Registration form

WASTEWATER TREATMENT 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. _____

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

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Home (_____) _____Work (_____) _____

Operator ID# _____Exp Date_____

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

Wastewater Treatment_____ Other _____

Technical Learning College PO Box 3060, Chino Valley, AZ 86323
Toll Free (866) 557-1746 Fax (928) 272-0747 info@tlch2o.com

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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.

State Approval Listing Link; Check to see if your State or Agency accepts or has pre-approved this course. Not all States are listed. Not all courses are listed. If the course is not accepted for CEU credit, we will give you the course free if you ask your State to accept it for credit.

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

State Approval Listing URL…
http://www.abctlc.com/downloads/PDF/CEU%20State%20Approvals.pdf

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

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

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

No refunds.

For Texas Wastewater Licensed Operators Information Changes

Wastewater/Collections Rule Changes (Texas Only)

Rule Changes and Updates for Domestic Wastewater Systems
On Nov. 4, 2014, TCEQ commissioners adopted revisions to 30 Texas Administrative Code (TAC), Chapter 217, Design Criteria for Domestic Wastewater Systems, and "re-adopted" previously repealed rules in 30 TAC, Chapter 317, Design Criteria Prior to 2008.

***Some of the changes to Chapter 217 include**:*

- Adding new definitions and clarifying existing definitions;
- Adding design criteria and approval requirements for rehabilitation of existing infrastructure;
- Adding design criteria for new technologies, including cloth filters and air lift pumps;
- Making changes to reflect modern practices, standards and trends;
- Modifying rule language to improve readability and enforceability; and
- Modifying the design organic loadings and flows for a new wastewater treatment facility.

SUBCHAPTER A: ADMINISTRATIVE REQUIREMENTS §§217.1 - 217.18
Effective December 4, 2015 §217.1. Applicability. (a) Applicability. (1) This chapter applies to the design, operation, and maintenance of: (A) domestic wastewater treatment facilities that are constructed with plans and specifications received and approved by the executive director after the effective date of the amendments to this chapter; (B) treatment units that are altered, constructed, or re-rated with plans and specifications received and approved by the executive director after the effective date of the amendments to this chapter; (C) collection systems that are constructed with plans and specifications received and approved by the executive director after the effective date of the amendments to this chapter; (D) collection system units that are altered, constructed, or re-rated with plans and specifications received and approved by the executive director after the effective date of the amendments to this chapter; (E) existing domestic wastewater treatment facilities that do not have a current Texas Pollutant Discharge Elimination System permit or a Texas Land Application Permit and are required to have an active wastewater permit; (F) existing wastewater treatment facilities and collection systems that never received approval for plans and specifications from the executive director; and (G) collection system rehabilitation projects covered in §217.56(c) and §217.69 of this title (relating to Trenchless Pipe Installation; and Maintenance, Inspection, and Rehabilitation of the Collection System). (2) Domestic wastewater treatment facilities, treatment units, collection systems, and collection system units with plans and specifications approved by the executive director that were received on or after August 28, 2008 and before the effective date of this chapter must comply with the rules in this chapter, as they existed immediately before the effective date of the amendments to this chapter.

The rules in Texas Commission on Environmental Quality Page 2 Chapter 217 - Design Criteria for Domestic Wastewater Systems effect immediately before the effective date of the amendments to this chapter are continued in effect for that purpose. (3) This chapter does not apply to: (A) the design, installation, operation, or maintenance of domestic wastewater treatment facilities, treatment units, collection systems, or collection system units with plans and specifications that were approved by the executive director on or before August 27, 2008, which are governed by Chapter 317 of this title (relating to Design Criteria Prior to 2008) or design criteria that preceded Chapter 317 of this title; and (B) systems regulated by Chapter 285 of this title (relating to On-Site Sewage Facilities); or collection systems or wastewater treatment facilities that collect, transport, treat, or dispose of wastewater that does not have the characteristics of domestic wastewater, although the wastewater may contain domestic wastewater.
(b) The executive director may grant variances from new requirements added by the amendments of this chapter to a person who proposes to construct, alter, or re-rate a collection system or wastewater treatment facility if the plans and specifications for the project are submitted within 180 days after the date the amendments to this chapter are effective, provided the plans and specifications comply with the rules in effect immediately prior to the amendment. Adopted November 4, 2015 Effective December 4, 2015

The link to the rules is available on the TCEQ website at
https://www.tceq.texas.gov/rules/indxpdf.html

*For Texas Students Only****....***

Please sign and date this notice

Printed Name

_____

Signature Date

_____

Texas Students Only

Acknowledgement of Notice of Potential Ineligibility for License

You are required to sign and return to TLC or your credit will not be reported.

Name: _____

Date of Birth: _____

Email Address: _____

By signing this form, I acknowledge that Technical Learning College notified me of the following:

- the potential ineligibility of an individual who has been convicted of an offense to be issued an occupational license by the Texas Commission on Environmental Quality (TCEQ) upon completion of the educational program;
- the current TCEQ Criminal Conviction Guidelines for Occupational Licensing, which describes the process by which the TCEQ's Executive Director determines whether a criminal conviction:
- renders a prospective applicant an unsuitable candidate for an occupational license;
- warrants the denial of a renewal application for an existing license; or
- warrants revocation or suspension of a license previously granted.
- the right to request a criminal history evaluation from the TCEQ under Texas Occupations Code Section 53.102; and
- that the TCEQ may consider an individual to have been convicted of an offense for the purpose of denying, suspending or revoking a license under circumstances described in Title 30 Texas Administrative Code Section 30.33.

Enrollee Signature: _____ Date: _____

Name of Training Provider/Organization: Technical Learning College

Contact Person: Melissa Durbin Role/Title: Dean

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

Wastewater Treatment CEU Course Answer Key

Name _____ ***Telephone #*** _____

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? _____

What is the course 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. No refunds.

Please write down any question that you are not able to find.
Please circle, underline, bold or X only one correct answer

1. A B C D	19. A B C D	37. A B C D	55. A B
2. A B C D	20. A B C D	38. A B C D	56. A B
3. A B C D	21. A B C D	39. A B C D	57. A B
4. A B C D	22. A B C D	40. A B C D	58. A B
5. A B C D	23. A B C D	41. A B	59. A B C D
6. A B	24. A B	42. A B	60. A B C D
7. A B	25. A B C D	43. A B C D	61. A B C D
8. A B C D	26. A B C D	44. A B C D	62. A B C D
9. A B C D	27. A B C D	45. A B C D	63. A B C D
10. A B C D	28. A B C D	46. A B	64. A B C D
11. A B C D	29. A B C D	47. A B C D	65. A B C D
12. A B C D	30. A B C D	48. A B C D	66. A B C D
13. A B	31. A B C D	49. A B	67. A B C D
14. A B C D	32. A B	50. A B	68. A B C D
15. A B	33. A B C D	51. A B C D	69. A B C D
16. A B C D	34. A B C D	52. A B	70. A B C D
17. A B	35. A B C D	53. A B	71. A B C D
18. A B	36. A B C D	54. A B C D	72. A B C D

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196. A B C D
197. A B C D
198. A B C D
199. A B C D
200. A B C D

I understand that I am 100 percent responsible to ensure that TLC receives the Assignment and Registration Key. I understand that TLC has a zero tolerance towards not following their rules, cheating or hostility towards staff or instructors. I need to complete the entire assignment for credit. There is no credit for partial assignment completion. My exam was proctored.

I will contact TLC if I do not hear back from them within 2 days of assignment submission. I will forfeit my purchase costs and will not receive credit or a refund if I do not abide with TLC's rules.

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

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Signature

When finished with your assignment.

Please scan the Registration Page, Proctoring report, Answer Key and Driver's License and email it to info@TLCH2O.com.

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

If you are unable to scan and email, please fax these to TLC,

(928) 468-0675
If you fax, call to confirm that we received your paperwork.

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 along with your final exam

WASTEWATER TREATMENT
CEU TRAINING COURSE
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Wastewater Treatment
CEU Course Assignment

The Assignment is available in Word on the Internet for your Convenience, please visit www.ABCTLC.com and download the assignment and email 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. 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.

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

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

Please write down any questions or answers that you could not find or has an error.

Biological

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

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

2. Which of the following wastewater terms means a suspended growth process for removing organic matter from sewage by saturating it with air and microorganisms that can break down the organic matter?

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

3. Masses of microorganisms grow and rapidly metabolized organic pollutants because of the addition of which term to wastewater?

A. Oxygen C. MLVSS
B. Carbon dioxide D. None of the Above

Chemical

4. Which of the following wastewater terms are often used at the later stages of treatment to improve the settling of excess microbiological growth or biosolids?

A. Polymers C. Methenol
B. Activated Sludge D. None of the Above

Organic Matter

5. Which of the following wastewater terms can cause pollution, if too much of this organic matter in wastewater; it can be devastating to receiving waters?

A. Iron
B. Biodegradable material(s)
C. Organic material(s.
D. High supply of oxygen

Oil and Grease

6. 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

7. 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

Pollutants, Oxygen-Demanding Substances

8. 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
B. Carbon
C. Carbon Dioxide
D. Oxygen

Nutrients

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

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

Inorganic and Synthetic Organic Chemicals

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

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

Primary Treatment

11. 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
B. Trickling ditch
C. Suspended growth process(es)
D. Primary and secondary stages

Preliminary Treatment

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

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

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

A. True B. False

14. Especially in cities with combined sewer systems, removing the-this missing term-that washes off streets or land during storms is very important.
A. Very fine solids C. Primary sludge
B. Grit and gravel D. None of the Above

Primary Sedimentation
15. 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

16. 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) C. Dissolved organic and inorganic constituents
B. Suspended solids D. None of the Above

17. 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

Secondary Treatment
18. The wastewater enters from Preliminary Treatment into the clarifier process a biological process consisting of large oval shaped basins that are capable of removing these finer solids.
A. True B. False

19. 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

20. Which of the following terms form larger and heavier aggregates that can by physically separated?
A. Solid(s) C. Finer solids
B. Finer debris D. None of the Above

21. 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

Biochemical Oxygen Demand
22. The BOD test has merit as a pollution parameter continues to be debated, _____has the advantage of a long period of record.
A. BOD C. MLSS
B. CBOD D. MLVSS

Application Specific Microbiology

23. Which of the following terms is the preferred methodology in wastewater treatment affecting the efficiency of biological nutrient removal?

A. Attached growth
B. Advanced treatment technologies
C. Application-specific microbiology
D. None of the Above

Topic 3 - Secondary Treatment Section

Aerobic Processes

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

A. True B. False

25. Which of the following terms is used to degrade carbonaceous BOD?

A. Temperature
B. Primary sludge
C. Headworks
D. Activated sludge processes

26. Which of the following terms is the amount of food provided to the bacteria in the aeration tank (the food-to-microorganism ratio, F/M)?

A. Carbonaceous BOD
B. Attached growth processes
C. Mean cell residence time (MCRT)
D. Food-to-microorganism ratio, F/M

Raw Water Screening

27. 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
B. Series or in parallel
C. Compacted clay bottoms and sides
D. None of the above

28. 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
B. A quiet zone
C. Activated sludge
D. None of the above

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

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

30. Ponds may be lined with a synthetic liner or simply have _____.

A. Wind and algae
B. Series or in parallel
C. Compacted clay bottoms and sides
D. None of the above

31. Many ponds rely on _____ to supply oxygen instead of mechanical aeration.

A. Wind and algae
B. Series or in parallel operation
C. Compacted clay bottoms and sides
D. None of the above

Lagoon Systems

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

A. True B. False

Lagoon Microorganisms Introduction

33. Swimming and _____engulf bacteria or other prey.

A. Gliding ciliates C. Heterotrophic bacteria
B. Predators D. None of the Above

34. Predators feed mostly on stalked and _____.

A. Floc-forming bacteria C. Methane Fermenters
B. Swimming ciliates D. None of the Above

35. Food (organic loading) regulates_____?

A. Strict aerobes C. Microorganism numbers
B. Predators D. None of the Above

36. 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

37. 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

38. Aerobic BOD removal generally proceeds well from which 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.

A. 5.5 to 8.0 C. 6.5 to 7.0
B. 6.5 to 9.0 D. None of the Above

39. 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

40. 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

Mixed or Suspended Lagoons

41. The aerated lagoons are basins, normally excavated in earth and operated without Solids recycling into the system. This is the major difference with respect to activated sludge systems.

A. True B. False

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

43. 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
44. 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

45. 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
46. WWTP treatment levels beyond secondary treatment are called advanced treatment.
A. True B. False

47. Which of the following terms 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

48. 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

Clarifier Sludge Blanket
49. 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

Constant MLSS (Mixed Liquor Suspended Solids)
50. 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

Denitrification
51. 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

Extended Aeration Activated Sludge Plants
52. 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

Filaments
53. Filamentous organisms are a group of thread-like organisms that, when in excess, can impair the settling of activated sludge and create a bulking condition in the final clarifier.
A. True B. False

Food –To- Microorganism Ratio (F/M Ratio)
54. 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

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

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

Sludge Age
57. 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

Young Sludge
58. 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

Regular MLSS Removal

59. 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

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

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

61. 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

62. 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

63. 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

64. 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

65. 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

66. 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

67. 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

68. 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

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

70. 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

71. 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

72. It is crucial that adequate solids concentrating equipment and _____are part of any plans for building or expanding an activated sludge plant.
A. Secondary system C. Solids storage capability
B. The operator D. None of the above

73. Which of the following is one of the most important controls available to the operator because it controls the most important aspect of treatment, biomass population?
A. Secondary system C. Activated sludge plant
B. Secondary sludge wasting D. None of the above

74. A good _____ control situation is one that allows the operator to set a totalizer which determines the maximum number of gallons wasted in a particular day and also allows the operator to control and monitor the WAS flow rate.
A. Temperature C. Oxygen
B. WAS D. Headworks

Environmental Conditions
75. Waste activated sludge flow along with environmental conditions such as water temperature and accessibility to _____, influences the process biology and level of treatment achieved.
A. MLSS concentration C. BOD, nutrients, and oxygen
B. WAS D. None of the above

76. 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

77. 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

78. 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

79. Waste activated sludge also determines the _____.

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

Organic Loading Methods

Organic Load

80. 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

Common Types

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

A. True B. False

Sludge Problems and Solutions Section

Excess Solids

82. 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)

83. 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

Return Rates Too Low

84. 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

Excessive Old Sludge

85. 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

Topic 5 – Nutrient Section

TKN

86. 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

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

A. True B. False

Ammonia

88. 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

89. 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

Nitrogen Introduction

90. 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

Nitrifying Bacteria

91. 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

92. 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

93. 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

Nitrification
94. Nitrification is an anaerobic process in which heterotrophic bacteria oxidize carbon for energy production.
A. True B. False

Nitrogen Gas
95. 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

Total Inorganic Nitrogen (TIN)
96. 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
97. 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

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

Conversion of Nitrate to Nitrogen Gas
99. 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
100. 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
B. 2 and 4
C. 100 to 500
D. 1,000 – 2,000

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

Phosphorus Section
102. Which of the following in domestic wastewater typically ranges between 4 and 8 mg/L but can be higher depending on sources?
A. Phosphorus as phosphate
B. Orthophosphate
C. Total phosphorus (TP)
D. None of the Above

Biological Phosphorus Control
103. 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)
104. 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
105. 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
106. 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

Logistical Problem
107. 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
108. 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
109. 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

Tertiary Filtration
110. 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
111. 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
112. 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. Magnesium and potassium ions

University of Cape Town (UCT) and Modified UCT (MUCT)
113. 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. An aerobic stage

Johannesburg (JHB), Modified Johannesburg and Westbank
114. 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
115. Nitrosomonas europaea, which oxidizes ammonia to nitrite, and Nitrobacter winogradskyi, which oxidizes nitrite to nitrate.
A. True B. False

116. 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

117. 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

118. 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

119. 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
B. Low MLSS sludge systems
C. Attached growth systems
D. None of the Above

Anaerobic Bacteria

120. 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. Aerobic bacteria
C. Anaerobic, heterotrophic bacteria
D. Mixed slaked ciliates

121. Anaerobic methane formation involves _____bacteria.

A. Three different groups of anaerobic
B. Methane fermentation
C. Organic overloading conditions
D. None of the Above

122. Which of the following bugs or related terms many genera of anaerobic bacteria hydrolyze proteins, fats, and polysaccharides present in wastewater to amino acids?

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

Photosynthetic Organisms

123. 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
B. Methane bacteria
C. Aerobic bacteria
D. None of the Above

Methane Forming Bacteria

124. Which of the following bugs or related terms is a major cause of odors in ponds?

A. Sulfate reduction
B. Methane fermentation
C. Acid-forming bacteria
D. None of the Above

Nutrient Constituents and Measurement Methods

The TKN method has three major steps:

125. Digestion to convert organic nitrogen to?

A. Ammonium sulfate
B. Organic nitrogen
C. Dissolved, biodegradable compounds
D. None of the Above

126. 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
B. Inorganic nitrogen
C. Aliphatic N compounds
D. None of the Above

127. 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
B. Nitrites
C. Aliphatic N compounds
D. None of the Above

128. 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

129. 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

130. 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

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

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

133. 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

134. The chemical composition of DON in wastewater effluents is completely understood.
A. True B. False

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

Topic 6- Wastewater Microbiology Section
Bacteria Section
135. Many bacteria exist as _____ and the study of biofilms is very important.
A. Filamentous Bacteria C. Application-specific bacteria
B. A biofilm D. None of the Above

136. Bacteria come in a variety of shapes. The. Bacteria formed like simple shapes, round spheres or balls are called Cocci (singular coccus). The next simplest shape is cylindrical. Cylindrical bacteria are called rods (singular rod).
A. True B. False

Peritrichous Bacteria
137. Bacteria may be classified according to whether they require oxygen (aerobic or anaerobic) and how they react to a test with Gram's stain.
A. True B. False

138. Bacteria in which alcohol washes away Gram's stain is called gram-negative, while bacteria in which alcohol causes the bacteria's walls to absorb the stain are called Gram-positive.
A. True B. False

139. Pleomorphic bacteria can assume a variety of shapes.
A. True B. False

Fecal Coliform Bacteria
140. Fecal Coliform Bacteria live in the waste material, or feces, excreted from the intestinal tract. When fecal coliform bacteria are present in high numbers in a water sample, it means that the water has received_____ from one source or another.
A. Fecal matter C. Bacterial concentrations
B. Fecal coliform D. None of the Above

141. Although not necessarily agents of disease, _____ may indicate the presence of disease-carrying organisms, which live in the same environment as the fecal coliform bacteria.
A. Fecal matter C. Fecal coliform bacteria
B. Fecal concentration D. None of the Above

Filamentous Bacteria
142. 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
143. 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
144. 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

Anaerobic Bacteria
145. 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

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

Protozoans and Metazoans

147. Which of the following or bugs and the relative abundance of certain species can be a predictor of operational changes within a treatment plant?

A. Nematodes and rotifers C. Protozoans and metazoans
B. Macroinvertebrates D. None of the Above

Dispersed Growth

148. 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

149. 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 C. Bulking sludge
B. Dispersed growth D. None of the Above

Activated Sludge Bugs

150. In the Activated Sludge process, the settled bugs_are also called _____.

A. Organism sludge C. Pre-mixed liquor
B. Waste Activated Sludge D. None of the Above

151. Which bug feeds on the larger bugs and assist with settling is in the fourth group, known as?

A. Water bear C. Rotifer
B. Suctoria D. None of the Above

152. An asset in settling the bug is its fat storage property and as the bugs “bump” into each other, the fat on each of them sticks together and causes flocculation of the_____.

A. Mixed liquor C. Non-organic solids and biomass
B. Floc D. None of the Above

Paramecium sp.

153. 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) C. Euglypha
B. Paramecium D. None of the Above

Vorticella sp.

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

A. Shelled amoeba(s) C. Euglypha
B. Vorticella D. None of the Above

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

A. Shelled amoeba(s) C. Vorticella
B. Euglypha D. None of the Above

Euglypha sp.
156. Which of the following bugs are common in soil, treatment plants, and stream bottoms where decaying organic matter is present?
A. Shelled amoeba(s) C. Stalked ciliate
B. Euglypha D. None of the Above

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

158. Euchlanis is a typical?
A. Euglypha C. Rotifer(s)
B. Shelled amoeba(s) D. None of the Above

Activated Sludge Aerobic Flocs
159. 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

Problems may appear during the operation of activated sludge systems, including:
160. 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 C. Biomass health and effluent quality
B. High solids D. None of the Above

161. Which of the following wastewater treatment related terms that which settles too slowly and is not compactable, and caused by the predominance of filamentous organisms?
A. Settling sludge C. Bulking sludge
B. Organic material D. None of the Above

Filamentous Organisms
162. Which of the following wastewater treatment related terms reach too high a concentration, they can extend dramatically from the floc particles?
A. Filamentous organisms C. Organic material
B. Floc particles D. None of the Above

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

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

Microthrix parvicella

165. Microthrix parvicella is another common cause of?

A. Disruptive foaming C. Viscous brown color
B. Mixotrophic D. None of the Above

Sphaeroliticus natans

166. Which of the following requires high levels of oxygen are necessary?

A. Stain gram-negative C. Slower growing filaments
B. A strict aerobe D. None of the Above

Filamentous Bacteria

167. There is a potential for instability with _____is an acute problem when strict demands on treatment performance are in place.

A. Organic carbon C. High BOD
B. Activated sludge D. None of the Above

Water Quality Criteria

168. 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

Human Health Criteria

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

A. True B. False

Aquatic Life Criteria

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

A. True B. False

Biological Criteria

171. A water body in its natural condition is free from _____, habitat loss, and other negative stressors.

A. Allowable concentrations C. Acute (short term) and chronic (long term)
B. Harmful effects of pollution D. None of the Above

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

A. Water quality standards C. Acute (short term) and chronic (long term)
B. Harmful effects of pollution D. Human health and aquatic life criteria

Pollutants in the Sediment

173. Controlling the concentration of pollutants in the sediment helps to protect bottom dwelling species and prevents harmful toxins from moving up the food chain and accumulating in the tissue of animals at progressively higher levels.

A. True B. False

Genera

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

A. Carbonaceous BOD
B. Attached growth processes
C. Suspended growth processes
D. Mass of biomat

Topic 8- Laboratory Analysis/ Process Control Section

pH Testing Section

175. When an atom loses _____and thus has more protons than electrons, the atom is a positively-charged ion or cation.

A. A proton
B. Charge
C. An electron
D. None of the Above

176. Measurement of pH for aqueous solutions can be done with a glass electrode and a pH meter, or using indicators like strip test paper.

A. True
B. False

177. 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

178. Pure water has a pH very close to?

A. 7
B. 7.5
C. 7.7
D. None of the Above

179. pH is defined as the decimal logarithm of the reciprocal of the_____, a_H+, in a solution.

A. Hydrogen ion activity
B. Acid-base behavior
C. Brønsted–Lowry acid–base theory
D. None of the Above

180. Which of the following may be used to measure pH, by making use of the fact that their color changes with pH?

A. Indicators
B. Spectrophotometer
C. A set of non-linear simultaneous equations
D. None of the Above

181. Sodium hydroxide, NaOH, is an example of a?

A. Weak base
B. Strong base
C. Strong acid
D. None of the Above

182. Since pH is a logarithmic scale, a difference of one pH unit is equivalent to _____ difference in hydrogen ion concentration.

A. 1
B. .1
C. 10
D. None of the Above

183. Which of the following measurements is used in the interpretation and control of water and wastewater treatment processes?

A. Acid
B. Alkalinity
C. Hydrogen bond formation
D. None of the Above

184. Which of the following are compounds that, for practical purposes, are completely dissociated in water?
A. Strong acids and bases C. Strong bases and weak acids
B. Chemical ions in chains D. None of the Above

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

186. Aerobes decompose inorganics in the water; the result is carbon dioxide and H2SO4.
A. True B. False

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

188. Which of the following wastewater terms indicate that dissolved oxygen is present?
A. Sample(s) C. Aerobic conditions
B. DO analysis D. None of the Above

Iodometric Test
189. According to the text, 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

190. 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

Total Dissolved Solids
191. The TDS test does not provide us much insight into specific water quality issues, such as: Elevated Hardness, Salty Taste, or?
A. Total Solids C. Corrosiveness
B. TDS D. Alkalinity

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

193. 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

194. 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

195. 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

196. 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

197. 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)

198. 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

199. 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

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

When finished with your assignment.

Please scan the Registration Page, Answer Key, Proctoring report, and Driver's License and email it to info@TLCH2O.com.

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