid-forming bacteria
F. None of the Above

353. Which of the following bugs or related terms these bacteria convert formic acid, methanol, methylamine, and acetic acid under anaerobic conditions to methane?
A. Nitrifying bacteria
B. Methane forming bacteria
C. General anaerobic degraders
D. Aerobic bacteria
E. Anaerobic, heterotrophic bacteria
F. None of the Above

354. A problem exists at times where the acid formers overproduce organic acids, lowering the pH below where the methane bacteria can function (a pH < 6.5). This can stop methane formation and lead to a buildup of sludge in a lagoon with a low pH. In an anaerobic fermenter, this is called a "stuck digester".
A. True B. False

355. _____ are environmentally sensitive and have a narrow pH range of 6.5-7.5 and require temperatures > 14^{o} C.
A. BOD and sulfate
B. Methane fermentation
C. Methane bacteria
D. Organic overloading and anaerobic conditions
E. Acid-forming bacteria
F. None of the Above

356. _____ that the products of these bugs become the substrate for the methane producers.

A. Nitrifying bacteria
B. Methane forming bacteria
C. Acid formers (principally acetic acid)
D. Aerobic bacteria
E. Anaerobic, heterotrophic bacteria
F. None of the Above

357. _____ceases at cold temperature.

A. BOD and sulfate
B. Methane fermentation
C. Methane bacteria
D. Organic overloading and anaerobic conditions
E. Acid-forming bacteria
F. None of the Above

358. _____ can use sulfate as an electron acceptor, reducing sulfate to hydrogen sulfide?

A. Nitrifying bacteria
B. Methane forming bacteria
C. Sulfate reducing bacteria
D. Aerobic bacteria
E. Anaerobic, heterotrophic bacteria
F. None of the Above

359. _____is a major cause of odors in ponds?

A. Sulfate reduction
B. Methane fermentation
C. Methane bacteria
D. Organic overloading and anaerobic conditions
E. Acid-forming bacteria
F. None of the Above

360. _____ and represented by about 28 genera, oxidize reduced sulfur compounds using light energy to produce sulfur and sulfate.

A. Nitrifying bacteria
B. Methane forming bacteria
C. Red and green sulfur bacteria
D. Aerobic bacteria
E. Anaerobic, heterotrophic bacteria
F. None of the Above

361. _____ which can grow in profusion and give a lagoon a pink or red color.

A. Chromatium, Thiocystis, and Thiopedia
B. Methane fermentation
C. Methane bacteria
D. Organic overloading
E. Acid-forming bacteria
F. None of the Above

362. According to the text, conversion of odorous sulfides to sulfur and sulfate by these bugs is a significant odor control mechanism in facultative and anaerobic lagoons.

A. BOD and sulfate
B. Sulfur bacteria
C. Methane bacteria
D. Organic overloading and anaerobic conditions
E. Acid-forming bacteria
F. None of the Above

Treatment Lagoon

363. _____ at a treatment lagoon is determined by the various chemical species of alkalinity that are present.

A. Bicarbonate ion (HCO_3)
B. CO_2
C. Carbonate ion (CO_2^3)
D. pH
E. Phosphorus
F. None of the Above

364. High amounts of _____ yield a low lagoon pH, while high amounts of CO_2^3 yield a high lagoon pH.

A. Alkalinity and pH
B. CO_2
C. BOD
D. Algal growth
E. Phosphorus
F. None of the Above

365. Bacterial growth on BOD releases CO_2 which subsequently dissolves in water to yield?.
A. Bicarbonate ion (HCO_3)
B. CO_2
C. Carbonate ion (CO_2^3)
D. Carbonic acid (H_2CO_3)
E. Phosphorus
F. None of the Above

366. According to the text, algal growth in lagoons has the opposite effect on lagoon_____, raising the pH due to algal use for growth of inorganic carbon (CO_2 and HCO_3).
A. Alkalinity and pH
B. CO_2
C. BOD
D. pH
E. Phosphorus
F. None of the Above

367. Algal growth reduces the lagoon alkalinity that may cause the _____ to increase if the lagoon alkalinity (pH buffer capacity) is low.
A. Bicarbonate ion (HCO_3)
B. CO_2
C. Carbonate ion (CO_2^3)
D. pH
E. Phosphorus
F. None of the Above

368. Algae can grow to such an extent in lagoons that they consume?
A. Alkalinity and pH
B. CO_2
C. BOD
D. All of the CO_2 and HCO_3
E. Phosphorus
F. None of the Above

369. pH caused by _____can be beneficial.
A. Bicarbonate ion (HCO_3)
B. CO_2
C. Carbonate ion (CO_2^3)
D. Algal growth
E. Phosphorus
F. None of the Above

370. Which of the following related terms, removal by natural chemical precipitation is greatly enhanced at pH values greater than pH = 8.5?
A. Alkalinity and Ph
B. CO_2
C. BOD
D. Algal growth
E. Phosphorus
F. None of the Above

Protozoans and Microinvertebrates

371. Many higher life forms (animals) develop in lagoons. These include protozoans and microinvertebrates such as rotifers, daphnia, annelids, chironomids, and mosquito larvae.
A. True B. False

372. _____ best describe the most common higher life forms in lagoons with about 250 species identified in lagoons to date.
A. Mosquitoes
B. Bacteria and algae
C. Protozoans
D. Rotifers and daphnia
E. Culex tarsalis
F. None of the Above

373. _____ best describe important at controlling algal overgrowth and these often "bloom" when algal concentrations are high.
A. Mosquitoes
B. Bacteria and algae
C. Protozoans
D. Rotifers and daphnia
E. Culex tarsalis
F. None of the Above

374. _____ best describe relatively slow growing and only occur in systems with a detention time of >10 days?

A. Mosquitoes
B. Bacteria and algae
C. Protozoans
D. Rotifers and daphnia
E. Microinvertebrates
F. None of the Above

375. The requirement for a minimum lagoon bank slope and removal of shoreline vegetation by most regulatory agencies is based on the public health need to reduce mosquito vectors.

A. True B. False

Activated Sludge Methods
Wastewater Bug Section

376. In the Activated Sludge process, the _____are also called waste activated sludge.

A. Organisms
B. Settled bugs
C. Mixed liquor
D. Secondary treatment
E. Sludge Volume Index
F. None of the Above

377. The waste sludge is treated separately. The remaining wastewater is now much cleaner. In fact, after primary and _____, about 85% or more of all pollutants in the wastewater has been removed and it goes on to disinfection.

A. Oxygen
B. Settled bugs
C. Activated sludge
D. Secondary treatment
E. Settleable Solids
F. None of the Above

378. The first group is the bacteria which eat the dissolved organic compounds is generally four (4) groups of bugs that do most of the "eating" in the _____process.

A. Mixed liquor
B. Settled bugs
C. Activated sludge
D. Secondary treatment
E. Total Dissolved Solids
F. None of the Above

379. The second and third groups of bugs are microorganisms known as the free-swimming and _____. These larger bugs eat the bacteria and are heavy enough to settle by gravity.

A. Mixed liquor
B. Suctoria
C. Stalked ciliates
D. Bacteria
E. Volatile Solids
E. None of the Above

380. _____ feeds on the larger bugs and assist with settling is in the fourth group, known as?

A. Water bear
B. Suctoria
C. Activated sludge bugs
D. Rotifer
E. Vorticella
F. None of the Above

381. _____have several interesting properties--their "fat reserve" is stored on the outside of their body and this strange feature.

A. Fur
B. Feet
C. Eyes
D. No Mouth
E. No Cilia
F. None of the Above

382. Once the bacteria have “contacted” their food, they start the digestion process. A chemical enzyme is sent out through the cell wall to break up the_____.
A. Mixed liquor D. Bacteria
B. Organic compounds E. Total Dissolved Solids
C. Activated sludge F. None of the Above

383. The cell is highly engineered and because of this hydrolytic enzyme, it breaks the organic molecules into small units which are able to pass through the cell wall of the _____.
A. Mixed bugs D. Bacteria
B. Compound E. Protozoan
C. Organism F. None of the Above

384. In wastewater treatment, the process of using bacteria-eating-bugs in the presence of oxygen to reduce the organics in water is called?
A. Mixed liquor D. Reduction
B. Oxidation E. Settleable Solids
C. Activated sludge F. None of the Above

385. Activated Sludge: The first step in the process, the contact of the bacteria with the organic compounds, takes about?
A. 24 hours D. 30 Minutes
B. 2 Hours E. 72 Hours
C. 1 Hour F. None of the Above

386. An asset in settling the bug is its fat storage property and as the bugs “bump” into each other, the fat on each of them sticks together and causes flocculation of the _____.
A. Mixed liquor D. WAS
B. Floc E. Settleable Solids
C. Non-organic solids and biomass F. None of the Above

387. What does facultative mean as far as bugs? What environments are they adaptable to survive and multiply in?
A. Either anaerobic or aerobic conditions D. Aerobic only
B. Anaerobic only E. Volatile
C. Facultative F. None of the Above

388. We need to be able to properly identify the bugs and this common bug is a medium size to large swimming Ciliate, commonly observed in activated sludge, sometimes in abundant numbers.
A. Vorticella D. Euchlanis
B. Euglypha E. Rotifer
C. Paramecium F. None of the Above

Activated Sludge Methods-Organic Load

389. The organic loading from primary treatment processes enters the reactor (aeration basin) where the active microbial population is present.
A. True B. False

390. The mixture of wastewater, oxygen, and microorganisms flows from the aeration basin to a secondary clarifier where the cells (microorganisms) are settled. The settled microorganisms are also called waste activated sludge.
A. True B. False

391. The flocculating characteristics of the cells improve the longer they are retained in the system, since they start to produce extra cellular slime which favors _____.

A. Secondary settling
B. High degradation rate
C. Flocculating
D. Organic load
E. Settled biomass
F. None of the Above

Common Types

392. In the conventional activated sludge process, baffles in the aeration tank cause the wastewater to circulate along the aeration tank in _____.

A. Plug flow mode
B. Laminar flow mode
C. 24 to 48 hours
D. Higher organic load
E. Settled biomass
F. None of the Above

393. In the completely mixed activated sludge process, wastewater inflow streams enter the aeration basin at several points to facilitate the homogeneity of the mixing.

A. True B. False

Paramecium sp.

394. Paramecium is a _____ commonly present in activated sludge. It is medium to large size (100-300 µm).

A. Shelled amoebas
B. Euglypha
C. Vorticella
D. Stalked ciliate
E. Swimming ciliate
F. None of the Above

395. Paramecium is _____ over the entire body surface, allowing it to swim with a smooth gliding motion.

A. Round-shaped
B. Inflexible
C. Coiled
D. Stalked
E. Uniformly ciliated
F. None of the Above

396. Paramecium may also be seen paired up with another _____ which makes a good diagnostic key.

A. Shelled amoeba(s)
B. Euglypha
C. Vorticella
D. Stalked ciliate
E. Paramecium
F. None of the Above

397. _____ swim freely in the water column and filter suspended bacteria from the water.

A. Shelled amoeba(s)
B. Euglypha
C. Vorticella
D. Stalked ciliate
E. Paramecium
F. None of the Above

Vorticella sp.

398. Vorticella is a _____ found in activated sludge that ranges in length from 30 to 150 µm.

A. Shelled amoeba(s)
B. Euglypha
C. Vorticella
D. Stalked ciliate
E. Paramecium
F. None of the Above

399. Characteristics of a Vorticella organism include: oval to round shape; contractile stalk; domed feeding zone; and a water vacuole located near the terminal end of the feeding cavity.

A. True B. False

400. After reproducing, the offspring of a Vorticella develops swimming cilia and forms its own stalk.
A. Shelled amoeba(s) D. Swarmer
B. Euglypha E. Paramecium
C. Vorticella F. None of the Above

401. A bunch of empty _____ indicates poor conditions in an activated sludge system, such as low DO or toxicity.
A. Shelled amoebas D. Stalked ciliates
B. Euglypha E. Ciliates
C. Vorticella stalks F. None of the Above

402. _____are present when the plant effluent quality is high.
A. Shelled amoeba(s) D. Stalked ciliate
B. Euglypha E. Paramecium
C. Vorticella F. None of the Above

403. The organism expelled during the reproduction of a Vorticella is called a _____.
A. Shelled amoebas D. Swarmer
B. Euglypha E. Paramecium
C. Vorticella F. None of the Above

Euglypha sp.
404. Euglypha are _____ with jelly-like bodies and range in size from 70 to 100 µm.
A. Shelled amoeba(s) D. Stalked ciliates
B. Euglypha E. Paramecium
C. Vorticella F. None of the Above

405. Euglypha move and feed on bacteria by extending the pseudopodia outward in long, thin, rays.
A. True B. False

406. _____are common in soil, treatment plants, and stream bottoms where decaying organic matter is present?
A. Shelled amoeba(s) D. Stalked ciliate
B. Euglypha E. Paramecium
C. Vorticella F. None of the Above

407. _____is a shelled (testate) amoeba?
A. Shelled amoeba(s) D. Stalked ciliate
B. Euglypha E. Paramecium
C. Vorticella F. None of the Above

408. _____have a rigid covering which is either secreted or built from sand grains or other extraneous materials?
A. Euglypha D. Euchlanis
B. Shelled amoeba(s) E. Spirochaetes
C. Rotifer(s) F. None of the Above

Euchlanis sp.
409. Euchlanis is a swimmer, using its foot and cilia for locomotion. In common with other rotifers, it has a head rimmed with cilia, a transparent body, and a foot with two strong swimming toes.
A. True B. False

410. Euchlanis is a typical _____. It uses cilia rimmed around its head and a foot with two strong swimming toes for locomotion. It also has a transparent body.
A. Euglypha D. Euchlanis
B. Shelled amoeba(s) E. Spirochaetes
C. Rotifer(s) F. None of the Above

411. Euchlanis is _____ that eats detritus, bacteria, and small protozoa.
A. Euglypha D. Euchlanis
B. Shelled amoeba E. Spirochaetes
C. An omnivore F. None of the Above

412. Which of the following bugs has a glassy shell secreted by its outer skin?
A. Euglypha D. Euchlanis
B. Shelled amoeba(s) E. Spirochaetes
C. Rotifer(s) F. None of the Above

413. A characteristic of this creature is their mastax?
A. Euglypha D. Euchlanis
B. Shelled amoeba(s) E. Spirochaetes
C. Rotifer(s) F. None of the Above

414. The presence of Euchlanis in _____ is evidence that aerobic conditions have be sustained, and that effluent quality is good.
A. Biofilm D. Activated sludge
B. Plant effluent E. Wastewater
C. Some bacteria F. None of the Above

Bacteria Section
415. Bacteria shapes can be round spheres (cocci), cylindrical (rods), or twisted, bent, or curved rods (spirilla).
A. True B. False

416. _____ live in chains, one after the other, and often have long thin cells.
A. Biofilm bacteria D. Activated sludge bacteria
B. Filamentous bacteria E. Omnivores
C. Some bacteria F. None of the Above

417. A plane or thin layer of bacteria over the surface of an object is called _____.
A. Filamentous Bacteria D. Either anaerobic or aerobic conditions
B. A biofilm E. Anaerobic to aerobic state
C. Application-specific bacteria F. None of the Above

418. _____ secrete sticky substances that form the gel in which they live.
A. Biofilm bacteria D. Activated sludge bacteria
B. Filamentous bacteria E. Omnivores
C. Some bacteria F. None of the Above

Filamentous Bacteria
419. The floc structure created by filamentous bacteria keeps the floc from breaking up or shearing due to the turbulence from pumps, aeration, or transfer of the water.
A. True B. False

420. Filamentous bacteria found in wastewater function similar to _____. They degrade BOD well and add stability and backbone to the floc structure.
A. Biofilm bacteria D. Activated sludge
B. Filamentous bacteria E. Floc forming bacteria
C. Some bacteria F. None of the Above

421. According to the text, filaments are _____that grow in long thread-like strands or colonies.
A. Bacteria D. Bacteria and fungi
B. Facultative Bacteria E. Anaerobic to aerobic state bacteria
C. Application-specific bacteria F. None of the Above

Site Specific Bacteria
422. The efficient degradation of organic matter depends on two key operational parameters – aeration and biofilm building.
A. True B. False

423. _____ become site-specific over time as the biofilm develops and matures. The site-specific bacteria are even more effective in treating the waste stream at that particular treatment plant.
A. Anaerobic action D. Aerobic bacteria
B. Absence of free oxygen E. Application-specific bacteria
C. Facultative bacteria F. None of the Above

Facultative Bacteria
424. Facultative bacteria can survive and multiply in either anaerobic or aerobic conditions.
A. True B. False

425. According to the text, usually, facultative bacteria will be _____ unless there is some type of mechanical or biochemical process used to add oxygen to the wastewater.
A. Anaerobic D. Aerobic
B. Absence of free oxygen E. Application-specific bacteria
C. Facultative bacteria F. None of the Above

426. When oxygen is added to the environment of facultative bacteria, the metamorphosis from _____ takes place within a couple of hours.
A. Filamentous bacteria D. Site-specific bacteria
B. Facultative bacteria E. Anaerobic to aerobic state
C. Application-specific bacteria F. None of the Above

Anaerobic Bacteria
427. _____ live and reproduce when free oxygen is absent.
A. Site-specific bacteria D. Aerobic bacteria
B. Anaerobic bacteria E. Application-specific bacteria
C. Facultative bacteria F. None of the Above

428. Organic material in an anaerobic treatment system must be exposed to _____ and/or detained for a much longer period to remove a given amount of organic material.
A. Nitrogen D. Aerobic bacteria
B. Free oxygen E. A significantly higher quantity of bacteria
C. Air F. None of the Above

429. Septic tanks use _____ to break down organic material.
A. Filamentous organisms
B. Floc particles
C. Organic material
D. Anaerobic bacteria
E. Biosurfactant trehalose
F. None of the Above

430. _____ can be hazardous because they release hydrogen sulfide and methane gas.
A. Filamentous Bacteria
B. Anaerobic bacteria
C. Application-specific bacteria
D. Either anaerobic or aerobic conditions
E. Aerobic bacteria
F. None of the Above

431. Because of _____, hydrogen sulfide or explosive methane gas can accumulate in the collection system and be life-threatening.
A. Anaerobic action
B. Free oxygen
C. Facultative bacteria
D. Aerobic bacteria
E. Application-specific bacteria
F. None of the Above

Aerobic Bacteria
432. Aerobic bacteria require free oxygen to live and multiply.
A. True B. False

433. Facultative bacteria become aerobic when oxygen is present.
A. True B. False

434. Since the metabolism of aerobes is much higher than _____, organic material can be removed with 90% fewer organisms or in 90% less time compared to the anaerobic process.
A. Anaerobic action
B. Anaerobes
C. Facultative bacteria
D. Aerobic bacteria
E. Application-specific bacteria
F. None of the Above

435. The by-products of _____ are carbon dioxide and water.
A. Anaerobic action
B. Absence of free oxygen
C. Facultative bacteria
D. Aerobic bacteria
E. Application-specific bacteria
F. None of the Above

436. _____or bugs live in colonial structures called floc.
A. Anaerobic action
B. Absence of free oxygen
C. Facultative bacteria
D. Aerobic bacteria
E. Application-specific bacteria
F. None of the Above

437. With the mechanical nature of the_____, maintenance and operator oversight are required.
A. Aerobic digestion process
B. Facultative
C. Application-specific bacteria
D. Either anaerobic or aerobic conditions
E. Anaerobic to aerobic state
F. None of the Above

Protozoans and Metazoans
438. In a wastewater treatment system, the next higher life form above bacteria is?
A. Nematodes and rotifers
B. Metazoan(s)
C. Protozoan(s)
D. Protozoan and metazoan
E. Aerobic floc
F. None of the Above

439. _____or bugs are also indicators of biomass health and effluent quality.
A. Organic material
B. Protozoans
C. Macroinvertebrates
D. Biomass health and effluent quality
E. Aerobic flocs
F. None of the Above

440. _____or bugs are very similar to protozoans except that they are usually multi-celled animals.
A. Nematodes and rotifers
B. Metazoan(s)
C. Protozoan(s)
D. Protozoan and metazoan
E. Aerobic floc
F. None of the Above

441. _____or bugs are typically found only in a well-developed biomass.
A. Nematodes and rotifers
B. Metazoan(s)
C. Protozoan(s)
D. Protozoan and metazoan
E. Macroinvertebrates
F. None of the Above

442. _____or bugs and the relative abundance of certain species can be a predictor of operational changes within a treatment plant.
A. Nematodes and rotifers
B. Metazoan(s)
C. Protozoan(s)
D. Protozoans and metazoans
E. Macroinvertebrates
F. None of the Above

Dispersed Growth

443. Dispersed growth is material suspended within the activated sludge process that has not been adsorbed into the floc particles. This material consists of very small quantities of colloidal (too small to settle out) bacteria as well as organic and inorganic particulate material.
A. True B. False

444. According to the text, while a small amount of _____between the floc particles is normal, excessive amounts can be carried through a secondary clarifier.
A. Denitrification process
B. Organic material
C. Bulking sludge
D. Dispersed growth
E. Anaerobic sludge
F. None of the Above

Activated Sludge Aerobic Flocs

445. Aerobic flocs in a healthy state are referred to as activated sludge. While aerobic floc has a metabolic rate approximately 10 times higher than anaerobic sludge, it can be increased even further by exposing the bacteria to an abundance of oxygen.
A. True B. False

446. Wastewater treatment efficiencies and removal levels are so much improved that additional downstream treatment components are?
A. Denitrification process
B. Organic material
C. Bulking sludge
D. Insufficient aeration in the reactor
E. Dramatically reduced or totally eliminated
F. None of the Above

Problems may appear during the operation of activated sludge systems, including:

447. _____content in clarified effluent, which may be due to too high or too low solids retention time and to growth of filamentous microorganisms.
A. Organic material
B. High solids
C. Macroinvertebrates
D. Biomass health and effluent quality
E. Aerobic flocs
F. None of the Above

448. _____occurrs when sludge that normally settles rises back to the surface after having settled.
A. Denitrification process
B. Organic material
C. Bulking sludge
D. Insufficient aeration in the reactor
E. Rising sludge
F. None of the Above

449. _____ that which settles too slowly and is not compactable, and caused by the predominance of filamentous organisms?
A. Denitrification process
B. Organic material
C. Bulking sludge
D. Insufficient aeration in the reactor
E. Anaerobic sludge
F. None of the Above

450. According to the text, insufficient reduction of organic load, probably caused by a_____, insufficient amount of nutrients such as P or N.
A. Filamentous organisms
B. Floc particles
C. Organic material
D. Low solids retention time
E. Biosurfactant trehalose
F. None of the Above

451. Odors, caused by _____in the settling tanks or insufficient aeration in the reactor.
A. Denitrification process
B. Organic material
C. Bulking sludge
D. Insufficient aeration in the reactor
E. Anaerobic conditions
F. None of the Above

Filamentous Organisms

452. _____ reach too high a concentration, they can extend dramatically from the floc particles.
A. Filamentous organisms
B. Floc particles
C. Organic material
D. Process control variation
E. Biosurfactant trehalose
F. None of the Above

453. _____because ofthe increased surface area and without a corresponding increase in mass, this will not settle well.
A. Larger floc particles
B. Activated sludge
C. Floating scum mat
D. Biomass
E. Filaments
F. None of the Above

454. _____due to the high surface area of this term will reach an excess concentration?
A. Filamentous organisms
B. Floc particles
C. Organic material
D. Process control variation
E. Filamentous bacteria
F. None of the Above

455. The majority of filamentous organisms are bacteria, although some of them are classified as algae, fungi or other life forms. There are a number of types of filamentous bacteria which proliferate in the Activated sludge process.
A. True B. False

456. Filamentous organisms serve to strengthen the?
A. Filamentous organisms
B. Floc particles
C. Organic material
D. Process control variation
E. Biosurfactant trehalose
F. None of the Above

457. _____that settling in the clarifier also tends to accumulate smaller particulates.
A. Larger floc particles D. Biomass
B. Activated sludge process E. Filaments
C. Floating scum mat F. None of the Above

Filamentous Bacteria Identification
458. Filamentous Identification should be used as a tool to monitor the health of the biomass when a floating scum mat is suspected.
A. True B. False

459. _____ usually have a process control variation associated with the type of filament present that can be implemented to change the environment present.
A. Filamentous organisms D. All filamentous bacteria
B. Floc particles E. Biosurfactant trehalose
C. Organic material F. None of the Above

460. _____ change must be made or the filaments will return with time eventually.
A. Larger floc particles D. Biomass
B. Activated sludge process E. A process
C. Floating scum mat F. None of the Above

Nocardia amarae
461. Nocardia amarae, a common cause of Gram-positive, chemoautotrophic, filamentous in waste treatment plants, is a slow growing, usually gram-positive, chemoautotrophic, filamentous, strict aerobe that produces the biosurfactant trehalose.
A. True B. False

462. Colonies can be_____, so color alone is not a key to identifying this species.
A. Stain gram-negative D. Disruptive foaming
B. Not casease E. Brown, pink, orange, red, purple, gray or white
C. Slower growing filaments F. None of the Above

463. N. amarae, member of the Actinomycetes family, is very motile, so it does not rely on movement of the water to carry it through the system.
A. True B. False

464. The foam from Nocardia amarae is usually a _____ unless algae are entrapped in it, in which case it appears green and brown.
A. Viscous brown color D. Gram-positive, chemoautotrophic, filamentous
B. Staining gram-positive E. Disruptive foaming
C. Mixotrophic F. None of the Above

Nostocoida limicola
465. Nostocoida limicola is yet another common cause of disruptive foaming in waste treatment plants, motile in its Hormogonia and sometimes Trichome phases.
A. True B. False

466. Nostocoida can also be identified by their starburst effect formations using phase contrast microscopy at 400 to 1000x magnification. After chlorination, a few dead cells sticking out identify stress to this species.
A. True B. False

467. _____Nostocoida produces round cells within tight coil formations.
A. Viscous brown color
B. Staining gram-positive
C. Staining gram-negative
D. Gram-positive, chemoautotrophic, filamentous
E. Disruptive foaming
F. None of the Above

Thiothrix

468. Thiothrix spp., the primary cause of disruptive foaming in wastewater treatment plants appears as straight to slightly curved cells with rectangular shape form filaments up to 1000 microns in length, in multicellular rigid filaments Staining gram-positive, with obligately aerobic respiration.
A. True B. False

469. Thiothrix are considered which term below, using several small organic carbons and reduced inorganic sulfur sources for growth and energy.
A. Viscous brown color
B. Staining gram-positive
C. Mixotrophic
D. Gram-positive, chemoautotrophic, filamentous
E. Disruptive foaming
F. None of the Above

470. According to the text, Thiothrix II produces rectangular filaments up to 200 microns in length and is easily identified by their _____using phase contrast microscopy at 400 to 1000x magnification.
A. Stain gram-negative
B. Not casease
C. Slower growing filaments
D. Starburst effect formations
E. Multicellular rigid filaments
F. None of the Above

Microthrix parvicella

471. Microthrix parvicella is another common cause of?
A. Viscous brown color
B. Staining gram-positive
C. Mixotrophic
D. Gram-positive, chemoautotrophic, filamentous
E. Disruptive foaming
F. None of the Above

Sphaeroliticus natans

472. Sphaeroliticus natans is another filamentous species, and yet it is reputed to increase settleability by branching between flocs, increasing surface area.
A. True B. False

473. Cells are straight to slightly curved, up to 1000 microns in length and?
A. Stain gram-negative
B. Not casease
C. Slower growing filaments
D. Disruptive foaming
E. Multicellular rigid filaments
F. None of the Above

474. A low F/M ratio favors filamentous organisms, because their higher ratio of surface area to volume provides them with a selective advantage for?
A. Viscous brown color
B. Staining gram-positive
C. Mixotrophic
D. Gram-positive, chemoautotrophic, filamentous
E. Securing nutrients in nutrient limited environments
F. None of the Above

475. _____requires high levels of oxygen are necessary?
A. Stain gram-negative
B. A strict aerobe
C. Slower growing filaments
D. Disruptive foaming
E. Multicellular rigid filaments
F. None of the Above

Filamentous Bacteria

476. A problem that often frustrates the performance of activated sludge is bulking sludge due to the growth of filamentous bacteria. Sludge bulking can often be solved by careful process modifications.
A. True B. False

477. Different filamentous bacteria such as Microthrix, Sphaerotilus, Nostocoida, Thiothrix or ”Type 021N” and others cause?
A. Bulking for very different reasons D. Bacteria and other microbes
B. Dissolved oxygen decrease E. Oxygen-demanding pollutants
C. Sludge bulking F. None of the Above

478. There is a potential for instability with _____is an acute problem when strict demands on treatment performance are in place.
A. Organic carbon D. High BOD
B. Activated sludge E. Growth of filamentous bacteria
C. Domestic wastewater F. None of the Above

Other Wastewater Treatment Components
Biochemical Oxygen Demand

479. Biochemical Oxygen Demand (BOD or BOD5) is an indirect measure of Biodegradable organic compounds in water, and is determined by measuring the dissolved oxygen decrease in a controlled water sample over a five-day period.
A. True B. False

480. During this five-day period, aerobic (oxygen-consuming) bacteria decompose organic matter in the sample and consume dissolved oxygen in proportion to the amount of organic material that is present.
A. True B. False

481. _____reflects high concentrations of substances that can be biologically degraded, thereby consuming oxygen.
A. Organic carbon D. High BOD
B. Human sources E. Growth of filamentous bacteria
C. Domestic wastewater F. None of the Above

482. The BOD test has merit as a pollution parameter continues to be debated, _____has the advantage of a long period of record.
A. BOD D. Bacteria and other microbes
B. Dissolved oxygen decrease E. Oxygen-demanding pollutants
C. Sludge bulking F. None of the Above

Organic Carbon

483. Most organic carbon in water occurs as partly degraded plant and animal materials, some of which are resistant to microbial degradation.
A. True B. False

484. Dead tissue containing carbon is decomposed as _____by bacteria and other microbes.
A. An essential nutrient D. Detritus
B. Dissolved oxygen decrease E. Oxygen-demanding pollutants
C. Sludge bulking F. None of the Above

Total Organic Carbon

485. TOC bears a direct relationship with biological and chemical oxygen demand; high levels of TOC can result from human sources, this missing term being the main concern.

A. Organic carbon
B. High oxygen demand
C. Domestic wastewater
D. High BOD
E. Growth of filamentous bacteria
F. None of the Above

Nitrogen and Phosphorus Removal Technologies

486. Small system owners and operators should work closely with their program staff as well as engineers to ensure that the technologies selected will work effectively in combination to achieve the goals related to?

A. Effluent
B. Oxidation
C. Optimal DO levels
D. Trickling filter FFSs
E. A portion of the denitrified effluent
F. None of the Above

Nutrient Removal Technologies

Fixed-film systems - Aerobic/anaerobic trickling filter package plant

487. _____ are biological treatment processes that employ a medium such as rock, plastic, wood, or other natural or synthetic solid material that will support biomass on its surface.

A. Trickling filter(s)
B. Fixed-film systems (FFSs)
C. Nitrogen removal system(s)
D. Aerobic nitrification processes
E. Recirculating sand filters (RSFs)
F. None of the Above

488. _____ are typically constructed as beds of media through which wastewater flows.

A. A closed loop
B. Nitrogen removal system(s)
C. Optimal DO levels
D. Trickling filter FFSs
E. A portion of the denitrified effluent
F. None of the Above

489. _____represents removal typically varies from 0 to 35 percent although removal percentages as high as 65%.

A. Nitrified effluent
B. Nitrogen
C. Total Nitrogen (TN)
D. Nitrogen and phosphorus levels
E. Activated sludge
F. None of the Above

490. Phosphorus removal is typically 1 to 1.5 percent.

A. True B. False

Sequencing batch reactor (SBR)

491. According to the text, the SBR process is a sequential suspended growth process in which all major steps occur in the same tank in sequential order.

A. True B. False

Intermittent sand filters (ISF)

492. _____- provide advanced secondary treatment of settled wastewater or septic tank effluent.

A. Trickling filter(s)
B. Oxidation Ditches
C. Sand filters
D. Aerobic nitrification filters
E. Recirculating sand filters (RSFs)
F. None of the Above

Recirculating sand filters (RSF)

493. Recirculating filters using _____provide advanced secondary treatment of settled wastewater or septic tank effluent.

A. Sand, gravel, or other media
B. Wastewater
C. Denitrification
D. Phosphorus-reduction system(s)
E. Excessive sludge production
F. None of the Above

The TKN method has three major steps:

494. Digestion to convert organic nitrogen to?

A. TKN
B. Organic nitrogen
C. Aliphatic N compounds
D. Ammonium sulfate
E. Dissolved, biodegradable compounds
F. None of the Above

Phosphorus

495. _____in domestic wastewater typically ranges between 4 and 8 mg/L but can be higher depending on sources.

A. Phosphorus as phosphate
B. Phosphorus
C. Orthophosphate
D. Pyrophosphate and trimetaphosphate
E. Total phosphorus (TP)
F. None of the Above

Chlorine Exposure Limits

496. OSHA PEL?

A. 10 PPM
B. 1 PPM
C. 00.1 PPM
D. 1,000 PPM
E. 100 PPM
F. None of the Above

497. Physical and chemical properties of which term: A yellowish green, nonflammable and liquefied gas with an unpleasant and irritating smell.

A. Cl3
B. Chlorine
C. HOCl and OCl-
D. Combined Available Chlorine
E. Monochloramine
F. None of the Above

498. Cl2's IDLH?

A. 10 PPM
B. 1 PPM
C. 00.1 PPM
D. 1,000 PPM
E. 100 PPM
F. None of the Above

499. Cl2's Fatal Exposure Limit?

A. 10 PPM
B. 1 PPM
C. 00.1 PPM
D. 1,000 PPM
E. 100 PPM
F. None of the Above

500. HOCl and OCl-: The OCL- is the hypochlorite ion and both of these species are known as free available chlorine, they are the two main chemical species formed by chlorine in water and they are known collectively as _____and the_____.

A. Hypochlorous acid, Cl2
B. Hypochlorous acid, Hypochlorite ion
C. HOCl2 and OCl2
D. Combined Available Chlorine, Total
E. Monochloramine, Cl2
F. None of the Above