Registration form

NUTRIENTS AND MICROBES TRAINING COURSE $200.00

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

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

Collection___ Wastewater Treatment ___ Pretreatment____ Other _____

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

Technical Learning College TLC PO Box 3060, Chino Valley, AZ 86323
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We will stop mailing the certificate of completion so we need either your fax number or e-mail address. We will e-mail the certificate to you, if no e-mail address; we will fax it to you.

DISCLAIMER NOTICE

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

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

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

AFFIDAVIT OF EXAM COMPLETION

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

Grading Information

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

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

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

A second certificate of completion for a second State Agency $50 processing fee.

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Some States and many employers require the final exam to be proctored.
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Nutrients and Microbes Answer Key

Name_____

Phone #_____

You are solely responsible in ensuring that this course is accepted for credit by your State. <u>No refunds</u>. Did you check with your State agency to ensure this course is accepted for credit?

Method of Course acceptance confirmation. Please fill this section

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You can also fill this assignment out electronically in Adobe Acrobat DC

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

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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 not be in non-compliance and do not follow this course for proper compliance.

Please fax or e-mail the answer key to TLC
Western Campus Fax (928) 272-0747.

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

Rush Grading Service

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

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

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

NUTRIENTS AND MICROBES CEU COURSE

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

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Nutrients and Microbes Training 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 Key and make copy for yourself. You can e-mail or fax your Answer Key along with the Registration Form to TLC. **(S) Means answer may be plural or singular**. **Multiple Choice Section, One answer per question and please use the answer key.**

Organic Matter

1. Some organic compounds are more stable than others and cannot be quickly broken down by organisms this is true of _____ developed for agriculture and industry.

A. Most inorganic substances
B. Organic material(s)
C. Organic compound(s)
D. Graywater and blackwater
E. Many synthetic organic compounds
F. None of the Above

2. Which of the following wastewater terms are toxic to humans, fish, and aquatic plants and often are disposed of improperly in drains or carried in stormwater?

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

3. Two toxic _____ like benzene and toluene are found in some solvents, pesticides, and other products.

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

4. Which of the following wastewater terms can cause pollution; too much organic matter in wastewater can be devastating to receiving waters?

A. Long chained compounds
B. Biodegradable material(s)
C. Organic material(s)
D. Wastewater-related source(s)
E. Supply of oxygen
F. None of the Above

5. Large amounts of biodegradable materials can reduce or deplete the _____in the water needed by aquatic life.

A. Outbreaks of these diseases
B. Supply of oxygen
C. Organic compound(s)
D. Graywater and blackwater
E. Oxygen
F. None of the Above

6. One of the measurements used to assess overall wastewater strength, the amount of oxygen organisms needed to break down wastes in wastewater is referred to as the?

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

Oil and Grease

7. Fatty organic materials from animals, vegetables, and petroleum are quickly broken down by bacteria and can cause pollution in receiving environments.

A. True B. False

8. Which of the following wastewater terms also adds to the septic tank scum layer, causing more frequent tank pumping to be required?

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

9. Which of the following wastewater terms used for motors and industry are considered hazardous waste and 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

10. When large amounts of oils and greases are discharged, these increase _____and they may float to the surface and harden, causing aesthetically unpleasing conditions.

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

11. Which of the following wastewater terms are relatively stable, and cannot be broken down easily by organisms in wastewater?

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

12. Extra treatment steps are often required to remove which term from industrial wastewater sources?

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

13. According to the text, heavy metals can be discharged with many types of industrial wastewaters are difficult to remove by conventional treatment methods.

A. True b. False

14. Which of the following wastewater terms are metals, and compounds, such as sodium, potassium, calcium, magnesium, cadmium, copper, lead, nickel, and zinc are common in wastewater from both residential and nonresidential sources?

A. Nutrients from wastewater
B. Inorganic materials
C. Inorganic minerals
D. Excessive grease
E. Pesticides and herbicide(s)
F. None of the Above

Nutrients

15. 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

16. Which of the following wastewater terms 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

17. Which of the following wastewater terms 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

18. According to the text, wastewater often contains large amounts of which 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

19. 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

20. Which of the following terms 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

21. Which of the following terms 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

22. Solid materials in wastewater can consist of which term and organisms?

A. BOD
B. Organic material
C. The solids
D. Microorganisms
E. Organic and/or inorganic materials
F. None of the Above

(S) means the answer may be plural or singular in nature.
All of the answers must be in accordance to the Course Manual.

23. The solids must be significantly reduced by treatment or they can increase which of the following terms when discharged to receiving waters?
A. Suspended solids D. Microorganisms
B. Organic material E. Dissolved solids
C. BOD F. None of the Above

24. 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

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

26. Which of the following terms 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

27. 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

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

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

30. 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
31. The gases hydrogen sulfide and along with this substance can be toxic and pose asphyxiation hazards.
A. Ammonia D. The lack of oxygen
B. Wastewater odor(s) E. Less oxygen
C. Hydrogen sulfide or H_2S problem(s) F. None of the Above

32. Ammonia as a dissolved gas in wastewater is not dangerous to fish.
A. True B. False

33. The best method of controlling hydrogen sulfide is to eliminate its habitat or growth area by keeping sewers cleaner. This action will harbor?
A. Fewer slime bacteria
B. Wastewater odor(s)
C. Hydrogen sulfide or H_2S problem(s)
D. The lack of oxygen
E. Less oxygen
F. None of the Above

34. Salts of zinc and iron may precipitate in to which term?
A. Dissolved oxygen
B. Sulfides
C. Magnesium hydroxide
D. Biochemical oxygen demand or BOD
E. Wastewater odor(s)
F. None of the Above

35. Which of the following terms will create conditions in the sewer system because of the lack of oxygen?
A. Slime bacteria
B. Wastewater odor(s)
C. Hydrogen sulfide
D. The lack of oxygen
E. Less oxygen
F. None of the Above

36. Unless effectively contained or minimized by design and location, wastewater odors can affect the mental well-being and?
A. Dissolved oxygen
B. Oxygen-demanding
C. Quality of life of residents
D. Biochemical oxygen demand or BOD
E. Wastewater odor(s)
F. None of the Above

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

38. 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. Ammonia
E. Carbon dioxide
F. None of the Above

39. 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

40. Which of the following terms is a key element in water quality that is necessary to support aquatic life?
A. Dissolved oxygen
B. Oxygen-demanding
C. Magnesium hydroxide
D. Biochemical oxygen demand or BOD
E. Wastewater odor(s)
F. None of the Above

41. Biochemical oxygen demand, or BOD, is used to measure how well a sewage treatment plant is working, it is a demand placed on the unnatural supply of pollutants in wastewater.
A. True B. False

42. If the effluent, the treated wastewater produced by a treatment plant, has a high content of organic pollutants or ammonia, it will demand more oxygen from the water and leave the water with less of this term to support fish and other aquatic life.

A. Slime bacteria
B. Wastewater odor(s)
C. Hydrogen sulfide or H_2S problem(s)
D. The lack of oxygen
E. Oxygen
F. None of the Above

43. Organic matter and which term are “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

44. According to the text, oxygen-demanding substances are contributed by which term and agricultural and industrial wastes?

A. Slime bacteria
B. Wastewater odor(s)
C. Hydrogen sulfide or H_2S problem(s)
D. The lack of oxygen
E. Domestic sewage
F. None of the Above

45. Oxygen-demanding substances are usually destroyed or converted to other compounds by which term if there is sufficient oxygen present in the water?

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

Pathogens

46. According to the text, modern disinfection techniques have greatly reduced the danger of waterborne disease.

A. True B. False

Nutrients

47. Which of the following wastewater terms are essential to living organisms and are the chief nutrients present in natural water?

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

48. Uncontrolled algae growth blocks out sunlight and chokes aquatic plants and animals by 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

49. According to the text, the release of nutrients in quantities that exceed the affected waterbody’s ability to assimilate them results in a condition called?

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

50. Which of the following wastewater terms do not remove the phosphorus and nitrogen to any substantial extent?

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

51. According to the text, Carbon, nitrogen, and phosphorus are essential to living organisms and are the chief nutrients present in natural water

A. True B. False

52. An excess of these nutrients over-stimulates the growth of water plants, the result causes unsightly conditions, interferes with drinking water treatment processes, and causes unpleasant and disagreeable tastes and odors in drinking water.

A. True B. False

53. Primarily _____but occasionally nitrogen, causes nutrient enrichment which results in excessive growth of algae.

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

Inorganic and Synthetic Organic Chemicals

54. Inorganic and Synthetic Organic Chemicals can cause _____problems, and many are not effectively removed by conventional wastewater treatment.

A. Toxic
B. Ecology
C. Nutrient enrichment
D. Excessive growth of algae
E. Taste and odor
F. None of the Above

Thermal

55. Which of the following terms reduces the capacity of water to retain oxygen?

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

56. Unchecked discharges of which term can seriously alter the ecology of a lake, a stream, or estuary.

A. Toxic
B. Waste heat
C. Nutrient enrichment
D. Eutrophication or cultural enrichment
E. Phosphorus and nitrogen
F. None of the Above

57. 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

58. The initial stage in the treatment of domestic wastewater is the bar screens.

A. True B. False

59. Coarse solids are removed from the wastewater in the primary stage of treatment. In some treatment plants, _____may be combined into one basic operation.
A. Solid(s) D. Suspended growth process(es)
B. Finer debris E. Primary and secondary stages
C. Grit and gravel F. None of the Above

60. There are two basic stages in the treatment of wastes, RAS and WAS.
A. True B. False

61. The secondary stage uses which term to further purify wastewater?
A. Very fine solids D. Primary sludge
B. Biological processes E. Grit and screenings
C. Pollutant(s) F. None of the Above

Preliminary Treatment
62. The Preliminary Treatment is purely a physical stage consisting of Coarse Screening, Raw Influent Pumping, Static Fine Screening, Grit Removal, and Selector Tanks.
A. True B. False

63. The _____enters from the collection system into the Coarse Screening process.
A. Solid(s) D. Raw wastewater
B. Finer debris E. Dissolved organic and inorganic constituents
C. Grit and gravel F. None of the Above

64. 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

65. Especially in cities with combined sewer systems, removing the _____that washes off streets or land during storms is very important.
A. Very fine solids D. Primary sludge
B. Grit and gravel E. Grit and screenings
C. Pollutant(s) F. None of the Above

66. Large amounts of which term entering a treatment plant can cause serious operating problems, such as excessive wear of pumps and other equipment?
A. Solid(s) D. Grit and sand
B. Finer debris E. Dissolved organic and inorganic constituents
C. Grit and gravel F. None of the Above

67. 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

68. Which of the following terms passes into the Static Fine Screening process consisting of two stationary screens?
A. Solid(s) D. Flow
B. Finer debris E. Dissolved organic and inorganic constituents
C. Grit and gravel F. None of the Above

69. The wastewater passes into the _____process which consists of two vortex grit separators which produce a whirlpool action to force the finest debris to the outside perimeter.

A. Very fine solids
B. De-gritted wastewater
C. Grit Removal
D. Primary sludge
E. Grit and screenings
F. None of the Above

70. Which of the following terms must be periodically collected and trucked to a landfill for disposal or are incinerated?

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

71. The Coarse Screening consists of a basket shaped bar screen that collects larger debris (several inches in diameter) prior to the Raw Influent Pumping.

A. True B. False

72. Which of the following terms is removed and placed into a dumpster for disposal into the landfill?

A. Liquids
B. Finer debris
C. Compounds
D. Debris
E. Dissolved organic and inorganic constituents
F. None of the Above

73. Which of the following terms passes into the Raw Influent Pumping process that consists of submersible centrifugal pumps?

A. Wastewater
B. Split samples
C. Duplicate samples
D. Dissolved organic and inorganic constituents
E. Grit and gravel
F. None of the Above

Primary Sedimentation

74. Pollutants that are dissolved or are very fine and remain suspended in the wastewater are easily removed effectively by gravity settling.

A. True B. False

75. When the wastewater enters a sedimentation tank, it slows down and the suspended solids gradually sink to the bottom, this mass of solids is called?

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

76. 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

77. Which of the following wastewater treatment terms consist of minute particles of matter that can be removed from the wastewater with further treatment such as sedimentation or gravity settling, chemical coagulation, or filtration?

A. Solid(s)
B. Suspended solids
C. Grit and gravel
D. Suspended growth process(es)
E. Dissolved organic and inorganic constituents
F. None of the Above

Secondary Treatment

78. The wastewater enters from Preliminary Treatment into the clarifier process which is a biological process consisting of large oval shaped basins which are capable of removing finer solids.

A. True B. False

79. Maintaining a population of microorganisms within the oxidation basins which consumes the _____and also adhere to the solids themselves.

A. Total Solids
B. TDS
C. Very fine solids
D. Elevated Hardness, Salty Taste, or Corrosiveness
E. Wastewater temperature
F. None of the Above

80. Which of the following terms form larger and heavier aggregates that can by physically separated?

A. Solid(s)
B. Finer debris
C. Grit and gravel
D. Finer solids
E. Dissolved organic and inorganic constituents
F. None of the Above

81. After which term has been through Primary Treatment processes, it flows into the next stage of treatment called secondary?

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

82. The two most common conventional methods used to achieve secondary treatment are: this term and suspended growth processes.

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

83. The Secondary Treatment stage consists of a biological process such as this term and a physical process, Secondary Clarification.

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

84. The Preliminary Treatment stage removes as much _____ as possible using physical processes.

A. Solid(s)
B. Finer debris
C. Grit and gravel
D. Suspended growth process(es)
E. Dissolved organic and inorganic constituents
F. None of the Above

Wastewater and Pretreatment Compliance Monitoring

85. There are two types of _____that are performed as part of compliance monitoring for permitted industries: unscheduled and demand.

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

86. Which of the following terms is used to determine the compliance status of the user?

A. Flow-proportional sampling
B. POTW samples
C. Unscheduled sampling
D. Composite and grab samples
E. Unannounced monitoring visits
F. None of the Above

87. Instances of noncompliance are often identified during unannounced monitoring visits. No notice is given for this type of sampling.

A. True B. False

88. Which of the following terms is usually initiated in response to a known or suspected violation?

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

89. 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
B. POTW samples
C. BOD and SS levels
D. Composite and grab samples
E. Unannounced smell tests
F. None of the Above

Nonpermitted Industrial Users (User Rate Charge Program) Policy Example

90. On a periodic basis (i.e., once every two to three years), commercial and minor industrial users are sampled to determine?

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

91. 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

Nitrogen and Phosphorus Removal Technologies

92. 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

93. Which of the following terms - 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

94. Which of the following terms 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

95. Which of the following terms 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

96. Phosphorus removal is typically 1 to 1.5 percent.

A. True B. False

97. Multi-pass systems result in higher treatment quality and assist in removing _____ levels by promoting nitrification in the aerobic media bed and denitrification in the anaerobic septic tank.

A. Total Solids
B. TDS
C. pH
D. Elevated Hardness, Salty Taste, or Corrosiveness
E. Total Nitrogen (TN)
F. None of the Above

98. According to the text, some of the factors affecting performance include influent wastewater characteristics, hydraulic and organic loading, medium type, maintenance of optimal DO levels, and?

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

99. Commercial on-site systems use synthetic media and receive wastewater from overlying sprayheads for anaerobic treatment and de-nitrification.

A. True B. False

100. Which of the following terms - returns to the anoxic zone to mix with either septic tank contents or incoming septic tank effluent for denitrification?

A. Filamentous organisms
B. Floc particles
C. Organic material
D. Nitrified effluent
E. Biosurfactant trehalose
F. None of the Above

101. Which of the following terms is discharged for disposal or further treatment?

A. Ammonia oxidation
B. Phosphorus removal
C. Nitrate removal
D. Denitrified effluent
E. Oxygen demand of wastewater
F. None of the Above

102. According to the text, currently typical trickling filters systems are capable of producing effluent _____ concentrations of 5 to 40 mg/L.

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

Sequencing batch reactor (SBR)

103. 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

104. Which of the following terms consists of a combination of level sensors, timers, and microprocessors which can be configured to meet the needs of the system?
A. SBR process D. Cluster applications
B. Underdrain system E. Process control timer(s)
C. Sand filter(s) F. None of the Above

105. Which of the following terms can be designed and operated to enhance removal of nitrogen, phosphorus, and ammonia, in addition to removing TSS and BOD?
A. Trickling filter(s) D. SBRs
B. Oxidation Ditches E. Recirculating sand filters (RSFs)
C. Nitrogen removal system(s) F. None of the Above

106. Which of the following terms are suitable for areas with little land, stringent treatment requirements, and mall wastewater flows such as RV parks, and other small applications?
A. Package plant SBRs D. Fixed-film bioreactor(s)
B. Sand filter(s) E. Diffused air or mechanical devices
C. Chemical adsorption F. None of the Above

107. The SBR system can typically be found in packaged configurations for onsite and small community or?
A. Decanter D. Cluster applications
B. Underdrain system E. Process control timer(s)
C. Sand filter(s) F. None of the Above

108. Which of the following terms are often sized to provide mixing as well and are operated by the process control timers?
A. Underdrain system D. Conventional recirculation tank
B. Free water surface (FWS) systems E. Anaerobic septic tank effluent
C. SBRs F. None of the Above

109. Several decanter configurations are available, including?
A. Fixed and floating units D. Septic tank effluent
B. Recirculating filter(s) E. Distribution network
C. Available adsorption sites F. None of the Above

Intermittent Sand Filters (ISF)

110. Intermittent sand filters (ISF) is used to describe a variety of Packed-bed filters of sand or other granular materials available on the market.
A. True B. False

111. Which of the following terms provide advanced secondary treatment of settled wastewater or septic tank effluent?
A. Trickling filter(s) D. Aerobic nitrification filters
B. Oxidation Ditches E. Recirculating sand filters (RSFs)
C. Sand filters F. None of the Above

112. Which of the following terms - collects the filter effluent for further processing or discharge?
A. SBR process D. Distribution network
B. Underdrain system E. Process control timer(s)
C. Sand filter(s) F. None of the Above

113. Which of the following terms are aerobic, fixed-film bioreactors?
A. Decanter D. Fixed-film bioreactor(s)
B. Sand filter(s) E. Diffused air or mechanical devices
C. Chemical adsorption F. None of the Above

114. Bioslimes from the growth of microorganisms develop as films on the sand particle surfaces. The microorganisms in the slimes capture soluble and colloidal waste materials in the wastewater as it percolates over the sand surfaces.
A. True B. False

115. Which of the following terms are strained out at the filter surface?
A. Total Solids D. Elevated Hardness, Salty Taste, or Corrosiveness
B. TDS E. Wastewater temperature
C. Most suspended solids F. None of the Above

116. Which of the following terms are usually limited, the capacity of the media to retain ions depends on the target constituent, the pH, and the mineralogy of the media?
A. Decanter D. Fixed-film bioreactor(s)
B. Sand filter(s) E. Adsorption sites in the media
C. Chemical adsorption F. None of the Above

117. Phosphorous is one element of concern in wastewater that can be removed in this manner, but the number of available adsorption sites is limited by the?
A. Characteristics of the media D. Septic tank effluent
B. Recirculating filter(s) E. Distribution network
C. Available adsorption sites F. None of the Above

118. Which of the following terms can be used for a broad range of applications, including single-family residences, large commercial establishments, and small communities?
A. Decanter D. Fixed-film bioreactor(s)
B. Sand filter(s) E. Diffused air or mechanical devices
C. Chemical adsorption F. None of the Above

119. Sand filters are frequently used to pretreat septic tank effluent prior to _____where the soil has insufficient unsaturated depth.
A. Surface water D. Septic tank effluent
B. Recirculating filter(s) E. Subsurface infiltration onsite
C. Available adsorption sites F. None of the Above

120. Which of the following terms are used primarily to treat domestic wastewater, but they have been used successfully in treatment trains to treat wastewaters high in organic materials?
A. Decanter D. Fixed-film bioreactor(s)
B. Sand filter(s) E. Diffused air or mechanical devices
C. Chemical adsorption F. None of the Above

Recirculating Sand Filters (RSF)

121. 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

122. Which of the following terms collects and recycles the filter effluent to the recirculation tank for further processing or discharge?

A. Underdrain system
B. Free water surface (FWS) systems
C. Oxygen
D. Conventional recirculation tank
E. Anaerobic septic tank effluent
F. None of the Above

123. The basic components of recirculating filters include a recirculation/dosing tank, pump and controls, distribution network, filter bed with an underdrain system, and a return line.

A. True B. False

124. The returned aerobic filtrate in the recirculation tank, mixes with the anaerobic septic tank effluent before being reapplied to the?

A. Underdrain system
B. Free water surface (FWS) systems
C. Filter
D. Conventional recirculation tank
E. Anaerobic septic tank effluent
F. None of the Above

125. Which of the following terms can be used for a broad range of applications, including single-family residences, large commercial establishments, and small communities?

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

126. Denitrification also has not been shown to occur in RSFs.

A. True B. False

Natural Systems

127. According to the text, wetland systems are typically described in terms of the position of the water surface and/or the type of vegetation grown.

A. True B. False

128. FWS wetlands with long detention times can remove minor amounts of _____ through plant uptake, adsorption, complexation, and precipitation.

A. Total Solids
B. TDS
C. pH
D. Elevated Hardness, Salty Taste, or Corrosiveness
E. Phosphorus
F. None of the Above

129. Which of the following terms is typically greater in the first year or two because of soil absorption?

A. Ammonia oxidation
B. Phosphorus removal
C. Nitrate removal
D. An aerobic wastewater treatment facility
E. Oxygen demand of wastewater
F. None of the Above

130. Which of the following terms is also possible with the use of an addition process, such as chemical addition and mixing prior to a final deep settling pond?
A. Ammonia oxidation
B. Phosphorus removal
C. Nitrate removal
D. An aerobic wastewater treatment facility
E. Oxygen demand of wastewater
F. None of the Above

131. Subsurface flow (SF) wetlands are specifically designed to treat or polish this missing term and are typically constructed as a bed or channel containing appropriate media.
A. Ammonia oxidation
B. Phosphorus removal
C. Nitrate removal
D. Wastewater
E. Oxygen demand of wastewater
F. None of the Above

132. As with tank designs, in the natural system, bacteria break down organic matter in the wastewater, aerobically, anoxically and anaerobically.
A. True B. False

133. Which of the following terms treat wastewater by bacterial decomposition, settling, and filtering?
A. Underdrain system
B. Free water surface (FWS) systems
C. Wetlands
D. Conventional recirculation tank
E. Anaerobic septic tank effluent
F. None of the Above

134. Oxygen for this missing term is supplied by the plants growing in the wetland.
A. Ammonia oxidation
B. Phosphorus removal
C. Nitrate removal
D. An aerobic wastewater treatment facility
E. Aerobic decomposition
F. None of the Above

135. Duckweed are floating macrophytes.
A. True B. False

136. Duckweed fronds can double their mass in two days under ideal conditions of nutrient availability, sunlight, and temperature. Although duckweed can be found in most regions, the rate of growth is optimal at 20 to 30^{o} C and they grow best in a pH range of 3.5 to 8.5.
A. True B. False

137. The wetland, effluent after two weeks is usually discharged by gravity to an unlined wetland bed, if these systems discharge effluent to oxidation ditches, they do not require a NPDES permit.
A. True B. False

138. Solids are filtered and finally settle out of the wastewater within the?
A. Underdrain system
B. Free water surface (FWS) systems
C. Wetland
D. Conventional recirculation tank
E. Anaerobic septic tank effluent
F. None of the Above

139. The emergent macrophytes can transmit the amount of oxygen from the leaves to their roots is negligible compared to the oxygen demand of wastewater, therefore _____ are devoid of oxygen.
A. Ammonia oxidation
B. Phosphorus removal
C. Nitrate removal
D. An aerobic wastewater treatment facility
E. Subsurface flow wetlands
F. None of the Above

140. Which of the following terms are a modification of subsurface flow wetlands which contain gravel or coarse sand and are loaded intermittently at the top surface?

A. Trickling filter(s)
B. Oxidation Ditches
C. Nitrogen removal system(s)
D. Vertical flow wetland beds
E. Recirculating sand filters (RSFs)
F. None of the Above

141. Which of the following terms in a subsurface flow wetland can be rapid and effective because the anoxic conditions and carbon sources?

A. Wastewater temperature
B. Phosphorus removal
C. Nitrate removal
D. An aerobic wastewater treatment facility
E. Oxygen demand of wastewater
F. None of the Above

142. Which of the following terms have been used for a number of years to treat wastewater for various purposes?

A. Duckweed
B. Free water surface (FWS) systems
C. Oxygen
D. Conventional recirculation tank
E. Anaerobic septic tank effluent
F. None of the Above

143. Duckweed can grow about six months per year in most U.S. climates. High levels of BOD and _____removal have been observed from duckweed systems. To achieve secondary treatment most duckweed systems are coupled with either facultative or aerated ponds.

A. Total Solids
B. TDS
C. pH
D. Elevated Hardness, Salty Taste, or Corrosiveness
E. TSS
F. None of the Above

144. Nitrogen is removed by plant uptake and?

A. Filamentous organisms
B. Floc particles
C. Organic material
D. Harvesting, by denitrification
E. Biosurfactant trehalose
F. None of the Above

145. A disadvantage of duckweed systems is the large amount of biomass produced by the rapidly growing plants, which creates a _____requirement.

A. Ammonia oxidation
B. Phosphorus removal
C. Nitrate removal
D. Solids handling
E. Oxygen demand of wastewater
F. None of the Above

Proprietary Filters/Improved and Emerging Technologies
Sustainable Nutrient Recovery

146. Studies have shown that about 80 percent of the _____ and 50 percent of the phosphorus in wastewater are derived from urine?

A. Total Solids
B. TDS
C. pH
D. Nitrogen
E. Wastewater temperature
F. None of the Above

147. Which of the following wastewater terms and pollution, nutrients could be recycled for agricultural use, and could be removed before being mixed with wastewater and released to the environment?

A. Total Solids
B. TDS
C. pH
D. Nitrogen
E. Nitrogen and phosphorus
F. None of the Above

148. If you could separate 50 to 60 percent of urine, this could reduce in-plant carbon dioxide gas discharges and result in fewer impurities in methane captured from sludge digestion.
A. True B. False

149. According to the text, one benefit would be reduced energy consumption at WWTPs as a result of reduced treatment requirements for?
A. Total Solids D. Nitrogen
B. TDS E. Nitrogen and phosphorus
C. pH F. None of the Above

Nutrient Removal for Small Communities and Decentralized Wastewater Treatment Systems
150. Which of the following wastewater terms treat and dispose of effluent on the same property that produces the wastewater?
A. Groundwater recharge D. Onsite septic systems
B. Community drainfield(s) E. Small volumes of wastewater
C. High-aluminum mud(s) F. None of the Above

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

152. Wastewater systems such as community drainfields, irrigation systems, and _____ are being installed to reduce infrastructure investment and minimize adverse environmental impacts.
A. Wildlife habitat D. Phosphorus-reduction system(s)
B. Package plants E. Excessive sludge production
C. Denitrification F. None of the Above

153. Additional alternatives that include_____, sand filters, and constructed wetlands can be used to reduce nutrient pollution?
A. Groundwater recharge D. Aerobic tanks
B. Community drainfield(s) E. Small volumes of wastewater
C. High-aluminum mud(s) F. None of the Above

Phosphorus Removal
154. Few phosphorus removal processes are well developed for _____application.
A. Onsite wastewater systems D. Phosphorus-reduction system(s)
B. Wastewater E. Excessive sludge production
C. Denitrification F. None of the Above

155. 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

156. 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

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

A. True B. False

158. 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

159. 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

160. 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

161. Which of the following terms 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

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

A. True B. False

163. 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

164. Which of the following wastewater terms 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

165. 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

166. Which of the following wastewater terms 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

167. As the microorganisms absorb organic matter and nutrients from the wastewater, they grow in size and number.

A. True B. False

168. Which of the following wastewater terms 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

169. 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

170. Lagoon systems are shallow basins which hold the waste-water for several months to allow for the natural degradation of sewage.

A. True B. False

171. 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

172. One important wastewater characteristic that can affect public health and the environment, as well as 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

173. The best temperatures for wastewater treatment probably range from 77 to 95 degrees Fahrenheit.

A. True B. False

174. 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

175. 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

176. The acidity or alkalinity of wastewater affects both treatment and the environment.

A. True B. False

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

A. True B. False

178. Which of the following terms of wastewater needs to remain between 6 and 9 to protect organisms?

A. Total Solids
B. TDS
C. pH
D. Elevated Hardness, Salty Taste, or Corrosiveness
E. Wastewater temperature
F. None of the Above

179. Other substances and some acids can alter _____ can inactivate treatment processes when they enter wastewater from industrial or commercial sources.

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

180. Pure water is tasteless, colorless, and odorless and is often called the universal solvent.

A. True B. False

181. Which of the following wastewater terms is a good solvent and 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

182. Which of the following wastewater terms refers to any minerals, salts, metals, cations or anions dissolved in water?

A. Total Solids
B. TDS
C. pH
D. Elevated Hardness, Salty Taste, or Corrosiveness
E. Dissolved solids
F. None of the Above

183. Which of the following wastewater terms comprise inorganic salts and some small amounts of organic matter that are dissolved in water?
A. Treatment processes D. Both treatment and the environment
B. Total dissolved solids (TDS) E. Universal solvent
C. Quality of the water F. None of the Above

184. 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

185. The total dissolved solids test provides a qualitative measure of the amount of dissolved ions, but does not tell us the nature or ion relationships.
A. True B. False

186. Which of the following wastewater terms has been due to natural environmental features such as: mineral springs, carbonate deposits, salt deposits, and seawater intrusion?
A. Total Solids D. Elevated Hardness, Salty Taste, or Corrosiveness
B. TDS E. Wastewater temperature
C. pH F. None of the Above

187. Which of the following wastewater terms is the concentration of the sum of the positively charged and negatively charged ions in the water?
A. Treatment processes D. Both treatment and the environment
B. Total dissolved solids (TDS) E. Universal solvent
C. Quality of the water F. None of the Above

188. 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
189. Which of the following wastewater terms 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

190. Which of the following wastewater terms 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

191. Which of the following wastewater terms 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

192. Which of the following wastewater terms – 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
B. Total dissolved solids (TDS)
C. Quality of the water
D. Total Suspended solids
E. Wastewater
F. None of the Above

193. 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)
194. Total Suspended Solids (TSS) are solids in water that can be trapped by a filter.
A. True B. False

195. Which of the following wastewater terms – can also cause an increase in surface water temperature, because the suspended particles absorb heat from sunlight?
A. Oxygen
B. High TSS
C. Settling sediments
D. Total Suspended Solids (TSS)
E. Suspended sediment
F. None of the Above

196. When suspended solids settle to the bottom of a water body, they can smother the eggs of fish and aquatic insects, as well as suffocate newly hatched insect larvae.
A. True B. False

197. Which of the following wastewater terms can fill in spaces between rocks which could have been used by aquatic organisms for homes?
A. Oxygen
B. High TSS
C. Settling sediments
D. Total Suspended Solids (TSS)
E. Suspended sediment
F. None of the Above

198. Which of the following wastewater terms can include a wide variety of material, such as silt, decaying plant and animal matter, industrial wastes, and sewage?
A. Total Solids
B. TDS
C. pH
D. TSS
E. Wastewater
F. None of the Above

199. Which of the following wastewater terms can block light from reaching submerged vegetation?
A. Total Solids
B. TDS
C. pH
D. Total Suspended Solids (TSS)
E. High TSS
F. None of the Above

200. 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

201. If light is completely blocked from bottom dwelling plants, the plants will stop producing oxygen and will die.
A. True B. False

202. Estimating which 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)
B. Flow volume(s)
C. Additional flows
D. This can increase flow(s)
E. Original design load
F. None of the Above

203. Engineers must allow for which term during wet weather due to inflow and infiltration of extra water into sewers?

A. Peak flow(s)
B. Flow volume(s)
C. Additional flows
D. This can increase flow(s)
E. Original design load
F. None of the Above

204. Which of the following terms can enter sewers through leaky manhole covers and cracked pipes and pipe joints, diluting wastewater?

A. Peak flow(s)
B. Flow volume(s)
C. Additional flows
D. Excess water
E. Original design load
F. None of the Above

205. The focus of wastewater treatment plants is to reduce which term in the effluent discharged to natural waters, meeting state and federal discharge criteria?

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

206. Treatment of wastewater usually involves this term such as the activated sludge system in the secondary stage after preliminary screening.

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

207. 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

208. Which of the following terms is the preferred methodology in wastewater treatment affecting the efficiency of 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

209. Laboratory prepared bugs are more efficient in organics removal if they have the right growth environment, this efficiency is multiplied if microorganisms are allowed to grow.

A. True B. False

210. To reduce the start-up phase for growing a mature biofilm one can also purchase this term from appropriate microbiology vendors.

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

Advanced Methods of Wastewater Treatment

211. 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

212. 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

213. 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

214. Treatment levels beyond secondary are called advanced treatment.

A. True B. False

215. Which of the following terms 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

216. Advanced treatment may include physical-chemical separation techniques such as adsorption, flocculation/precipitation, membranes for advanced filtration, _____, and reverse osmosis.

A. Denitrification process
B. Organic material
C. Ion exchange
D. Aeration in the reactor
E. Application-specific microbiology
F. None of the Above

Nitrogen Control

217. Nitrogen in one form or another is present in municipal wastewater and is usually not removed by secondary treatment.

A. True B. False

218. Ammonia in wastewater effluent is safe to aquatic life.

A. True B. False

219. Nitrogen in the form of _____can exert a direct demand on oxygen or stimulate the excessive growth of algae.

A. Nitrification
B. Ammonia
C. Nitrogen
D. Nitrogen in the nitrate form
E. Ammonia to the non-toxic nitrate
F. None of the Above

220. Which of the following wastewater treatment terms beyond the secondary stage, nitrifying bacteria present in wastewater treatment can biologically convert ammonia to the non-toxic nitrate through a process known as nitrification?

A. Nitrification
B. Denitrification
C. Nitrogen
D. Nitrogen in the nitrate form
E. Biological treatment
F. None of the Above

221. _____ process can be added to the system to convert the nitrate to nitrogen gas.

A. Nitrification
B. Denitrification
C. Nitrogen
D. Nitrogen in the nitrate form
E. Additional biological
F. None of the Above

Conversion of Nitrate to Nitrogen Gas

222. The conversion of nitrate to _____is accomplished by bacteria in a process known as denitrification.

A. Nitrogen gas
B. Phosphorus
C. Nitrogen
D. Nitrate nitrogen
E. Methanol
F. None of the Above

223. 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
B. Phosphorus
C. Nitrogen
D. Nitrate nitrogen
E. Methanol
F. None of the Above

224. Which of the following wastewater treatment terms comprises almost 80 percent of the air in the earth's atmosphere?

A. Phosphorus
B. Phosphorus
C. Nitrogen
D. Nitrate nitrogen
E. Methanol
F. None of the Above

Biological Phosphorus Control

225. Like nitrogen, phosphorus is also a necessary nutrient for the growth of algae.

A. True B. False

226. Which of the following wastewater treatment terms - removal can be achieved through chemical addition and a coagulation-sedimentation process?

A. Nitrification
B. Phosphorus
C. Nitrogen
D. Nitrate nitrogen
E. Oxygen
F. None of the Above

227. Some biological treatment processes called biological nutrient removal (BNR) can also achieve nutrient reduction, removing _____.

A. Both nitrogen and phosphorus
B. Phosphorus
C. Nitrogen
D. Nitrate nitrogen
E. Oxygen
F. None of the Above

228. BNR processes involve modifications of suspended growth treatment systems in that the bacteria in these systems also convert which 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

229. 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

230. Which of the following wastewater treatment terms 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

231. Which of the following wastewater treatment terms -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

232. Which of the following wastewater treatment terms 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

233. 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

234. Which of the following wastewater treatment terms 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

235. 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

236. 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

237. Which of the following wastewater treatment terms 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

238. 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

239. _____ when separated from the wastewater, contain 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

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

A. True B. False

241. Which of the following wastewater treatment terms 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

242. 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

243. _____ 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

244. Which of the following wastewater treatment terms 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

245. The Clean Water Act directs the EPA to develop criteria for water quality that accurately reflect the latest scientific knowledge about the effects of pollutants on aquatic life and human health.

A. True B. False

246. 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

247. EPA scientists research information to determine the levels at which specific chemicals are not likely to adversely affect water quality standard(s).

A. True B. False

Aquatic Life Criteria

248. Allowable concentrations provide protection for plants and animals that are found in surface waters.

A. True B. False

249. Allowable concentrations are designed to provide protection for both freshwater and saltwater aquatic organisms from the effects of acute and chronic exposure to potentially harmful chemicals.

A. True B. False

250. Which of the following wastewater treatment terms are based on toxicity information and are developed to protect aquatic organisms from death, slower growth, reduced reproduction?

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

Sediment Quality Criteria Guidance

251. Which of the following wastewater treatment terms - provide a habitat for many living organisms?

A. Allowable concentrations
B. Water quality
C. Sediments
D. Acute (short term) and chronic (long term)
E. Human health and aquatic life criteria
F. None of the Above

Pollutants in the Sediment

252. Which of the following wastewater treatment terms helps to protect bottom dwelling species and prevents harmful toxins from moving up the food chain?

A. Pollutants in the sediment
B. Water pollutant(s)
C. Water quality standard(s)
D. Concentration of pollutant(s)
E. A pollutant level
F. None of the Above

253. _____ 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

254. Which of the following wastewater treatment terms - 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

255. A water body in its natural condition is free from which term, habitat loss, and other negative stressors?

A. Allowable concentrations
B. Harmful effects of pollution
C. In a healthy aquatic community
D. Acute (short term) and chronic (long term)
E. Human health and aquatic life criteria
F. None of the Above

256. The EPA is developing methodologies that states can use to assess the biological integrity of their waters and, in so doing, set protective_____ .

A. Toxic pollutant(s)
B. Food chain
C. Biological integrity
D. Biological treatment(s)
E. Water quality standards
F. None of the Above

257. 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

258. 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

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

A. True B. False

260. 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

261. Some of the microorganisms present in wastewater treatment systems use the _____ of the wastewater as an energy source to grow?

A. Toxic pollutant(s)
B. Food chain
C. Biological integrity
D. Biological treatment(s)
E. Organic content
F. None of the Above

Genera

262. 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

263. In a well-functioning system, protozoas and rotifers are usually present and are useful in consuming dispersed _____or non-settling particles.

A. Bacteria
B. Attached growth processes
C. Protozoas and rotifers
D. Suspended growth processes
E. Food-to-microorganism ratio, F/M
F. None of the Above

264. The organic load present is incorporated in part as represented by which term by the microbial populations, and almost all the rest is liberated as gas?

A. Biological denitrification
B. Organic load
C. Bacteria
D. Biomass
E. Aerobic and facultative microorganisms
F. None of the Above

265. 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

266. 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
B. Organic load
C. Anaerobic microorganism
D. Nitrogen and phosphorus
E. Aerobic and facultative microorganisms
F. None of the Above

267. Which of the following terms means the microorganisms that are attached to a surface over which they grow are called "attached growth processes"?

A. Carbonaceous BOD
B. Attached growth processes
C. Protozoans and rotifers
D. Suspended growth processes
E. Food-to-microorganism ratio, F/M
F. None of the Above

Microorganisms in Lagoons

268. 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

269. Which of the following bugs or terms 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

270. The omnivores, such as most rotifers, eat whatever is readily available, while the worms feed on the floc or prey on larger organisms. Microorganisms are directly affected by their treatment environment.

A. True B. False

271. 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

272. 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

273. Three bacteria groups occur: freely dispersed, single bacteria; floc-forming bacteria; and filamentous bacteria. All function similarly to oxidize organic carbon to produce CO_2 and new bacteria.

A. True B. False

274. Which of the following bugs or terms are similar to those found in other treatment processes such as activated sludge?

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

275. Which of the following bugs or terms that degrade wastes grow as single bacteria dispersed in the wastewater?

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

276. Which of the following bugs or terms, grow in a large aggregate due to exocellular polymer production?

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

277. Growth form is important as these flocs degrade _____and settle at the end of the process, producing a low TSS effluent.

A. Anaerobic action
B. Absence of free oxygen
C. BOD
D. Aerobic bacteria
E. Application-specific bacteria
F. None of the Above

278. Which of the following terms occur in lagoons, usually at specific growth environments?

A. Anaerobic action
B. Absence of free oxygen
C. A number of filamentous bacteria
D. Aerobic bacteria
E. Application-specific bacteria
F. None of the Above

279. Which of the following bugs or terms have a wide range in environmental tolerance and can function effectively in BOD removal over a wide range in pH and temperature?

A. Strict aerobes
B. Predators
C. Bacteria
D. Most heterotrophic bacteria
E. Many bacterial species
F. None of the Above

280. Anaerobic BOD removal generally proceeds well from pH 6.5 to 9.0 and at temperatures from 3-4°C to 60-70°C (Aerobic bacteria are replaced by Mesophilic bacteria at temperatures above 35°C).

A. True B. False

281. BOD removal increases rapidly below 3-4°C and ceases at 1-2°C.

A. True B. False

282. A very specialized group of bacteria occurs to some extent in lagoons (and other wastewater treatment systems) that can oxidize ammonia via nitrite to nitrate, termed?

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

Aerated lagoons

283. 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

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

A. True B. False

285. 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)
B. Anaerobic decomposition
C. Aerated lagoon(s)
D. Odors
E. Complete nitrification
F. None of the Above

286. Lagoons which are exposed to low temperatures which can cause _____ and eventually the formation of ice.

A. Non-biodegradable fraction
B. Substantial alkalinity
C. Completely mixed lagoon
D. Reduced biological activity
E. Suspended solids in the effluent
F. None of the Above

287. If excavated basins are used for settling, care should be taken to provide a residence time long enough for the?

A. Facultative lagoon(s)
B. Sludge
C. Solids to settle
D. Odors
E. Complete nitrification
F. None of the Above

288. Which of the following terms might develop in the upper layers contributing to an increased content of suspended solids in the effluent?

A. Non-biodegradable fraction
B. Substantial alkalinity
C. Completely mixed lagoon
D. Settled sludge, and algae
E. Suspended solids in the effluent
F. None of the Above

289. Which of the following terms can be minimized by using minimum depths of up to 2 m?

A. Facultative lagoon(s)
B. Sludge
C. Aerated lagoon(s)
D. Odors
E. Complete nitrification
F. None of the Above

290. According to the text, accumulated solids will overall _____ .

A. Non-biodegradable fraction
B. Substantial alkalinity
C. Completely mixed lagoon
D. Decompose in the bottom
E. Suspended solids in the effluent
F. None of the Above

Nitrification

291. Nitrosomonas europaea, which oxidizes ammonia to nitrite, and Nitrobacter winogradskyi, which oxidizes nitrite to nitrate.

A. True B. False

292. Which of the following bugs require a neutral pH and substantial alkalinity?

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

293. Nitrification ceases at pH values above pH 9 and declines markedly at pH values below 7.

A. True B. False

294. Nitrification is a major pathway for nitrogen removal in lagoons.

A. True B. False

Treatment Lagoon

295. Which of the following related terms 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

296. 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

297. 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

298. 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

299. Algal growth reduces the lagoon alkalinity which 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

300. 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

301. 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

302. 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

303. 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

304. Which of the following bugs or related terms 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

305. Which of the following bugs or related terms 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

306. Which of the following bugs or related terms 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

307. 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

Organic Load

308. The organic load (generally coming from primary treatment operations such as settling, screening or flotation) enters the reactor where the active microbial population is present. The reactor must be continuously aerated.
A. True B. False

309. The mixture then passes to a settling tank where the cells are settled. The treated wastewater is disinfected while the secondary settling and is recycled in part to the aeration basin.
A. True B. False

310. According to the text, as the cells are retained longer in the system, the flocculating characteristics of the cells improve 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

311. The most common types of activated sludge are the conventional and the continuous flow stiffed tank, in which the contents are completely mixed. In the conventional process, the wastewater is circulated along the aeration tank, with the flow being arranged by baffles in plug flow mode. The oxygen demand for this arrangement is maximum at the inlet as is the organic load concentration.

A. True B. False

312. In the completely mixed process the inflow streams are usually introduced at several points to facilitate the homogeneity of the mixing; if the mixing is complete, the properties are constant throughout the reactor.

A. True B. False

Paramecium sp.

313. Which of the following bugs is a medium to large size (100-300 µm) swimming ciliate, commonly observed in activated sludge, sometimes in abundant numbers?

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

314. Which of the following bugs is uniformly ciliated over the entire body surface with longer cilia tufts at the rear of the cell?

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

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

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

316. Which of the following bugs is described as a filter-feeding ciliate because its cilia move and filter bacteria from the water?

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

Vorticella sp.

317. Which of the following bugs feeds by producing a vortex with its feeding cilia?

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

318. According to the text, if treatment conditions are bad, for example, low DO or toxicity, _____ will leave their stalks.

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

319. Which of the following bugs 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

320. According to the text, Vorticella is a?
A. Mixed liquor D. Free-swimming and stalked ciliate(s)
B. Bacteria E. Contracting stalk
C. Stalked ciliate F. None of the Above

321. According to the text, Vorticella are oval to round shaped, have a contractile stalk, a domed feeding zone, and a water vacuole located near the terminal end of the false foot.
A. True B. False

322. After reproducing, the offspring develops a band of swimming cilia and goes off to form its own stalk, the evicted organism is called a?
A. Shelled amoeba(s) D. Swarmer
B. Euglypha E. Paramecium
C. Vorticella F. None of the Above

Euglypha sp.
323. Which of the following bugs spines may be single or in groups of two or three?
A. Shelled amoeba(s) D. Stalked ciliate
B. Euglypha E. Paramecium
C. Vorticella F. None of the Above

324. The shell of which bug is often transparent, allowing the hyaline (watery) body to be seen inside the shell?
A. Euglypha D. Euchlanis
B. Shelled amoeba(s) E. Spirochaetes
C. Rotifer(s) F. None of the Above

325. Which of the following bugs 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

326. Which of the following bugs is a shelled (testate) amoeba?
A. Shelled amoeba(s) D. Stalked ciliate
B. Euglypha E. Paramecium
C. Vorticella F. None of the Above

327. Which of the following bugs 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.

328. 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

329. This microscopic animal is a typical _____ .

A. Euglypha D. Euchlanis
B. Shelled amoeba(s) E. Spirochaetes
C. Rotifer(s) F. None of the Above

330. Which of the following bugs is an omnivore, meaning that its varied diet includes detritus, bacteria, and small protozoa?

A. Euglypha D. Euchlanis
B. Shelled amoeba(s) E. Spirochaetes
C. Rotifer(s) F. None of the Above

331. 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

332. A characteristic of which creature is their mastax?

A. Euglypha D. Euchlanis
B. Shelled amoeba(s) E. Spirochaetes
C. Rotifer(s) F. None of the Above

333. According to the text, Euchlanis is commonly found in?

A. Biofilm bacteria D. Activated sludge
B. Filamentous bacteria E. An omnivore
C. Some bacteria F. None of the Above

Bacteria Section

334. Bacteria come in a variety of shapes. The simplest shape is a round sphere or ball. Bacteria formed like this are called Cocci (singular coccus). The next simplest shape is cylindrical. Cylindrical bacteria are called rods (singular rod).

A. True B. False

335. Some bacteria are basically rods but instead of being straight they are twisted, bent or curved, sometimes in a?

A. Cocci D. Spiral
B. Rods E. Spirochaetes
C. Balls F. None of the Above

336. Which of the following terms is tightly coiled up bacteria?

A. Cocci D. Spiral
B. Rods E. Spirochaetes
C. Balls F. None of the Above

337. When bacteria live in chains, one after the other, they are called _____ - these often have long thin cells.
A. Biofilm bacteria D. Activated sludge
B. Filamentous bacteria E. An omnivore
C. Some bacteria F. None of the Above

338. Many bacteria exist as this term and the study of biofilms is very important.
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

339. Which of the following terms secrete sticky substances that form a sort of gel in which they live?
A. Biofilm bacteria D. Activated sludge
B. Filamentous bacteria E. An omnivore
C. Some bacteria F. None of the Above

Filamentous Bacteria
340. Which of the following terms are a type of bacteria that can be found in a wastewater treatment system?
A. Filamentous Bacteria D. Either anaerobic or aerobic conditions
B. Facultative E. Anaerobic to aerobic state
C. Application-specific bacteria F. None of the Above

341. According to the text, filamentous Bacteria function similar to _____since they degrade BOD quite well.
A. Biofilm bacteria D. Activated sludge
B. Filamentous bacteria E. Floc forming bacteria
C. Some bacteria F. None of the Above

342. 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
343. Aeration and biofilm building are the key operational parameters that contribute to the efficient degradation of organic matter (BOD/COD removal).
A. True B. False

344. Which of the following terms become site-specific as the biofilm develops and matures and is even more efficient in treating the site-specific waste stream?
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

345. Most of the bacteria absorbing the organic material in a wastewater treatment system are facultative in nature, meaning they are adaptable to survive and multiply in either anaerobic or aerobic conditions.

A. True B. False

346. 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
B. Absence of free oxygen
C. Facultative bacteria
D. Aerobic
E. Application-specific bacteria
F. None of the Above

347. According to the text, when bacteria are in the process of being transferred from one environment to another, the metamorphosis from _____ (and vice versa) takes place within a couple of hours.

A. Filamentous Bacteria
B. Facultative
C. Application-specific bacteria
D. Either anaerobic or aerobic conditions
E. Anaerobic to aerobic state
F. None of the Above

Anaerobic Bacteria

348. Which of the following terms live and reproduce in the absence of free oxygen?

A. Anaerobic action
B. Anaerobic bacteria
C. Facultative bacteria
D. Aerobic bacteria
E. Application-specific bacteria
F. None of the Above

349. In order to remove a given amount of organic material in an anaerobic treatment system, the organic material must be exposed to a _____ and/or detained for a much longer period.

A. Anaerobic action
B. Absence of free oxygen
C. Facultative bacteria
D. Aerobic bacteria
E. Significantly higher quantity of bacteria
F. None of the Above

350. A typical use for these bugs would be in a septic tank.

A. Filamentous organisms
B. Floc particles
C. Organic material
D. Anaerobic bacteria
E. Biosurfactant trehalose
F. None of the Above

351. Which of the following terms or bugs release hydrogen sulfide as well as methane gas, both of which can create hazardous conditions?

A. Filamentous Bacteria
B. Anaerobic bacteria
C. Application-specific bacteria
D. Either anaerobic or aerobic conditions
E. Anaerobic to aerobic state
F. None of the Above

352. Which of the following terms begins in the collection lines of a sewer system, causing deadly hydrogen sulfide or explosive methane gas can accumulate and be life threatening?

A. Anaerobic action
B. Absence of free oxygen
C. Facultative bacteria
D. Aerobic bacteria
E. Application-specific bacteria
F. None of the Above

Aerobic Bacteria

353. Aerobic bacteria live and multiply in the presence of free oxygen.
A. True B. False

354. Facultative bacteria always achieve an aerobic state when oxygen is present.
A. True B. False

355. The metabolism of aerobes is much higher than _____ .
A. Anaerobic action D. Aerobic bacteria
B. Anaerobes E. Application-specific bacteria
C. Facultative bacteria F. None of the Above

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

357. Which of the following terms or bugs live in colonial structures called floc?
A. Anaerobic action D. Aerobic bacteria
B. Absence of free oxygen E. Application-specific bacteria
C. Facultative bacteria F. None of the Above

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

Protozoans and Metazoans

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

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

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

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

363. Which of the following terms 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
364. 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

365. 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
366. 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

367. 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:
368. Which of the following terms' 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

369. _____ occurs 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

370. Which of the following wastewater treatment related terms 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

371. 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

372. 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

373. Which of the following wastewater treatment related terms 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

374. Which of the following wastewater treatment related terms, because of the 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

375. Which of the following wastewater treatment related terms, 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

376. 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

377. 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

378. Which of the following wastewater treatment related terms that settling in the clarifier also tends to accumulate smaller particulates?
A. Larger floc particles
B. Activated sludge process
C. Floating scum mat
D. Biomass
E. Filaments
F. None of the Above

Filamentous Bacteria Identification

379. 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

380. Filamentous Identification is used to determine the type of filaments present so that a cause can be found and corrections can be made to the system to alleviate future problems.
A. True B. False

Nocardia amarae

381. 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

382. 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
B. Staining gram-positive
C. Mixotrophic
D. Gram-positive, chemoautotrophic, filamentous
E. Disruptive foaming
F. None of the Above

Nostocoida limicola

383. Nostocoida limicola is yet another common cause of disruptive foaming in waste treatment plants, motile in its Hormogonia and sometimes Trichome phases. This oxygenic phototrophic species often forms multicellular rigid filaments, forming non-symbiotic relationships with other species.
A. True B. False

384. 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

Thiothrix

385. 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

386. Thiothrix are considered which term, 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

Microthrix parvicella

387. 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

388. 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

389. 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

390. 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

Filamentous Bacteria

391. 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

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

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

Other Wastewater Treatment Components

Biochemical Oxygen Demand

394. 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

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

Organic Carbon

396. 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

Total Organic Carbon

397. (TOC) bears a direct relationship with biological and chemical oxygen demand; high levels of TOC can result from human sources, this 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

Nutrient Constituents in Wastewater and Measurement Methods

Nitrogen

398. The major contributors of nitrogen to wastewater are _____ such as food preparation, showering, and waste excretion.

A. Human activities
B. Dissolved oxygen decrease
C. Sludge bulking
D. Bacteria and other microbes
E. Oxygen-demanding pollutants
F. None of the Above

399. Influent concentration varies during the day and can vary significantly during rainfall events, as a result of?

A. An essential nutrient
B. Dissolved oxygen decrease
C. Sludge bulking
D. Inflow and infiltration to the collection system
E. Oxygen-demanding pollutants
F. None of the Above

The TKN method has three major steps:

400. 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