Registration form

NUTRIENT REMOVAL 2 CEU TRAINING COURSE

48 HOUR RUSH ORDER PROCESSING FEE ADDITIONAL $50.00

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

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

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

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Home (_____) _____ Work (_____) _____

Operator ID #_____Exp. Date_____

Class/Grade_____

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

Collection___ Wastewater Treatment ___ Pretreatment____ Other _____

Technical Learning College PO Box 3060, Chino Valley, AZ 86323-3060
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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 $169.95 plus shipping charges.

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.

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.

Please provide a copy of your driver's license to confirm your identity.

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CERTIFICATION OF COURSE PROCTOR

Technical Learning College requires that our students who takes a correspondence or home study program course must pass a proctored course reading, quiz and final examination. The proctor must complete and provide to the school a certification form approved by the commission for each examination administered by the proctor.

Instructions. When a student completes the course work, fill out the blanks in this section and provide the form to the proctor with the examination.

Name of Course:_____

Name of Licensee:_____

Instructions to Proctor. After an examination is administered, complete and return this certification and examination to the school in a sealed exam packet or in pdf format.

I certify that:

1. I am a disinterested third party in the administration of this examination. I am not related by blood, marriage or any other relationship to the licensee which would influence me from properly administering the examination.
2. The licensee showed me positive photo identification prior to completing the examination.
3. The enclosed examination was administered under my supervision on _____. The licensee received no assistance and had no access to books, notes or reference material.
4. I have not permitted the examination to be compromised, copied, or recorded in any way or by any method.
5. Provide an estimate of the amount of time the student took to complete the assignment.

Time to complete the entire course and final exam. _____

Notation of any problem or concerns:

Name and Telephone of Proctor (please print):

_____

_____

Signature of Proctor

Nutrient Removal 2 Answer Key

Name_____

Phone #_____

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

Method of Course acceptance confirmation. Please fill this section

Website __ Telephone Call___ Email____ Spoke to_____

Did you receive the approval number, if applicable? _____
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What is the course approval number, if applicable? _____

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Please select one answer. You can circle, underline, bold or X the answer.

1. A B C D	17. A B C D	33. A B C D	49. A B C D
2. A B C D	18. A B C D	34. A B C D	50. A B C D
3. A B C D	19. A B	35. A B C D	51. A B C D
4. A B C D	20. A B	36. A B C D	52. A B C D
5. A B	21. A B C D	37. A B	53. A B C D
6. A B C D	22. A B C D	38. A B C D	54. A B C D
7. A B C D	23. A B C D	39. A B	55. A B C D
8. A B C D	24. A B C D	40. A B	56. A B C D
9. A B C D	25. A B C D	41. A B	57. A B C D
10. A B C D	26. A B C D	42. A B	58. A B C D
11. A B	27. A B	43. A B C D	59. A B C D
12. A B	28. A B	44. A B C D	60. A B C D
13. A B	29. A B C D	45. A B C D	61. A B
14. A B C D	30. A B	46. A B C D	62. A B
15. A B C D	31. A B C D	47. A B C D	63. A B
16. A B C D	32. A B	48. A B C D	64. A B C D

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201. A B C D	214. A B	227. A B C D	240. A B C D
202. A B	215. A B C D	228. A B C D	241. A B C D
203. A B	216. A B C D	229. A B	242. A B C D
204. A B C D	217. A B C D	230. A B C D	243. A B C D
205. A B C D	218. A B	231. A B C D	244. A B
206. A B C D	219. A B C D	232. A B C D	245. A B
207. A B	220. A B C D	233. A B C D	246. A B
208. A B C D	221. A B C D	234. A B C D	247. A B
209. A B C D	222. A B C D	235. A B C D	248. A B
210. A B C D	223. A B C D	236. A B	249. A B C D
211. A B	224. A B C D	237. A B	250. A B C D
212. A B C D	225. A B C D	238. A B	
213. A B	226. A B C D	239. A B	

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

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Signature

Please write down any questions you were not able to find the answers or that have errors.

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

When Finished with Your Assignment...

REQUIRED DOCUMENTS
Please scan the **Registration Page, Answer Key, Proctoring report, Survey and Driver's License** and email these documents to info@TLCH2O.com.

IPhone Scanning Instructions
If you are unable to scan, take a photo of these documents with your **iPhone** and send these photos to TLC, info@TLCH2O.com.

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

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NUTRIENT REMOVAL 2 CEU COURSE
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Very Easy 0 1 2 3 4 5 Very Difficult

Please rate the difficulty of the testing process.

Very Easy 0 1 2 3 4 5 Very Difficult

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

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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 have received your assignment and to confirm your identity.

Thank you…

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.

Nutrient Removal 2 CEU 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, address on your answer key, and make a 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**

1. The Clean Water Act prohibits anybody from discharging "pollutants" through a "_____" into a "water of the United States" unless they have an NPDES permit.
A. Non-Point source C. Point source
B. Discharge D. None of the above

2. There are various methods used to monitor NPDES permit conditions. The permit will require the facility to sample its discharges and notify EPA and the state regulatory agency of these results. In addition, the permit will require the facility to notify EPA and the state regulatory agency when the facility determines it is not in _____ with the _____ of a permit.
A. Compliance - Suggestions C. Violation - Compliance
B. Compliance - Requirements D. None of the above

3. A National Pollutant Discharge Elimination System (NPDES) individual permit is written to reflect site-specific conditions of a _____ (or in rare instances to multiple co-permittees) based on information submitted by that discharger in a permit application and is unique to that discharger whereas an _____ is written to cover multiple dischargers with similar operations and types of discharges based on the permit writer's professional knowledge of those types of activities and discharges. 2 part question.
A. Discharger - NPDES specific permit
B. Company - NPDES specific permit
C. Single Discharger- NPDES general permit
D. None of the above

4. An Operator must submit a permit application to apply for coverage under a National Pollutant Discharge Elimination System (NPDES) individual permit. The application form must be submitted to the permitting authority at least _____ days before the expected commencement of the discharge.
A. 180 C. 30
B. 90 D. None of the above

Establishing the Regulatory Authority Program
5. The two basic types of NPDES permits issued are zero discharge and commercial permits.
A. True B. False

Authority over All Industrial Users Contributing to the POTW

6. A Control Authority must be able to impose and enforce applicable Pretreatment Standards and Requirements on every _____ user contributing wastewater to its collection system. Therefore, it is necessary that the Control Authority's sewer use ordinance provides it with the requisite authority to issue control mechanisms, conduct compliance monitoring activities, and, when warranted, take appropriate enforcement action in response to noncompliance by _____Users within its boundaries.

A. Industrial – Non-User
B. Nondomestic - Industrial
C. Zero discharger –Domestic
D. None of the above

Basic Wastewater Treatment Processes

Biological

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

A. Adding Oxygen
B. Advanced Treatment
C. Removing carbon dioxide
D. None of the above

8. Masses of microorganisms grow and rapidly metabolized organic pollutants because of the addition of _____to wastewater.

A. Oxygen
B. Carbon dioxide
C. Secondary treatment
D. None of the above

Organic Matter

9. 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. Pesticides and herbicide(s)
D. None of the above

10. Two toxic _____like benzene and toluene are found in some solvents, pesticides, and other products.

A. Nutrients from wastewater
B. Inorganic materials
C. Excessive grease
D. Organic compounds

Oil and Grease

11. Fatty organic materials from animals, vegetables, and petroleum are quickly broken down by bacteria and cannot cause pollution in receiving environments.

A. True B. False

Inorganics

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

A. True B. False

Hydrogen Sulfide and Ammonia

13. Ammonia as a dissolved gas in wastewater is dangerous to fish.

A. True B. False

BOD and COD Reduction

14. 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 _____ to support fish and other aquatic life.

A. pH C. Carbon Dioxide
B. Carbon D. Oxygen

15. Oxygen-demanding substances are usually destroyed or converted to other compounds by _____ if there is sufficient oxygen present in the water.

A. Phosphorus C. Ammonia
B. Abiogenesis D. Bacteria

Nutrients

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

A. Oxygen C. Carbon, nitrogen, and phosphorus
B. Carbon dioxide D. Answers A,B and C

17. 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 C. Eutrophication or cultural enrichment
B. Nutrient enrichment D. Oxygen and organic waste

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

A. Wuhrmann Process C. Conventional secondary biological treatment processes
B. Cape Town Process D. Oxygen and organic waste ditch filter

19. According to the text, nutrients may convert the inorganic forms into mineral form, making them more usable by plant life.

A. True B. False

20. An excess of 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

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

A. Phosphorus C. Ammonia
B. Nitrifying Bacteria D. Calcium Hydroxide

Inorganic and Synthetic Organic Chemicals

22. Inorganic and Synthetic Organic Chemicals can cause _____ problems, and many are not effectively removed by conventional wastewater treatment.

A. Non-toxic C. Excessive growth of aerobic bacteria
B. Non-potable D. Taste and odor

Topic 2 – Primary Wastewater Treatment Section

Primary Treatment

23. 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. Tertiary Filtration C. Suspended growth process(es)
B. Trickling ditch D. Primary and secondary stages

24. The secondary stage uses which term to further purify wastewater?

A. Fixed Bed Reactor C. Primary sludge
B. Biological processes D. None of the above

Preliminary Treatment

25. Large amounts of _____ entering a treatment plant can cause serious operating problems, such as excessive wear of pumps and other equipment.

A. Solid(s) C. Grit and sand
B. Finer debris D. Dissolved organic and inorganic constituents

26. 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 removal C. Grit Removal
B. De-gritted wastewater D. None of the above

27. 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

Primary Sedimentation

28. 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

29. 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 C. Primary sludge
B. RAS D. Heavy pollutants

Secondary Treatment

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

A. True B. False

31. Maintaining a population of microorganisms within the oxidation basins which consumes _____ and also adhere to the solids themselves.

A. Total Solids C. Elevated Hardness, Salty Taste, or Corrosiveness
B. Very fine solids D. Organic Loading Rate

32. After Wastewater has been through Secondary Treatment processes, it flows into the next stage of treatment called Third Stage.
A. True B. False

33. The two most common conventional methods used to achieve secondary treatment are: _____ and suspended growth processes.
A. Tickling filters C. Unsuspended growth process(es)
B. Attached growth processes D. Organic matter growth process(es)

34. The Secondary Treatment stage consists of a biological process such as _____ and a physical process, Secondary Clarification.
A. Nitrogen Loading C. Denitrification
B. Oxidation Ditches D. None of the above

35. The Preliminary Treatment stage removes as much _____as possible using physical processes.
A. Solid(s) C. Suspended growth process(es)
B. Finer debris D. Dissolved organic and inorganic constituents

Other Important Wastewater Characteristics
36. One important wastewater characteristic that can affect public health and the environment, as well as the design, cost, and?
A. Treatment processes C. The environmental effects
B. Total dissolved solids (TDS) D. Effectiveness of treatment

Temperature
37. The best temperature for wastewater treatment probably range from 77 to 95 degrees Fahrenheit.
A. True B. False

38. Biological treatment activity accelerates in warm temperatures and slows in cool temperatures, but_____can stop treatment processes altogether.
A. Non -filamentous C. Settling sediments
B. High TSS D. Extreme hot or cold

pH
39. The acidity or alkalinity of wastewater does not affects both treatment and the environment.
A. True B. False

40. pH indicates increasing acidity while a low pH indicates increasing alkalinity.
A. True B. False

41. The pH needs to remain between 3 and 6 to protect organism?
A. True B. False

Topic 3 - Secondary Treatment Section

Secondary Treatment

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

A. True B. False

43. Maintaining a population of microorganisms within the oxidation basins that consumes _____ and also adhere to the solids themselves.

A. Total Solids C. Very fine solids
B. TDS D. None of the Above

44. The Secondary Treatment stage consists of a biological process such as _____ and a physical process, Secondary Clarification.

A. Tickling filters C. Phosphorus-reduction system(s)
B. Oxidation Ditches D. None of the Above

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

A. Solid(s) C. Grit and gravel
B. Finer debris D. None of the Above

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

A. Solid(s) C. Finer solids
B. Finer debris D. None of the Above

47. The two most common conventional methods used to achieve secondary treatment are: _____ and suspended growth processes.

A. Attached growth processes C. Unsuspended growth process(es)
B. Finer debris D. None of the Above

Raw Water Screening

48. Raw wastewater may or may not be _____before being directed into the pond treatment system. The first two ponds in the pond system may be operated in series or in parallel.

A. Screened and de-gritted C. Compacted clay bottoms and sides
B. Series or in parallel D. None of the above

49. Generally, the microorganisms in the first ponds treat the incoming effluent, while the next pond is the settling or polishing pond. The third pond is to provide _____where the where the biological solids generated in the first two ponds can settle.

A. Wind and algae C. Activated sludge
B. A quiet zone D. None of the above

50. Ponds generally do not have a secondary clarifier, the _____fulfils the clarifier action.

A. Wind and algae C. Settling or polishing pond
B. Series or in parallel D. None of the above

Pond Lining

51. Ponds may be lined with a synthetic liner or simply have _____.
A. Wind and algae C. Compacted clay bottoms and sides
B. Series or in parallel D. None of the above

52. Many ponds rely on _____ to supply oxygen instead of mechanical aeration.
A. Wind and algae C. Compacted clay bottoms and sides
B. Series or in parallel operation D. None of the above

53. Filamentous bacteria generally do not cause any operational problems in lagoons, in contrast to activated sludge where _____and poor sludge settling is a common problem.
A. Redox potential C. BOD removal
B. Filamentous bulking D. None of the Above

54. Most heterotrophic bacteria have a wide range in environmental tolerance and can function effectively in _____ over a wide range in pH and temperature.
A. Redox potential C. BOD removal
B. Poor sludge settling D. None of the Above

55. Aerobic BOD removal generally proceeds well from pH _____ and at temperatures from 3-4°C to 60-70°C (37.4 -39.2° F to 140-158°F in the ATAD process (mesophilic bacteria are replaced by thermophilic bacteria at temperatures above 35°C).
A. 5.5 to 8.0 C. 6.5 to 7.0
B. 6.5 to 9.0 D. None of the Above

56. BOD removal generally declines rapidly below _____C and ceases at _____C.
A. 3-4° - 1-2° C. 1-2° - 3-4°
B. 4-6° - 2-3° D. None of the Above

57. 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 nitrifying bacteria. These bacteria are strict aerobes and require a redox potential of at least _____ m V.
A. +200 C. 2,000
B. – 200 D. None of the Above

Lagoon Systems

58. Lagoon systems take advantage of _____ and microorganisms in the wastewater to renovate sewage.
A. Nitrogen removal system(s) C. Natural aeration
B. Suspended film system(s) D. None of the Above

Microorganisms in Lagoons

59. Swimming and _____engulf bacteria or other prey.
A. Gliding ciliates C. Heterotrophic bacteria
B. Predators D. None of the Above

60. Food (organic loading) regulates_____?
A. Strict aerobes C. Microorganism numbers
B. Predators D. None of the Above

Lagoon Microorganisms Introduction

61. 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

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

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

64. Which of the following are similar to those found in other treatment processes such as activated sludge?
A. Treatment organism(s) C. Floc-forming bacteria
B. Aerobic bacteria D. None of the Above

65. Which of the following degrade wastes and grows as single bacteria dispersed in the wastewater?
A. Strict aerobes C. Many bacterial species
B. Predators D. None of the Above

66. Which of the following grows in a large aggregate due to exocellular polymer production?
A. Predators C. Floc-forming bacteria
B. Aerobic bacteria D. None of the Above

67. Growth form is important as these flocs degrade _____and settle at the end of the process, producing a low TSS effluent.
A. Anaerobic action C. BOD
B. Application-specific bacteria D. None of the Above

68. Which of the following bugs or terms occur in lagoons, usually at specific growth environments?
A. Anaerobic action C. A number of filamentous bacteria
B. Absence of free oxygen D. None of the Above

69. Which of the following 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 C. Most heterotrophic bacteria
B. Predators D. None of the Above

70. 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 are termed?
A. Strict aerobes C. Nitrifying bacteria
B. Predators D. None of the Above

Mixed or Suspended Lagoons

71. 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) C. Dissolved organic and inorganic constituents
B. Anaerobic decomposition D. None of the Above

Advanced Methods of Wastewater Treatment

72. 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 C. Soluble nutrients
B. Some contaminants D. None of the Above

73. All WWTPs provide a minimum of?

A. Biofilm and chemical removal C. Pretreatment and pollution prevention
B. Secondary treatment D. None of the Above

Advanced Treatment Technologies

74. Which of the following can be extensions of conventional secondary biological treatment to further stabilize oxygen-demanding substances?

A. Hydraulic Detention Time C. Advanced treatment technologies
B. Activated sludge system D. None of the Above

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

A. Denitrification process C. Ion exchange
B. Organic material D. None of the Above

Topic 4 - Activated Sludge Process Section

Regular MLSS Removal

76. To maintain a stable treatment process, MLSS must be removed on a regular schedule. The MLSS can be removed from the bottom of the clarifier or from the_____.

A. Secondary sludge wasting C. Activated sludge basin
B. Solids handling process D. None of the above

77. The _____ removed directly from the basin is renamed as WAS.

A. MLSS C. WAS
B. CRT D. None of the above

78. Some clarifiers have separate pipelines for RAS and WAS. In other cases, WAS is pumped out of the _____pipeline.

A. RAS C. WAS
B. CRT D. None of the above

Wasting Rates

79. CRT was defined as the average length of time in days that an organism remains in the_____.

A. Secondary treatment system C. Many activated sludge plants
B. Solids handling process D. None of the above

80. The operator determines the operating _____ for the facility and maintains it through wasting the appropriate amount of excess biomass (Waste Activated Sludge, WAS) from the secondary system.
A. Mixed Liquor C. WAS
B. CRT D. None of the above

81. The amount of _____in the secondary system is controlled and maintained through solids wasting.
A. Biomass (MLSS) C. WAS
B. CRT D. None of the above

82. In nearly all activated sludge plants, wasting is accomplished by directing a portion of the Return Sludge to the_____.
A. Secondary sludge wasting C. Many activated sludge plants
B. Solids handing facility D. None of the above

83. Wasting Return Sludge rather than _____ minimizes the volume of water that must be processed by the sludge thickening/dewatering equipment.
A. Mixed Liquor C. RAS
B. CRT D. None of the above

84. If intermittent wasting is practiced, it is usually best to waste over as long a time period as practical, and when the loading on the _____ is at the low point of the day.
A. Secondary system C. Many activated sludge plants
B. Solids handling process D. None of the above

85. Drastic changes should not be made in wasting rates from one day to the next; allow the _____time to acclimate to a change before another change is made.
A. Secondary sludge wasting C. Advanced system
B. Biological system D. None of the above

86. Consistency is a key element in successful _____ operation.
A. Secondary system C. Activated sludge plant
B. The operator D. None of the above

87. Many activated sludge plants were originally designed to waste secondary solids into the primary clarifiers. The reasoning was that as the less dense biological solids co-settle with the _____the combined sludge density would be increased.
A. Mixed Liquor C. Scum
B. Heavier primary solids D. None of the above

88. A more efficient operation will result if the WAS is wasted directly to a _____ and not allowed to return to the treatment system.
A. Secondary sludge wasting C. Many activated sludge plants
B. Solids handling process D. None of the above

Environmental Conditions

89. Waste activated sludge flow, along with environmental conditions such as water temperature and accessibility to _____, which influences the process biology and level of treatment achieved.

A. MLSS concentration C. BOD, nutrients, and oxygen
B. WAS D. None of the above

90. Slower growing microorganisms, including the nitrification bacteria and some bacteria and some filaments, can only remain in the treatment process if the _____ is held long enough for them to reproduce.

A. MLSS C. BOD, nutrients, and oxygen
B. WAS D. None of the above

Sludge Settling

91. Waste activated sludge determines how long the _____ stays in the system and, therefore, helps to determine which type of microorganisms will be present.

A. MLSS C. BOD, nutrients, and oxygen
B. WAS D. None of the above

92. The presence or absence of _____will influence how fast the sludge settles in the clarifier.

A. MLSS concentration C. Filaments
B. WAS D. None of the above

93. Waste activated sludge also determines the _____.

A. MLSS concentration C. BOD, nutrients, and oxygen
B. WAS D. None of the above

Organic Load

94. 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 that favors?

A. Secondary settling C. Flocculating
B. High degradation rate D. None of the Above

Sludge Problems and Solutions Section

Excess Solids

95. Solids are generated by microorganism growth and reproduction. The influent BOD supplies the food for the growth and reproduction. As microorganisms' populations multiply, excess solids (microorganisms) must be removed (wasted).

A. True B. False

Final Clarifier Solids Loading Rate (SLR)

96. The rate at which the activated sludge is returned from the final clarifiers to the aeration basins, along with the influent flow, effects the flow of solids into the clarifiers.

A. True B. False

Clarifier Sludge Blanket

97. Solids settle and concentrate in the first clarifier forming a sludge blanket. The sludge blanket can increase depending on the WAS flow rate. The proper WAS flow rate allows for a desired sludge blanket.

A. True B. False

Oxidation Ditch
98. Oxidation ditches are typically limited mix systems, and cannot be modified to approach plug flow conditions.
A. True B. False

Pin Floc
99. Very fine floc particles with poor settling characteristics, usually indicative of a young sludge (high MLSS levels).
A. True B. False

Sludge Age
100. Activated sludge (RAS) is recycled back through the aeration basins by returning settled sludge in the final clarifiers and thus remains in the activated sludge system for a number of days. For effective treatment, a specific sludge age is desired for the type of activated sludge system.
A. True B. False

101. For conventional activated sludge, a sludge age of 1-3 days is typical. For extended aeration activated sludge, older sludge ages of 3-10 days are common. F/M ratio and sludge age is inversely related (1 divided by the sludge age approximates the F/M ratio).
A. True B. False

Constant MLSS (Mixed Liquor Suspended Solids)
102. Provided the influent loadings are constant, the operator maintains a relatively constant solids inventory (MLSS level) in the aeration basins for a desired level of treatment. The range of MLSS is typically between 1000-4000 mg/L.
A. True B. False

Wasting Rates
103. The concentration of WAS has a direct bearing on how much to waste and the volume wasted. On a volume basis, a thicker waste activated sludge (low WAS concentration) will require more amount of wasting than a thicker waste activated sludge (high WAS concentration).
A. True B. False

Extended Aeration Activated Sludge Plants
104. For extended aeration activated sludge plants the range is between about 15 and 30 days. Generally, during the winter months, higher sludge ages are required to maintain a sufficient biological mass. In the summer time, biological activity increases and lower sludge ages normally produce a higher quality effluent.
A. True B. False

Clarifier Sludge Blanket
105. Solids settle and concentrate in the final clarifiers forming a sludge blanket. The sludge blanket can increase or decrease depending on the RAS flow rate. The proper RAS flow rate allows for a desired sludge blanket.
A. True B. False

Young Sludge
106. Young sludge is often associated with a low F/M. To correct for young sludge, it is necessary to increase wasting rates. This will decrease the amount of solids under aeration, reduce the F/M ratio, and increase the sludge age.
A. True B. False

Excessive Old Sludge
107. The required pressure is an increase in the total system sludge mass. Decreased wasting is required to accomplish that objective. This problem is very rare.
A. True B. False

Return Rates Too Low
108. Thin mixed liquor suspended solids and a sludge blanket build-up of solids. Rising clumps of sludge or gas bubbles may occur in the final clarifier.
A. True B. False

Return Rates Too High
109. A sludge blanket in the final clarifier and a thick return activated sludge.
A. True B. False

Denitrification in Final Clarifier
110. In the absence of oxygen, a sludge blanket that is too thick and remains in the clarifier too long can denitrify. Nitrates in the sludge will be converted to nitrogen gas. The release of nitrogen gas will cause small gas bubbles that will be observed at the clarifier surface. Clumps of sludge may also rise to the surface.
A. True B. False

Old Sludge
111. Old sludge filaments include M. parvicella, Type 0041, Type 0675, Type 1851 and Type 0803. M.parvicella is known for causing foaming and bulking occurrences, especially during winter operating conditions, in WWTPs that must remove ammonia year-round.
A. True B. False

Stable Nitrification
112. At a water temperature of 20^{o}C, the washout SRT for AOBs is approximately 1.6 weeks and the washout for POAs is approximately 2.0 days. To maintain a stable population and to avoid accidental loss of these bacteria resulting from accidental overwasting, the target SRT would need to be two to three times as long or between 1 and 3 days.
A. True B. False

Slimy Foam
113. A grayish slimy foam that is very thick is commonly caused by nutrient deficiencies. It is often noted with a slime bulking condition.
A. True B. False

Foam Trapping
114. A long-term solution includes some facilities using a vacuum truck to remove the foam from the surface. A short-term solution includes eliminating grease from the influent
A. True B. False

Bacteria and Temperature Effect
115. Washout SRT is affected by temperature. For every 10^{o}C drop in water temperature, the growth rate of bacteria decreases by 50% and the _____ doubles. Growth rates for floc forming and filament forming bacteria are similarly affected.
A. MLSS C. Washout SRT
B. CBOD D. WAS

Denitrification

116. When _____ flow rates are too low, thick sludge blankets in the final clarifier can result. The operator will see gas bubbles (from ammonia gas) and rising/floating sludge clumps on the clarifier surface.

A. MLSS C. RAS
B. CBOD D. WAS

Food –To- Microorganism Ratio (F/M Ratio)

117. For microbiological health and effective treatment, the microorganisms (mixed liquor suspended solids) under aeration should be maintained at a certain level for the amount of food (influent BOD) coming into the plant. This is known as the_____.

A. MLSS C. Food to microorganism ratio
B. CBOD D. WAS

Topic 5 – Nutrient Section

TKN

118. Recalcitrant means a certain compound is difficult to break down. This material can often be broken down given enough time, but not within the time it spends in secondary treatment.

A. True B. False

119. Inert means the material is safe for all microorganisms.

A. True B. False

120. The TKN content of influent municipal wastewater is typically between 5,000 and 6,000 mg/L.

A. True B. False

121. Organic nitrogen compounds in wastewater undergo microbial conversion to NH_3 and ammonium ion NH_4^+.

A. True B. False

Ammonia

122. Ammonia is a nutrient that contains_____. Its chemical formula is NH_3 in the un-ionized state and NH_4+ in the ionized form.

A. Nitrogen and hydrogen C. Phosphate
B. Total ammonia D. Both total and unionized ammonia

123. Ammonia results can be expressed as: total ammonia (mg/l), un-ionized ammonia (mg/l), total ammonia (as N, mg/l), un-ionized ammonia (_____).

A. µg/l C. As N, mg/l
B. mg/l/day D. mg/l

Nitrification

124. Nitrification is an anaerobic process in which heterotrophic bacteria oxidize carbon for energy production.

A. True B. False

125. Nitrification is normally a one-step aerobic biological process for the oxidation of ammonia to nitrate.

A. True B. False

126. Ammonia-nitrogen (NH_3-N) is first converted to nitrite (NO_2^-) by ammonia oxidizing bacteria (AOB). The nitrite produced is then converted to nitrate (NO_3-) by nitrite oxidizing bacteria (NOB). Both reactions usually occur in the same process unit at a wastewater treatment plant (e.g., activated sludge mixed liquor or fixed film biofilm).
A. True B. False

Nitrifying Bacteria
127. Ammonia can be converted into nitrite and nitrate by nitrifying bacteria. Effluent ammonia-nitrogen (NH_3-N) concentrations less than 1 mg/L NH_3-N are achievable.
A. True B. False

Autotrophic Bacteria
128. AOB and NOB are classified as autotrophic bacteria because they derive energy from the oxidation of reduced inorganic compounds (in this case, nitrogenous compounds) and use inorganic carbon (CO_2) as a food source.
A. True B. False

Significant Amount of Oxygen
129. Nitrifying bacteria require a significant amount of oxygen to complete the reactions, produce a small amount of biomass, and cause destruction of alkalinity through the consumption of carbon dioxide and production of hydrogen ions.
A. True B. False

Nitrogen Gas
130. Nitrate can be converted to nitrogen gas by a variety of autotrophic bacteria. The nitrogen gas is returned to the digester.
A. True B. False

131. Nitrate removal is limited by the amount of COD available.
A. True B. False

Total Inorganic Nitrogen (TIN)
132. Total inorganic nitrogen (TIN) as low as 5 mg/L N can be met through biological nitrification and denitrification.
A. True B. False

Total Nitrogen
133. Total nitrogen in domestic wastewater typically ranges from 1.5 to 2.0 mg/L for low to high strength wastewater.
A. True B. False

134. Factors affecting concentration include the extent of infiltration and the presence of industries. Influent concentration varies during the day and can vary significantly during rainfall events, as a result of inflow and infiltration to the collection system.
A. True B. False

Conversion of Nitrate to Nitrogen Gas
135. In this oxygen free environment, bacteria use the oxygen attached to the nitrogen that is in the nitrate form, then the nitrogen gas is released.
A. True B. False

136. Because nitrogen contains almost 50 percent of the earth's atmosphere, the release of nitrogen into the atmosphere causes a small amount of global warming.
A. True B. False

137. The conversion of nitrate to nitrogen gas is accomplished by bacteria in a process known as denitrification. Effluent with nitrogen in the form of nitrate is retained in a tank that lacks oxygen, where carbon-containing chemicals, such as methanol, are added or a small stream of raw wastewater is mixed in with the nitrified effluent.
A. True B. False

Phosphorus Section
138. Total phosphorus (TP) in domestic wastewater typically ranges between _____ mg/L but can be higher depending on industrial sources, water conservation, or whether a detergent ban is in place.
A. 4 and 8 C. 100 to 500
B. 2 and 4 D. 1,000 – 2,000

139. The _____fraction is soluble and can be in one of several forms (e.g., phosphoric acid, phosphate ion) depending on the solution pH.
A. Orthophosphate C. Phosphoric acid, phosphate ion
B. Phosphorus D. Total phosphorus (TP)

140. _____ can be hydrolyzed into orthophosphate during the treatment process.
A. Polyphosphate C. Particulate organically bound phosphorus
B. Phosphorus D. Soluble organically bound non-biodegradable phosphorus

141. Polyphosphates are high-energy, condensed _____such as pyrophosphate and trimetaphosphate. They are also soluble but will not be precipitated out of wastewater by metal salts or lime. They can be converted to phosphate through hydrolysis, which is very slow, or by biological activity.
A. Polyphosphates C. Phosphates
B. Phosphorus D. None of the above

142. _____can either be in the form of soluble colloids or particulate. It can also be divided into biodegradable and non-biodegradable fractions.
A. Organically bound phosphorus C. Soluble biodegradable phosphorus
B. Phosphorus D. None of the above

143. _____ is generally precipitated out and removed with the sludge.
A. Organically bound phosphorus C. Soluble biodegradable phosphorus
B. Phosphorus D. Particulate organically bound phosphorus

Biological Phosphorus Control
144. Phosphorus removal can be achieved through chemical addition and a coagulation-sedimentation process discussed in the following section. Some biological treatment processes called biological nutrient removal (BNR) can also achieve nutrient reduction, removing _____.
A. Polyphosphate C. Both nitrogen and phosphorus
B. Phosphorus D. Soluble organically bound non-biodegradable phosphorus

Phosphate Accumulating Organisms (PAOs)

145. PAOs accomplish removal of phosphate by accumulating it within their cells as _____.

A. Polyphosphate C. Both nitrogen and phosphorus
B. Phosphorus D. Soluble organically bound non-biodegradable phosphorus

Production of Polyphosphate

146. PAOs are by no means the only bacteria that can accumulate _____within their cells and in fact, the production of polyphosphate is a widespread ability among bacteria.

A. Polyphosphate C. Phosphoric acid, phosphate ion
B. Phosphorus D. Total phosphorus (TP)

Luxury Uptake

147. In an anaerobic secondary treatment process, some of the CBOD is broken down through fermentation by anaerobic bacteria into soluble CBOD and simpler organic molecules called _____.

A. COD C. Carbon and energy
B. VFAs D. ATP

148. Volatile fatty acids are a preferred source of _____by heterotrophic bacteria, including the PAOs, because these compounds are easily absorbed into the bacteria.

A. COD C. Carbon and energy
B. VFAs D. ATP

Logistical Problem

149. The PAOs have a logistical problem: When PAOs are under anaerobic conditions, they are exposed to _____, but without oxygen, nitrite or nitrate present, they cannot access them.

A. COD C. Carbon and energy
B. VFAs D. ATP

Adenosine Triphosphate (ATP) Energy

150. The PAOs take ATP to the next level and form an energy-rich compound called_____, which strings together large numbers of phosphate molecules.

A. Polyphosphate C. Carbon and energy
B. VFAs D. ATP

Chemical Precipitation of Phosphorus

151. Phosphorus can also be precipitated through chemical addition. Alum, ferric chloride, or lime can be added to wastewater where these chemicals combine with phosphorus to form a solid. The precipitate is removed by settling or filtration.

A. True B. False

152. Chemical phosphorus removal can meet effluent levels as low as 0.03 mg/L TP. Chemical and biological phosphorus removal methods are often used together in various combination processes.

A. True B. False

Tertiary Filtration

153. WWTPs typically use biological phosphorus removal methods to reduce P concentrations above 50 mg/L as P followed by chemical precipitation at or after the secondary clarifier.

A. True B. False

Biological Phosphorus Removal and Combination Processes
Principles
154. Biological phosphorus removal is achieved by contacting phosphorus accumulating organisms (PAOs) in the RAS with feed, containing volatile fatty acids (VFA), in a zone free of nitrates and DO (anaerobic zone).
A. True B. False

Fuhs & Chen Theory
155. PAOs have the ability to store a large mass of _____in their cells in the form of polyphosphates.
A. Carbon C. Poly-β-hydroxybutyrate (PHB)
B. Phosphorus D. None of the above

University of Cape Town (UCT) and Modified UCT (MUCT)
156. The UCT process was designed to reduce _____ to the anaerobic zone when high removal of nitrates in the effluent is not required. It consists of three stages: an anaerobic stage, an anoxic stage, and an aerobic stage.
A. Nitrates C. An anoxic zone
B. A nitrate rich stream D. None of the above

Johannesburg (JHB), Modified Johannesburg and Westbank
157. The JHB process is similar to the 3 Stage Pho-redox process, but has a pre-anoxic tank ahead of the anaerobic zone to protect the zone from nitrates when low effluent nitrates are not required. The low COD of the wastewater limited the de-nitrification capacity in the original plant (Northern Works), resulting in nitrates in the _____.
A. RAS C. An anoxic zone
B. Pre-anoxic zone D. An aerobic stage

Nitrification and Nutrient Removal Sub-Section
158. Nitrosomonas europaea, which oxidizes ammonia to nitrite, and Nitrobacter winogradskyi, which oxidizes nitrite to nitrate.
A. True B. False

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

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

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

162. Nitrifying bacteria exists in low numbers in lagoons, they prefer attached growth systems and/or?
A. Nitrifying bacteria C. High MLSS sludge systems
B. Low MLSS sludge systems D. None of the Above

163. Complete nitrification would be expected at pond pH values between pH _____.
A. 7.5 and 9.5 C. 6.0 and 7.5
B. 7.0 and 8.5 D. None of the Above

164. Nitrification ceases at pH values above pH _____ and declines markedly at pH values below _____.
A. 9 and 6 C. 9 and 7
B. 8 and 5 D. None of the Above

165. Nitrification, however, is not a major pathway for nitrogen removal in lagoons. Nitrifying bacteria exists in low numbers in lagoons. They prefer _____and/or high MLSS sludge systems.
A. Nitrifying bacteria C. Attached growth systems
B. Low MLSS sludge systems D. None of the Above

166. Which of the following bugs or related terms commonly occur in lagoons are involved in methane formation and in sulfate reduction?
A. Nitrifying bacteria C. Anaerobic, heterotrophic bacteria
B. Aerobic bacteria D. Mixed slaked ciliates

167. Anaerobic methane formation involves _____ bacteria.
A. Three different groups of anaerobic C. Organic overloading conditions
B. Methane fermentation D. None of the Above

168. Which of the following genera of anaerobic bacteria hydrolyze proteins, fats, and polysaccharides present in wastewater to amino acids?
A. Nitrifying bacteria C. General anaerobic degraders
B. Methane forming bacteria D. None of the Above

Photosynthetic Organisms
169. Which of the following bugs is a diverse group of bacteria that converts products from under anaerobic conditions to simple alcohols and organic acids?
A. Acid-forming bacteria C. Aerobic bacteria
B. Methane bacteria D. None of the Above

170. 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 C. General anaerobic degraders
B. Methane forming bacteria D. None of the Above

171. Which of the following bugs or related terms are environmentally sensitive and have a narrow pH range of 6.5-7.5 and require temperatures > 14° C?
A. Acid-forming bacteria C. Aerobic bacteria
B. Methane bacteria D. None of the Above

172. Which of the following bugs or related terms that the products of these bugs become the substrate for the methane producers?
A. Acid formers (principally acetic acid) C. Aerobic bacteria
B. Methane bacteria D. None of the Above

173. Which of the following bugs or related terms ceases at cold temperature?
A. Acid-forming bacteria C. Aerobic bacteria
B. Methane fermentation D. None of the Above

174. Which of the following bugs or related terms can use sulfate as an electron acceptor, reducing sulfate to hydrogen sulfide?
A. Nitrifying bacteria C. Sulfate reducing bacteria
B. Methane forming bacteria D. None of the Above

175. Which of the following bugs or related terms is a major cause of odors in ponds?
A. Sulfate reduction C. Acid-forming bacteria
B. Methane fermentation D. None of the Above

176. Which of the following bugs or related terms and represented by about 28 genera, oxidize reduced sulfur compounds using light energy to produce sulfur and sulfate?
A. Nitrifying bacteria C. Red and green sulfur bacteria
B. Methane forming bacteria D. None of the Above

177. Which of the following bugs or related terms that can grow in profusion and give a lagoon a pink or red color?
A. Chromatium, Thiocystis, and Thiopedia C. Acid-forming bacteria
B. Methane bacteria D. None of the Above

178. According to the text, conversion of odorous sulfides to sulfur and sulfate by these bugs is a significant odor control mechanism in facultative and anaerobic lagoons.
A. Methane bacteria C. Acid-forming bacteria
B. Sulfur bacteria D. None of the Above

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

Nutrient Constituents in Wastewater and Measurement Methods
Nitrogen
180. The per capita contribution of nitrogen in domestic wastewater is about 1/10th of that for BOD.
A. True B. False

181. Which of the following in domestic wastewater typically ranges from 20 to 70 mg/L for low to high strength wastewater?
A. Organic carbon C. BOD
B. Total nitrogen D. None of the Above

182. The major contributors of nitrogen to wastewater are _____ such as food preparation, showering, and waste excretion.
A. Human activities C. Bacteria and other microbes
B. Oxygen-demanding pollutants D. None of the Above

183. Influent concentration varies during the day and can vary significantly during rainfall events, as a result of?
A. Oxygen-demanding pollutants C. Inflow and infiltration to the collection system
B. Dissolved oxygen decrease D. None of the Above

The TKN method has three major steps:
184. Digestion to convert organic nitrogen to?
A. Ammonium sulfate C. Dissolved, biodegradable compounds
B. Organic nitrogen D. None of the Above

185. Conversion of which term into condensed ammonia gas through addition of a strong base and boiling?
A. Ammonia gas C. Ammonia-nitrogen concentration
B. Ammonium sulfate D. None of the Above

186. Measuring the concentration includes ammonia, with this term being subtracted from the TKN to determine organic nitrogen.
A. Ammonia gas C. Ammonia-nitrogen concentration
B. Ammonium sulfate D. None of the Above

187. Nitrogen components in wastewater are typically reported on an "_____" basis?
A. As Nitrite C. As nitrogen
B. As Nitrate D. None of the Above

188. Wastewater treatment plants are designed for nitrification and denitrification and these can remove 80 to 95 percent of _____, but the removal of organic nitrogen is typically much less efficient.
A. TKN C. Aliphatic N compounds
B. Inorganic nitrogen D. None of the Above

189. According to the text, domestic wastewater organic nitrogen may be present in particulate, colloidal or dissolved forms and consist of proteins, amino acids, _____, refractory natural compounds in drinking water.
A. VFAs C. Aliphatic N compounds
B. Nitrites D. None of the Above

190. Which of the following may be released in secondary treatment by microorganisms either through metabolism or upon death and lysis?
A. TKN C. Aliphatic N compounds
B. Organic nitrogen D. None of the Above

191. Which of the following happens by microorganisms releasing organic nitrogen as dissolved, biodegradable compounds?
A. Ammonia gas C. Hydrolysis of particulate and colloidal material
B. THMs D. None of the Above

192. Other forms of _____ may be more persistent in wastewater treatment processes.
A. TKN C. Dissolved, biodegradable compounds
B. Organic nitrogen D. None of the Above

Hyperlink to the Glossary and Appendix
http://www.abctlc.com/downloads/PDF/WWTGlossary.pdf

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

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

Site Specific Bacteria
195. 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

Facultative Bacteria
196. 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

197. 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 C. Aerobic
B. Application-specific bacteria D. None of the Above

Anaerobic Bacteria
198. A typical use for _____ would be in a septic tank.
A. Aerobic bacteria C. Facultative bacteria
B. Anaerobic bacteria D. None of the Above

199. Which of the following or bugs release hydrogen sulfide as well as methane gas, both of which can create hazardous conditions?
A. Aerobic bacteria C. Facultative bacteria
B. Anaerobic bacteria D. None of the Above

200. Which of the following live and reproduce in the absence of free oxygen?
A. Aerobic bacteria C. Facultative bacteria
B. Anaerobic bacteria D. None of the Above

201. 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 of time.
A. Anaerobic action C. Significantly higher quantity of bacteria
B. Absence of free oxygen D. None of the Above

Aerobic Bacteria

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

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

204. The metabolism of aerobes is much higher than?
A. Application-specific bacteria C. Aerobic bacteria
B. Anaerobes D. None of the Above

205. The by-products of _____ are carbon dioxide and water.
A. Anaerobic action C. Aerobic bacteria
B. Application-specific bacteria D. None of the Above

Topic 7- Laboratory Analysis/ Process Control Section

pH Testing Section

206. When an atom loses _____and thus has more protons than electrons, the atom is a positively-charged ion or cation.
A. A proton C. An electron
B. Charge D. None of the Above

207. In chemistry, pH is a measure of the acidity or basicity of an aqueous solution. Solutions with a pH greater than 7 are said to be acidic and solutions with a pH less than 7 are basic or alkaline.
A. True B. False

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

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

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

Dissolved Oxygen Testing Section

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

212. At least two general forms of bacteria act in balance in a wastewater digester: Saprophytic organisms and?
A. Methane Fermenters C. Butyric acid fermenters
B. DO fermenters D. Carbon dioxide fermenters

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

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

215. Oxygen is an important component in water plant operations. Its primary value is to oxidize iron and manganese into forms that will precipitate out of the water. It also removes excess _____.
A. Carbon dioxide C. Molecular oxygen
B. Water sample D. None of the Above

216. The amount of _____in a water sample will affect the taste of drinking water also.
A. Carbon dioxide C. Dissolved oxygen
B. Water D. None of the Above

Methods of Determination
217. There are two methods that we will be using in the lab. The membrane electrode method procedure is based on the rate of diffusion of _____ across a membrane. The other is a titrimetric procedure (Winkler Method) based on the oxidizing property of the (DO).
A. Carbon dioxide C. Molecular oxygen
B. Water D. None of the Above

218. Many factors determine the solubility of oxygen in a water sample. Temperature, atmospheric pressure, salinity, biological activity and pH all have an effect on the (DO) content.
A. True B. False

Iodometric Test
219. Reactions take place with the addition of certain chemicals that liberate iodine equivalent to the?
A. Original (DO) content C. Anaerobic conditions
B. Dissolved Oxygen D. None of the Above

220. Which of the following can liberate iodine from iodides and some reducing agents reduce iodine to iodide?
A. Ammonia oxidation C. Certain oxidizing agents
B. Phosphorus removal D. None of the Above

221. Which of the following effectively removes interference caused by nitrates in the water sample, so a more accurate determination of (DO) can be made?
A. Winkler Method C. The alkaline Iodide-Azide reagent
B. Dissolved Oxygen D. None of the Above

222. Which of the following is highly dependent on the source and characteristics of the sample?
A. Methods of analysis C. Aerobic conditions
B. DO analysis D. None of the Above

223. Which of the following passes through the membrane and measured by the meter?
A. Carbon dioxide C. Only molecular oxygen
B. Dissolved Oxygen D. None of the Above

224. Membrane electrodes provide an excellent method for_____in polluted, highly colored turbid waters and strong waste effluents.
A. Sample(s) C. Aerobic conditions
B. DO analysis D. None of the Above

225. Proper samples must be taken in_____ bottles where agitation or contact with air is at a minimum.
A. BOD C. MLSS measurement
B. DO analysis D. None of the Above

226. Which of the following–is the one of the most important analyses in determining the quality of natural waters?
A. Anaerobic conditions C. The dissolved oxygen test
B. Undissolved Oxygen D. None of the Above

227. Which of the following measurement is essential for adequate process control?
A. Dissolved oxygen C. Aerobic conditions
B. DO analysis D. None of the Above

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

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

Total Dissolved Solids
230. Which of the following refers to any minerals, salts, metals, cations or anions dissolved in water?
A. Total Solids C. Total Suspended solids
B. TDS D. Dissolved solids

231. Which of the following comprise inorganic salts and some small amounts of organic matter that are dissolved in water?
A. Settleablity C. Quality of the water
B. Total dissolved solids (TDS) D. Total Solids

Total Solids

232. Which of the following includes both total suspended solids, the portion of total solids retained by a filter and total dissolved solids?
A. Total Solids C. Corrosiveness
B. TDS D. Alkalinity

233. Which of the following 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. Total Solids C. Total Suspended solids
B. TDS D. Alkalinity

234. Which of the following refers to matter suspended or dissolved in water or wastewater, and is related to both specific conductance and turbidity?
A. Total Solids C. Corrosiveness
B. TDS D. Alkalinity

235. Which of the following is the term used for material left in a container after evaporation and drying of a water sample?
A. Total Solids C. Total Suspended solids
B. TDS D. Alkalinity

Total Suspended Solids (TSS)

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

237. 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

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

239. 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

240. Which of the following can also cause an increase in surface water temperature, because the suspended particles absorb heat from sunlight?
A. Total Solids C. Total Suspended solids
B. High TSS D. Alkalinity

241. Which of the following can fill in spaces between rocks that could have been used by aquatic organisms for homes?
A. Oxygen C. Settling sediments
B. High TSS D. Suspended sediment

242. Which of the following can include a wide variety of material, such as silt, decaying plant and animal matter, industrial wastes, and sewage?
A. Total Solids C. Total Suspended solids
B. TDS D. Alkalinity

243. Which of the following can block light from reaching submerged vegetation?
A. Oxygen C. Settling sediments
B. High TSS D. Suspended sediment

Settleometer Test
244. The test requires a settleometer, which is typically a clear plastic cylinder with a capacity of 2 liters. Graduations on the cylinder range from 100 to 1000 cubic centimeters (or milliliters) of Settled sludge per liter.
A. True B. False

245. A sample of nitrates should be obtained from the discharge end of the aeration tank, being careful not to include scum in the sampling container.
A. True B. False

246. A simple procedure called the Settleometer Test is used to determine the settling characteristics of mixed liquor.
A. True B. False

247. It is a good idea to occasionally record the MLSS concentration volume every 5 minutes while the flocs are settling and prepare a graph of settled activated sludge versus minutes. This allows the operator to see whether bugs are settling too quickly or slowly.
A. True B. False

248. Mix the sample well, and fill the settleometer to the 1000 graduation. Immediately start a timer and at the end of 10 minutes record the solids volume in the settleometer.
A. True B. False

249. Do not allow the sample to set for more than a few minutes before the settling test is performed. Determine the _____in milligrams per liter on a portion of this sample.
A. MLSS concentration C. Nitrates
B. The solids D. None of the Above

250. Solids that settle too quickly may be an indication of _____that will probably leave straggler floc in the effluent, while solids that settle too slowly or do not compact well may be washed out of the clarifier during times of high hydraulic load.
A. Settled sludge C. Sludge volume
B. An old sludge D. None of the Above

When Finished with Your Assignment...

REQUIRED DOCUMENTS
Please scan the **Registration Page, Answer Key, Proctoring report, Survey and Driver's License** and email these documents to info@TLCH2O.com.

IPhone Scanning Instructions
If you are unable to scan, take a photo of these documents with your **iPhone** and send these photos to TLC, info@TLCH2O.com.