

Registration form

NUTRIENT REMOVAL II 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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Home (____) _____ **Work (____)** _____

Operator ID # _____ **Exp. Date** _____

Please record hours worked on assignment, must match your state's requirement _____

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.

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DISCLAIMER NOTICE

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

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

You can obtain a printed version of the course from TLC for an additional \$59.95 plus shipping charges.

AFFIDAVIT OF EXAM COMPLETION

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

Grading Information

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

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

All downloads are electronically tracked and monitored for security purposes.

Some States and many employers require the final exam to be proctored.

Nutrient Removal II Answer Key

Name _____

Phone _____

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

Method of Course acceptance confirmation. Please fill this section

Website ___ Telephone Call ___ Email ___ Spoke to _____

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What is the approval number if Applicable? _____

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

You can use Adobe Acrobat DC Program to complete the assignment.

Multiple Choice. Pick only one answer per question. 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 e-mail or fax this survey with your final exam

**NUTRIENT REMOVAL II CEU COURSE
CUSTOMER SERVICE RESPONSE CARD**

NAME: _____

E-MAIL _____ PHONE _____

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

1. Please rate the difficulty of your course.

Very Easy 0 1 2 3 4 5 Very Difficult

2. Please rate the difficulty of the testing process.

Very Easy 0 1 2 3 4 5 Very Difficult

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

Very Similar 0 1 2 3 4 5 Very Different

4. How did you hear about this Course? _____

5. What would you do to improve the Course?

How about the price of the course?

Poor _____ Fair _____ Average _____ Good _____ Great _____

How was your customer service?

Poor _____ Fair _____ Average _____ Good _____ Great _____

Any other concerns or comments.

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

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...

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

Nutrient Removal II 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.**

Please select the best answer for the question.

1. Which of the following terms is an application to the Control Authority, the industrial user must provide engineering, production, sampling and analysis, and such other information so the control authority can make its determination; or (b) sanitary wastestreams where such streams are not regulated by a categorical pretreatment standard; or (c) from any process wastestreams?

- A. Detection Limit
- B. Development Document
- C. Dilute Wastestream
- D. Effluent Limitations Guideline
- E. None of the Above

2. Which of the following terms is BOD, TSS, fecal coliform, oil and grease, and pH?

- A. Daily Maximum Limitations
- B. Continuous Discharge
- C. Concentration-based Limit
- D. Control Authority
- E. Conventional Pollutants
- F. None of the Above

3. Which of the following terms is a report submitted by categorical industrial users (CIUs) within 180 days after the effective date of an applicable categorical standard?

- A. Best Professional Judgment (BPJ)
- B. Baseline Monitoring Report (BMR)
- C. Best Management Practices (BMPs)
- D. Best Practicable Control Technology Currently Available (BPT)
- E. None of the Above

4. Which of the following terms is a discharge of untreated wastewater from a combined sewer system at a point prior to the headworks of a publicly owned treatment works?

- A. Code of Federal Regulations (CFR)
- B. Chronic
- C. Combined Sewer Overflow (CSO)
- D. Clean Water Act (CWA)
- E. None of the Above

5. Which of the following terms is a program administered by a POTW that meets the criteria established in 40 CFR Part 403?
- A. Approved State Pretreatment Program
 - B. Approved/Authorized State
 - C. Act or "the Act"
 - D. Approval Authority
 - E. Approved POTW Pretreatment Program or Program
 - F. None of the Above
6. Which of the following terms is a schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the U.S?
- A. Best Professional Judgment (BPJ)
 - B. Baseline Monitoring Report (BMR)
 - C. Best Management Practices (BMPs)
 - D. Best Practicable Control Technology Currently Available (BPT)
 - E. None of the Above
7. Which of the following terms is a record of each person involved in the possession of a sample from the person who collects the sample to the person who analyzes the sample in the laboratory?
- A. Blowdown
 - B. Categorical Industrial User (CIU)
 - C. Bypass
 - D. Chain of Custody (COC)
 - E. None of the Above
8. Which of the following terms is the maximum allowable discharge of pollutants during a 24-hour period?
- A. Daily Maximum Limitations
 - B. Continuous Discharge
 - C. Concentration-based Limit
 - D. Control Authority
 - E. Conventional Pollutants
9. Which of the following terms is the minimum concentration of an analyte that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero?
- A. Detection Limit
 - B. Development Document
 - C. Dilute Wastestream
 - D. None of the Above
10. Which of the following terms is a detailed report of studies conducted by the U.S. EPA for the purpose of establishing effluent guidelines and categorical pretreatment standards?
- A. Detection Limit
 - B. Development Document
 - C. Dilute Wastestream
 - D. Effluent Limitations Guideline
 - E. None of the Above

11. Which of the following terms is a combination of individual samples proportional to the flow of the wastestream at the time of sampling.
- A. Federal Water Pollution Control Act
 - B. Flow Weighted Average Formula (FWA)
 - C. Existing Source
 - D. Enforcement Response Plan
 - E. Flow Proportional Composite Sample
 - F. None of the Above

Clean Water Act (Rule) Summary

33 U.S.C. s/s 1251 et seq. (1977)

12. The CWA makes it unlawful for any person to discharge any pollutant from a point source into navigable waters unless a permit (NPDES) is obtained under the?

- A. Act
- B. Water quality levels
- C. Clean water legislation
- D. EPA
- E. OSHA
- F. None of the Above

13. Which of the following terms focused upon toxic pollutants?

- A. Clean Water Act or CWA
- B. EPA
- C. Congress
- D. Water quality standard(s)
- E. The 1977 amendments
- F. None of the Above

14. The CWA provisions for the delegation by _____ of many permitting, administrative, and enforcement aspects of the law to state governments. In states with the authority to implement CWA programs, the EPA still retains oversight responsibilities.

- A. Clean Water Act or CWA
- B. Water quality levels
- C. Clean water legislation
- D. EPA
- E. Valuable wetlands and other aquatic habitats
- F. None of the Above

15. Which of the following terms requires major industries to meet performance standards to ensure pollution control, charges states and tribes with setting specific water quality criteria appropriate for their waters and developing pollution control programs?

- A. Clean Water Act
- B. Water quality levels
- C. Clean water legislation
- D. EPA still retains oversight responsibilities
- E. Valuable wetlands and other aquatic habitats
- F. None of the Above

Biological

16. The bacteria normally present in wastewater must have oxygen to do their part in breaking down the sewage.

- A. True
- B. False

17. According to the text, excess microbiological growth could be removed from the wastewater by physical processes.

- A. True
- B. False

18. The process of saturating sewage with air and microorganisms to break down the organic matter is called _____.

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

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

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

20. The addition of _____ to the biological process causes masses of microorganisms to grow and rapidly metabolize organic materials.

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

21. Which of the following wastewater terms involves treatment levels beyond secondary treatment?

- A. Oxygen
- B. Carbon dioxide
- C. Gravity
- D. Advanced Treatment
- E. Physical separation step
- F. None of the Above

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

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

Organic Matter

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

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

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

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

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

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

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

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

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

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

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

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

Oil and Grease (scum)

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

- A. True
- B. False

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

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

31. 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

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

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

Inorganics

33. 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

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

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

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

- A. True
- B. False

36. Which of the following wastewater terms - 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

37. 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

38. According to the text, wastewater often contains large amounts of _____ 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

39. 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

40. 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

41. 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

Solids

42. 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

43. 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

44. Solid materials in wastewater can consist of which term and organisms?
 A. BOD D. Microorganisms
 B. Organic material E. Organic and/or inorganic materials
 C. The solids F. None of the Above
45. 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
46. 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
47. On the bottom of settling tanks and ponds, which missing term 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
48. 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
49. Some dissolved materials are consumed by-this missing term-in wastewater.
 A. BOD D. Microorganisms
 B. Organic material E. Suspended solids in wastewater
 C. The solids F. None of the Above
50. Excessive amounts of dissolved solids in wastewater can have adverse effects on the environment.
 A. True B. False

Gases

51. Certain gases in wastewater can cause odors, affect treatment, or are potentially dangerous.
 A. True B. False
52. Methane gas is a byproduct of which 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

53. Salts of zinc and iron may precipitate _____.
- A. Dissolved oxygen
 - B. Sulfides
 - C. Magnesium hydroxide
 - D. Biochemical oxygen demand, or BOD
 - E. Wastewater odor(s)
 - F. None of the Above
54. The lack of oxygen causes _____ conditions to occur in the sewer system.
- A. Slime bacteria
 - B. Wastewater odor
 - C. Hydrogen sulfide
 - D. The lack of oxygen
 - E. Less oxygen
 - F. None of the Above
55. The mental well-being and _____ of residents can be affected by uncontained wastewater odors.
- A. Attitude
 - B. Income
 - C. Quality of life
 - D. Political views
 - E. Social activities
 - F. None of the Above
56. Hydrogen sulfide and _____ are gasses that can be toxic and pose asphyxiation hazards.
- A. Ammonia
 - B. Wastewater odors
 - C. Air
 - D. Oxygen
 - E. Less oxygen
 - F. None of the Above
57. Ammonia as a dissolved gas in wastewater is not dangerous to fish.
- A. True
 - B. False
58. Cleaner sewers will produce less hydrogen sulfide because they will harbor _____.
- A. Fewer slime bacteria
 - B. Wastewater odors
 - C. Hydrogen sulfide
 - D. BOD
 - E. Less oxygen
 - F. None of the Above
59. 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 H₂S problem(s)
 - D. High DO
 - E. Lack of turbidity
 - F. None of the Above
60. 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
61. 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

62. Aquatic life needs _____ in the water to survive.
- A. Dissolved oxygen
 - B. Oxygen-demand
 - C. Magnesium hydroxide
 - D. Biochemical oxygen demand or BOD
 - E. Wastewater odors
 - F. None of the Above
63. The biochemical oxygen demand (BOD) of the effluent is not an indicator of how well a sewage treatment plan is working.
- A. True
 - B. False
64. If the wastewater treatment plant effluent has a high content of organics or ammonia, more _____ will be demanded from the receiving water. This will leave less oxygen to support fish and aquatic plants.
- A. Slime bacteria
 - B. Wastewater odors
 - C. Hydrogen sulfide
 - D. Nitrogen
 - E. Oxygen
 - F. None of the Above
65. Domestic sewage and _____ all contribute oxygen-demanding substances to wastewater.
- A. Slime bacteria
 - B. Wastewater odors
 - C. Hydrogen sulfide
 - D. The lack of oxygen
 - E. Agricultural and industrial wastes
 - F. None of the Above
66. According to the text, oxygen-demanding substances are contributed by _____ and agricultural and industrial wastes?
- A. Slime bacteria
 - B. Wastewater odor(s)
 - C. Hydrogen sulfide or H₂S problem(s)
 - D. The lack of oxygen
 - E. Domestic sewage
 - F. None of the Above
67. If there is sufficient oxygen present in the water, oxygen-demanding substances are usually destroyed or converted to other compounds by the _____ in the water.
- A. Dissolved oxygen
 - B. Nitrogen
 - C. Magnesium hydroxide
 - D. Biochemical oxygen demand, or BOD
 - E. Bacteria
 - F. None of the Above

Nutrients

68. The chief nutrients present in natural water that are essential to living organisms are _____.
- A. Oxygen
 - B. Ecology
 - C. Nutrient enrichment
 - D. Carbon, nitrogen, and phosphorus
 - E. Phosphorus and nitrogen
 - F. None of the Above
69. Aquatic plants and animals are harmed when uncontrolled algae growth blocks out the sunlight, thereby depleting _____ in the water at night.
- A. Pathogen(s)
 - B. Dissolved oxygen
 - C. Nutrient enrichment
 - D. Excessive growth of algae
 - E. Phosphorus and nitrogen
 - F. None of the Above

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

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

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

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

72. According to the text, nutrients may convert the organic forms of these substances into mineral form, making them more usable by plant life.

- A. True
- B. False

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

- A. True
- B. False

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

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

Thermal

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

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

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

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

77. 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

78. The initial stage in the wastewater treatment process is called primary treatment.

- A. True
- B. False

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

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

80. Many wastewater treatment plants have preliminary treatment units before primary and secondary treatment begins.

- A. True B. False

81. 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

82. The Preliminary Treatment is purely physical stage consisting of Coarse Screening, Raw Influent Pumping, Static Fine Screening, Grit Removal, and Selector Tanks.

- A. True B. False

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

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

84. After coarse screening, the wastewater may flow into a grit chamber to remove sand, grit, cinders, and small stones.

- A. True B. False

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

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

86. Treatment plant pumps and other equipment can be damaged by large amounts of _____ entering the plant.

- A. Solids D. Grit and sand
B. Finer debris E. Dissolved organic and inorganic constituents
C. Inorganics F. None of the Above

87. In some wastewater treatment plants, another finer screen is used after the grit chamber to remove additional material that may damage equipment.

- A. True B. False

88. After the raw influent pumping process, the _____ passes into the static fine screening process to remove finer debris not captured by the coarse screens.

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

89. The wastewater passes into _____ 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

90. The _____ removed by the preliminary treatment processes must be collected and disposed of in a landfill or incinerated.

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

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

- A. True
- B. False

92. 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

93. 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

94. Pollutants that are dissolved in the wastewater are effectively removed by gravity settling.

- A. True
- B. False

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

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

96. 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

97. 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

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

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

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

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

100. The wastewater from preliminary treatment flows directly into the secondary clarifier.

- A. True
- B. False

101. The _____ (which are primarily organic) are consumed by microorganisms within the oxidation basins. The microorganisms also adhere to the solids themselves.

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

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

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

103. The Secondary Treatment stage consists of a biological process such as this missing 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

104. After preliminary treatment, the _____ are still present in the wastewater, since they cannot be removed by physical processes.

- A. Very fine solids
- B. Coarse debris
- C. Grit and gravel
- D. Suspended growth processes
- E. Larger debris
- F. None of the Above

Nitrogen and Phosphorus Removal Technologies

105. 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

106. 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

107. 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

108. 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

109. Phosphorus removal is typically 1 to 1.5 percent.

- A. True
- B. False

110. 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

111. 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

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

- A. True
- B. False

113. 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

114. 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

115. According to the text, currently typical trickling filters systems are capable of producing effluent-this missing term- 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)

116. 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

117. 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
- B. Underdrain system
- C. Sand filter(s)
- D. Cluster applications
- E. Process control timer(s)
- F. None of the Above

118. 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)
- B. Oxidation Ditches
- C. Nitrogen removal system(s)
- D. SBRs
- E. Recirculating sand filters (RSFs)
- F. None of the Above

119. Which of the following terms are suitable for areas with little land, stringent treatment requirements, and small wastewater flows such as RV parks, and other small applications?

- A. Package plant SBRs
- B. Sand filter(s)
- C. Chemical adsorption
- D. Fixed-film bioreactor(s)
- E. Diffused air or mechanical devices
- F. None of the Above

120. The SBR system can typically be found in packaged configurations for onsite and small community or?

- A. Decanter
- B. Underdrain system
- C. Sand filter(s)
- D. Cluster applications
- E. Process control timer(s)
- F. None of the Above

121. Which of the following terms are often sized to provide mixing as well and are operated by the process control timers?

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

122. Several decanter configurations are available, including?

- A. Fixed and floating units
- B. Recirculating filter(s)
- C. Available adsorption sites
- D. Septic tank effluent
- E. Distribution network
- F. None of the Above

Intermittent Sand Filters (ISF)

123. Intermittent sand filters is used to describe a variety of packed-bed filters of sand or other granular materials available on the market.

- A. True B. False

124. 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

125. 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

126. 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

127. 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

128. 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

129. 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

130. 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

131. 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

132. Sand filters are frequently used to pretreat septic tank effluent prior to -this missing term- where the soil has insufficient unsaturated depth.

- A. Surface water
- B. Recirculating filter(s)
- C. Available adsorption sites
- D. Septic tank effluent
- E. Subsurface infiltration onsite
- F. None of the Above

133. 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
- B. Sand filter(s)
- C. Chemical adsorption
- D. Fixed-film bioreactor(s)
- E. Diffused air or mechanical devices
- F. None of the Above

Recirculating Sand Filters (RSF)

134. 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

135. 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

136. 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

137. 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

138. 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

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

- A. True
- B. False

Natural Systems

140. 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

141. Subsurface flow wetlands are specifically designed to treat or polish _____ 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

142. 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

143. 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

144. 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

145. As with tank designs, in the natural system, bacteria break down organic matter in the wastewater, aerobically, anoxically and anaerobically.

- A. True
- B. False

146. Which of the following terms treats 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

147. 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

148. Duckweed fronds can double their mass in two days under ideal conditions of nutrient availability, sunlight, and temperature.

- A. True
- B. False

149. The wetland's 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

150. 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

151. 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 -this missing term- 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

**Proprietary Filters/Improved and Emerging Technologies
Sustainable Nutrient Recovery**

152. 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

153. 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

154. 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

155. According to the text, one benefit would be reduced energy consumption at WWTPs as a result of reduced treatment requirements for?

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

Nutrient Removal for Small Communities and Decentralized Wastewater Treatment Systems

156. Which of the following wastewater terms treats and disposes of effluent on the same property that produces the wastewater?

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

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

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

158. Wastewater systems such as community drainfields, irrigation systems, and this missing term are being installed to reduce infrastructure investment and minimize adverse environmental impacts?

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

159. Additional alternatives that include this missing term, sand filters, and constructed wetlands can be used to reduce nutrient pollution?

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

Phosphorus Removal

160. Few phosphorus removal processes are well developed for _____ application.

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

161. 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

162. Studies of high-iron sands and which missing term 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

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

- A. True
- B. False

164. 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

165. 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

166. There are systems that utilize membrane solids separation following _____ are capable of removing total nitrogen down to very low concentrations.

- 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

167. 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

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

- A. True
- B. False

169. In the SCP, the majority of microorganism-rich underflow 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

170. 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

171. 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

172. 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

173. After the microorganisms have been suspended in the wastewater for several hours, they are settled out as sludge.

- A. True
- B. False

174. 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

175. 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

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

- A. True
- B. False

177. Lagoon systems take advantage of which missing term 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

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

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

Temperature

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

- A. True
- B. False

180. While warm temperatures accelerate biological processes and cool temperatures slow them down, _____ 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

181. Hot water is a byproduct of many manufacturing processes and is not considered 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

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

- A. True
- B. False

183. Low pH indicates increasing acidity while a high pH indicates increasing alkalinity.

- A. True
- B. False

184. In order to protect organisms in the biological process, the _____ of the wastewater needs to remain between 6 and 9.

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

185. Industrial or commercial discharges containing acids and other substances can alter the _____ of the wastewater and inactivate treatment processes.

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

Total Dissolved Solids

186. Pure water is tasteless, colorless, and odorless and is called "the universal solvent".

- A. True
- B. False

187. _____ is often called the universal solvent because it picks up impurities easily.

- A. Treatment processes
- B. Total dissolved solids (TDS)
- C. Quality of the water
- D. Wastewater
- E. Water
- F. None of the Above

188. Any minerals, salts, metals, cations or anions dissolved in water are referred to as _____.

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

189. Which of the following wastewater terms comprise inorganic salts and some small amounts of organic matter that are dissolved in water?

- A. Treatment processes
- B. Total dissolved solids (TDS)
- C. Quality of the water
- D. Both treatment and the environment
- E. Universal solvent
- F. None of the Above

190. Total dissolved solids in drinking water come from natural sources, sewage, urban runoff, industrial wastewater, and water treatment chemicals.

- A. True
- B. False

191. Water quality issues such as elevated hardness, salty taste, or corrosiveness cannot be evaluated using the TDS test.

- A. True
- B. False

192. 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
- B. TDS
- C. pH
- D. Elevated Hardness, Salty Taste, or Corrosiveness
- E. Wastewater temperature
- F. None of the Above

193. Which of the following wastewater terms is the concentration of the sum of the cations and anions ions in the water?

- A. Treatment processes
- B. Total dissolved solids (TDS)
- C. Quality of the water
- D. Both treatment and the environment
- E. Universal solvent
- F. None of the Above

194. Water quality issues such as elevated hardness, salty taste, or _____ cannot be evaluated using the TDS test.

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

Total Solids

195. 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
- B. TDS
- C. pH
- D. Elevated Hardness, Salty Taste, or Corrosiveness
- E. Wastewater temperature
- F. None of the Above

196. Which of the following wastewater terms is used for material left inside a container after evaporation and drying of a water sample?

- A. Treatment processes
- B. Total dissolved solids (TDS)
- C. Quality of the water
- D. Total solids
- E. pH
- F. None of the Above

197. 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
- B. TDS
- C. pH
- D. Elevated Hardness, Salty Taste, or Corrosiveness
- E. Wastewater
- F. None of the Above

198. 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

199. 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)

200. Total Suspended Solids (TSS) are solids in water that can be trapped by a filter.

- A. True
- B. False

201. Because the suspended particles absorb heat and light, _____ can raise the surface water temperature.

- A. Oxygen
- B. High TSS
- C. Settling sediments
- D. Hydrogen sulfide
- E. Suspended sediment
- F. None of the Above

202. The eggs of fish and aquatic insects can be smothered when suspended solids settle to the bottom of a water body.

- A. True B. False

203. Estimating _____ for centralized treatment systems is a complicated task, especially when designing a new treatment plant in a community where one has never existed previously.

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

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

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

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

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

206. High TSS can be problematic for industries because the solids may clog or scour pipes and machinery.

- A. True B. False

207. Treatment of wastewater usually involves _____ such as the activated sludge system in the secondary stage after preliminary screening.

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

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

Application Specific Microbiology

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

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

210. 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

211. When starting up an activated sludge process, _____ can be purchased to reduce the time for growing a mature biofilm
- A. Mature biofilms
 - B. Activated sludge system
 - C. Advanced treatment technologies
 - D. Application specific bacterial cultures
 - E. Pretreatment and pollution prevention
 - F. None of the Above

Advanced Methods of Wastewater Treatment

212. 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

213. 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

214. 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

215. Treatment levels beyond secondary are called advanced treatment.

- A. True
- B. False

216. 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

217. 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

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

- A. True
- B. False

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

- A. True
- B. False

220. 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

221. A biological treatment process beyond the secondary stage uses nitrifying bacteria to convert ammonia to non-toxic nitrate. This process is called _____.

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

222. To remove nitrate from wastewater effluent, another _____ process can be added to convert nitrate to nitrogen gas.

- A. Nitrification
- B. Chemical
- C. Physical
- D. Primary
- E. Biological
- F. None of the Above

Conversion of Nitrate to Nitrogen Gas

223. 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

224. 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

225. 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

226. Phosphorous needs to be removed from wastewater effluent to prevent excessive algal growth in the receiving waters.

- A. True
- B. False

227. _____ 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

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

229. The bacteria in BNR processes systems also convert _____ to inert nitrogen gas, and cause phosphorous to be trapped in the solids that are subsequently removed.
- A. Both nitrogen and phosphorus
 - B. Phosphorus
 - C. Nitrogen
 - D. Nitrate nitrogen
 - E. Oxygen
 - F. None of the Above

Coagulation-Sedimentation Process

230. 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

231. 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

232. Which of the following wastewater treatment terms are added to 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

233. 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

234. 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

235. 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

Water Quality Criteria

236. 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

237. When developing water quality criteria, EPA examines the effects of specific pollutants on aquatic life, plant life, aesthetics, and recreation in any body of water.

A. True B. False

Human Health Criteria

238. Humans can be exposed to water pollutants by drinking untreated surface water or eating fish or wildlife that have been contaminated by pollutants in surface water.

A. True B. False

Aquatic Life Criteria

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

A. True B. False

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

A. True B. False

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

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

Sediment Quality Criteria Guidance

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

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

Aerobic Processes

243. The most common aerobic processes are: activated sludge systems, lagoons, trickling filters and rotating disk contactors.

A. True B. False

244. In wastewater treatment, carbonaceous BOD is degraded using _____.

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

245. Pilot plant and laboratory studies are required to design _____.

- | | |
|---------------------|---------------------------------|
| A. Effluent quality | D. Nitrogen and phosphorus load |
| B. Organic load | E. Activated sludge plants |
| C. Bacteria | F. None of the Above |

246. An activated sludge process can be designed based on the amount of time the sludge spends in the system, this is referred to as the _____.

- A. Carbonaceous BOD
- B. Attached growth processes
- C. Mean cell residence time (MCRT)
- D. Suspended growth processes
- E. Food-to-microorganism ratio, F/M
- F. None of the Above

Nitrification

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

- A. True
- B. False

248. 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

Anaerobic Bacteria

249. Which of the following bugs or related terms commonly occur in lagoons are involved in methane formation and in sulfate reduction?

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

250. Anaerobic methane formation involves _____ bacteria.

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

Photosynthetic Organisms

251. Which of the following bugs or related terms - this diverse group of bacteria converts products from above under anaerobic conditions to simple alcohols and organic acids?

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

252. Which of the following bugs or related terms these bacteria convert formic acid, methanol, methylamine, and acetic acid under anaerobic conditions to methane?

- A. Nitrifying bacteria
- B. Methane forming bacteria
- C. General anaerobic degraders
- D. Aerobic bacteria
- E. Anaerobic, heterotrophic bacteria
- F. None of the Above

Protozoans and Microinvertebrates

253. 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

Activated Sludge Methods

Organic Load

254. The organic loading from primary treatment processes enters the reactor (aeration basin) where the active microbial population is present.

- A. True
- B. False

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

256. The flocculating characteristics of the cells improve the longer they are retained in the system, since they start to produce extra cellular slime which favors _____.
A. Secondary settling D. Organic load
B. High degradation rate E. Settled biomass
C. Flocculating F. None of the Above

Common Types

257. In the conventional activated sludge process, baffles in the aeration tank cause the wastewater to circulate along the aeration tank in _____.
A. Plug flow mode D. Higher organic load
B. Laminar flow mode E. Settled biomass
C. 24 to 48 hours F. None of the Above

258. In the completely mixed activated sludge process, wastewater inflow streams enter the aeration basin at several points to facilitate the homogeneity of the mixing.
A. True B. False

Bugs or MOs Section - Paramecium sp.

259. 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

260. Paramecium is _____ over the entire body surface, allowing it to swim with a smooth gliding motion.
A. Round-shaped D. Stalked
B. Inflexible E. Uniformly ciliated
C. Coiled F. None of the Above

Vorticella sp.

261. Vorticella is a _____ found in activated sludge that ranges in length from 30 to 150 μm .
A. Shelled amoeba(s) D. Stalked ciliate
B. Euglypha E. Paramecium
C. Vorticella F. None of the Above

262. 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

263. A bunch of empty _____ indicates poor conditions in an activated sludge system, such as low DO or toxicity.

- A. Shelled amoebas
- B. Euglypha
- C. Vorticella stalks
- D. Stalked ciliates
- E. Ciliates
- F. None of the Above

Euglypha sp.

264. Euglypha are _____ with jelly-like bodies and range in size from 70 to 100 μm .

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

265. The shell of this bug is often transparent, allowing the hyaline body to be seen inside the shell.

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

266. Which of the following bugs are common in soil, treatment plants, and stream bottoms where decaying organic matter is present?

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

Euchlanis sp.

267. Euchlanis is _____ that eats detritus, bacteria, and small protozoa.

- A. Euglypha
- B. Shelled amoeba
- C. An omnivore
- D. Euchlanis
- E. Spirochaetes
- F. None of the Above

268. The presence of Euchlanis in _____ is evidence that aerobic conditions have been sustained, and that effluent quality is good.

- A. Biofilm
- B. Plant effluent
- C. Some bacteria
- D. Activated sludge
- E. Wastewater
- F. None of the Above

Bacteria Section

269. Many bacteria exist as _____ and the study of biofilms is very important.

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

270. Which of the following terms secrete sticky substances that form a sort of gel in which they live?

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

Filamentous Bacteria

271. Which of the following terms are a type of bacteria that can be found in a wastewater treatment system?

- 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

272. Filamentous bacteria found in wastewater function similar to _____. They degrade BOD well and add stability and backbone to the floc structure.

- A. Biofilm bacteria
- B. Filamentous bacteria
- C. Some bacteria
- D. Activated sludge
- E. Floc forming bacteria
- F. None of the Above

273. The floc structure created by filamentous bacteria keeps the floc from breaking up or shearing due to the turbulence from pumps, aeration, or transfer of the water.

- A. True
- B. False

Site Specific Bacteria

274. The efficient degradation of organic matter depends on two key operational parameters – aeration and biofilm building.

- A. True
- B. False

275. _____ become site-specific over time as the biofilm develops and matures. The site-specific bacteria are even more effective in treating the waste stream at that particular treatment plant.

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

Facultative Bacteria

276. Facultative bacteria can survive and multiply in either anaerobic or aerobic conditions.

- A. True
- B. False

277. Facultative bacteria will be _____ unless oxygen is added to the water.

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

278. When oxygen is added to the environment of facultative bacteria, the metamorphosis from _____ takes place within a couple of hours.

- A. Filamentous bacteria
- B. Facultative bacteria
- C. Application-specific bacteria
- D. Site-specific bacteria
- E. Anaerobic to aerobic state
- F. None of the Above

Anaerobic Bacteria

279. _____ live and reproduce when free oxygen is absent.

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

280. Organic material in an anaerobic treatment system must be exposed to _____ and/or detained for a much longer period of time to remove a given amount of organic material.

- A. Nitrogen
- B. Free oxygen
- C. Air
- D. Aerobic bacteria
- E. A significantly higher quantity of bacteria
- F. None of the Above

281. 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

Aerobic Bacteria

282. Aerobic bacteria live and multiply in the presence of free oxygen.

- A. True
- B. False

283. Facultative bacteria become aerobic when oxygen is present.

- A. True
- B. False

284. Since the metabolism of aerobes is much higher than _____, organic material can be removed with 90% fewer organisms or in 90% less time compared to the anaerobic process.

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

Protozoans and Metazoans

285. In a wastewater treatment system, the next higher life form above bacteria is?

- A. Nematodes and rotifers
- B. Metazoan(s)
- C. Protozoan(s)
- D. Protozoan and metazoan
- E. Aerobic floc
- F. None of the Above

286. Which of the following terms or bugs are also indicators of biomass health and effluent quality?

- A. Organic material
- B. Protozoans
- C. Macroinvertebrates
- D. Biomass health and effluent quality
- E. Aerobic flocs
- F. None of the Above

287. Which of the following terms or bugs are very similar to protozoans except that they are usually multi-celled animals?

- A. Nematodes and rotifers
- B. Metazoan(s)
- C. Protozoan(s)
- D. Protozoan and metazoan
- E. Aerobic floc
- F. None of the Above

Dispersed Growth

288. 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

289. 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

290. 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

291. 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:

292. 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

293. Which of the following wastewater treatment related terms 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

Filamentous Organisms

294. Which of the following wastewater treatment related terms, due to the high surface area of _____ 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

295. 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

296. 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

297. 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

298. *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

299. *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

300. According to the text, *Thiothrix* II produces rectangular filaments up to 200 microns in length and is easily identified by their _____ using phase contrast microscopy at 400 to 1000x magnification.

- | | |
|-----------------------------|----------------------------------|
| A. Stain gram-negative | D. Starburst effect formations |
| B. Not casease | E. Multicellular rigid filaments |
| C. Slower growing filaments | F. None of the Above |