Level 1 Wastewater Operator
Final Exam

1. List 3 sources of wastewater in your community
    a. Urban, Suburban, Rural
    b. Force Main, Gravity Main, Rainwater
    c. Groundwater, Stormwater, Rainwater
    d. Residential, Commercial, Industrial

2. The pipe in which all the forms of wastewater flows into is called the _____ System
    a. Piping
    b. Connected
    c. Collection
    d. Distribution

3. List 2 forms of nutrients found in wastewater

4. List 5 good Operator Traits

5. If 1.0 MGD of flow contains 153 mg/L of BOD. How many pounds of BOD would that be?
    a. 62 lbs
    b. 127 lbs
    c. 1,144 lbs
    d. 1,276 lbs

6. BOD is a measure of….
    a. Pollution
    b. Gallons per Day
    c. Concentration in mg/L of inert materials in wastewater
    d. Concentration in mg/L of toxins in the wastewater

7. What is the condition when a bar screen has formed a dam causing upstream increase in level?
    a. Increased Flow
    b. Increased Velocity
    c. Increased Head
    d. Decreased Head

8. If a rag bin that is 4 feet tall, 4 feet wide and 4 feet deep has been filled with rags, how cubic feet of rags are in the bin?
    a. 12 cubic feet
    b. 64 cubic feet
    c. 128 cubic feet
    d. 478 cubic feet

9. Why is a grit chamber aerated?
    a. To decrease water density and increase the settling rate
    b. To increase water velocity
    c. To provide air to hungry organisms
    d. To increase water density and decrease the settling rate

10. What are the 2 reasons to remove grit from wastewater?
    a. Reduce downstream abrasion and loss of tank capacity
    b. Reduce downstream organic load
    c. Increase downstream inorganic load
    d. Increase downstream pipe abrasion to keep pipes scoured and clean

11. Centrifugal force slings heavier objects to the outside of the vortex (True or False)

12. Primary Treatment removes _____ % of BOD and _____% TSS
    a. 80/20
    b. 70/30
    c. 20/80
    d. 30/70

13. The general concept of activated sludge is that BOD is a…
    a. Oxygen source for microbiology
    b. Food source for microbiology
    c. Source of total suspended solids
    d. All of the above

14. Of all of the indicator organisms the _____ is the ideal organism to target for a healthy biomass.
    a. Filaments
    b. Rotifers
    c. Stalked Ciliates
    d. Free Swimming Ciliates

15. Ideal organisms populations are controlled through…
    a. Sludge age and wasting rates
    b. Return Activated Sludge flow rate
    c. Secondary Clarifier blanket depth
    d. DO, pH, Alkalinity

16. MLVSS measures only the volatile content of the mixed liquor (True or False)

17. F:M ratio measures…
    a. Flow to Mixed Liquor
    b. Flow to Mean Cell Residence Time
    c. Food to Mean Cell Residence Time
    d. Food to Mass

18. Influent Flow = 1.0 MGD
    Influent BOD = 223 mg/L
    Aeration Basin Volume = 500,000 gallons
    MLSS = 3,200 mg/L
    MLVSS = 87%
    What is the F:M Ratio?

19. Settlometer tests with microscopic analysis should be performed…
    a. Hourly
    b. Daily
    c. Weekly
    d. Monthly

20. Nocardia and Microthrix are….
    a. Indicator organisms that are signs of healthy biomass
    b. Filaments that can cause foam and slow settling
    c. Free swimmers that can settle slowly causing straggler floc
    d. Flagellates that can effectively consume and settle pollution in the wastewater

21. Match the condition to the probable organism

Ashing	Free Swimmers
Pin Floc	Filaments
Straggler Floc	Dead Cells (due to excessive Clarifier Detention)
Bulking	Rotifers

22. Higher influent BOD load to the Aeration Basin results in…
    a. Decreased Aeration Basin DO
    b. Increased Aeration Basin DO
    c. Decreased Aeration Basin Loading
    d. Decreased Aeration Basin growth rate

23. OUR test measures…
    a. Overflow Under Aeration
    b. Depletion of oxygen within a grabbed field sample
    c. Measure of oxygen saturation
    d. Measure of oxygen concentration increase while agitated

24. What's the volume of a circular Secondary Clarifier with a diameter of 120 feet and a depth of 14 feet?

25. If primary treatment is receiving influent BOD of 175 mg/L and has an effluent of 60 mg/L, what is the Efficiency of Removal?

26. Foaming and Bulking is caused by
    a. Filaments
    b. Stalked Ciliates
    c. Free Swimming Ciliates
    d. Rotifers

27. Warmer wastewater temperatures will…
    a. Increase biomass metabolism
    b. Decrease biomass metabolism
    c. Increase wastewater density
    d. Solidify grease (from solution to solid)

28. SRT includes biomass inventory in both the Aeration Basin and the secondary clarifiers. (True or False)

29. Given the following factors what is the SRT?
    10,000 pounds of Biomass in the Aeration Basin
    1,000 pounds of Biomass wasted daily

30. List 5 successful ingredients for a weekly process control meeting

31. List 3 needs for a quality field sample

32. During a high flow event how should the Operator adjust RAS?
    a. Increase RAS
    b. Decrease RAS
    c. Leave RAS flow rate alone to help with stability
    d. Decrease WAS

33. Treatment Ponds are not capable of high-quality wastewater treatment. (True or False)

34. Rotating Biological Contactors and Trickling Filters utilize the same kind of fixed film media. (True or False)

35. The Nitrification cycle of oxidation of ammonia includes
    a. Nitrate NO_3, Nitrite NO_2, Ammonia NH_3
    b. Nitrite NO_2, Nitrate NO_3, Ammonia NH_3
    c. Ammonia NH_3, Nitrite NO_2, Nitrate NO_3
    d. Above a) occurs in the winter and b) occurs in the summer

36. How many pounds of alkalinity is needed per pound of ammonia?
    a. 7.14
    b. 7.48
    c. 8.34
    d. It is a 1 to 1 relationship

37. How does nitrification affect the F:M ratio?
    a. It typically makes the F:M ratio go up (larger number)
    b. It typically makes the F:M ratio go down (smaller number)
    c. F:M ratio is only affected by DO levels in the aeration basin
    d. F:M ratio is not affected by nitrifiers present within the mixed liquor

38. What are the specialized community of organisms that can break down ammonia?
    a. POA Poly Organic Assimilators
    b. Nitrosomonas and Nitrobacter
    c. PAO Polyphosphate Absorbing Organisms
    d. PSA Polyphosphate Saturated Assimilators

39. The first step in ammonia oxidation
    a. Ammonia breaks down to Nitrite NO_3
    b. Ammonia breaks down to Nitrate NO_2
    c. Ammonia breaks down to Nitrate N Gas
    d. Ammonia breaks down to Nitrite NO_2

40. The byproduct of ammonia oxidation is…
    a. Nitric Acid
    b. Alkalinity
    c. Oxygen
    d. Both a) and b)

41. Microorganisms primarily adsorb organics in aeration and absorb them in the clarifier. (True or False)

42. If influent flow rate is 1.0 MGD and contains 35 mg/L of ammonia, how many pounds of alkalinity is needed to nitrify?
    a. 2,715 lbs
    b. 2610 lbs
    c. 2,084 lbs
    d. None of the above

43. List 3 Tertiary Treatment designs

44. What is the difference between Free and Combined chlorine?
    a. Free chlorine has not combined with other molecules
    b. Combined chlorine is a stronger form combining chlorine and hypochlorite
    c. Combined chlorine is chlorine that has combined with sodium bisulfite
    d. Free chlorine is cheaper

45. Chlorine Contact Chamber = 100,000 gallons
    Flow Rate = 1.0 MGD
    What is the chlorine contact time in hours?
    a. 2.4 Hours
    b. 4.8 Hours
    c. 6.0 Hours
    d. Less than 90 minutes

46. Aerobic Digestion Requires:
    a. Carbon Dioxide, Nutrients Daily
    b. Oxygen, Time, and near neutral pH
    c. Carbon Dioxide, Time, Nutrients and near neutral pH
    d. Carbon Dioxide, Nutrients and Alkalinity

47. Given the following Mesophilic Digester parameters, which of the parameters are out of range?

    Temperature 97F
    Sludge 1.5% TS
    Sludge VS 83%
    pH 6.9
    HRT 17 Days
    Alkalinity 1,275 mg/L
    Volatile Acid to Alkalinity Ratio 0.08
    Digester Gas CO_2 18%

    a. Temperature, Volatile Solids, HRT
    b. pH, Alkalinity, Volatile Solids
    c. Sludge TS, Sludge VS, pH
    d. Alkalinity, Volatile Acid to Alkalinity Ratio, CO_2

48. List 5 components of a Sampling Plan

49. When adjusting a dewatering machine or system how many adjustments should be made at the same time?

    a. No more than 2 adjustments
    b. No more than 1 adjustment
    c. More than 3 adjustments made at the same time must be entered in the log
    d. More than 3 adjustments must be made within 5 minutes of the initial adjustment

50. Polymer is a…

    a. Short molecular chain that acidifies sludge so it retains moisture
    b. Short molecular chain that helps biosolids retain water
    c. Long molecular chain that helps the biosolids shed water
    d. Long molecular chain that helps the biosolids retain water

51. Asset longevity is dependent on

    a. Proactive care invested up front
    b. Quick reactive care when needed
    c. Modern Asset Care practices - run until failure
    d. How many hours the equipment or treatment process runs

52. What is the volume in gallons of this rectangular primary clarifier?
    150 feet long
    35 feet wide
    10 feet deep
    a. 392,700 gallons
    b. 52,500 gallons
    c. 41,213 gallons
    d. 437,850 gallons

53. List 3 resources you have when troubleshooting a piece of equipment or system

54. When troubleshooting a piece of equipment its best to first…
    a. Write a work order
    b. Contact the manufacturer
    c. Contact your mechanic
    d. Thoroughly assess the equipment condition and make no assumptions

55. Is falling DO in the aeration basin a symptom or a core cause?

56. If the initial chlorine residual is 3.7 mg/L and the final chlorine residual is 0.5 mg/l what is the chlorine demand?
    a. 0.5 mg/L
    b. 4.2 mg/L
    c. 3.2 mg/L
    d. 3.7 mg/L

57. Logbook entry mistakes should be…
    a. Erased neatly and corrected
    b. Blackened out and corrected
    c. Strikethrough and initial
    d. None of the above

58. The purpose of a logbook is to…
    a. Accurately capture events through the workday
    b. Provide accurate times for each event that occurred through the workday
    c. Serve as part of effective communications to Operators and Leadership
    d. All the above

59. Given a thicker sludge that needs to be pumped against a high head, what is the best pump to use?
    a. Centrifugal
    b. Positive Displacement
    c. A pump with high horsepower
    d. A brand new pump

60. A centrifugal blower is a pump (True or False)

61. The pump's effort to pull and push are known as…
    a. Static and Random Kinetics
    b. Suction Lift and Discharge Head
    c. Water hammer
    d. Russel Theory of Random Dynamics

62. A centrifugal pump needs to convey 100 GPM under a total head of 10 feet. Which pump horsepower would you select?
    a. 1 horsepower
    b. 5 horsepower
    c. 10 horsepower
    d. 25 horsepower

63. Rectangular Aerobic Digester 10 feet wide 15 feet long and 10 feet deep. The digester contains 7 feet of digested sludge (or 3 feet of available space). The digester is receiving a daily wasting volume of 1,100 gallons. How many days of wasting capacity does the digester have?
    a. 3 days
    b. 5 days
    c. 7days
    d. 12 days

64. Best practice is to perform housekeeping daily and to cleanup spills at the end of the month. (True or False)

65. Clean equipment runs better and is easier to repair (True or False)

66. The last step of a completed project is to clean the area of debris, materials and tools (True or False)

67. Each Project must have a Housekeeping Action Plan in writing (True or False)

68. The first stop of a Round should be at the…
    a. Headworks
    b. Final Effluent
    c. Chemical Storage
    d. Control Room/Logbook

69. The last stop of a Round should be at the…
    a. Final Effluent
    b. Final Effluent Flow Meter
    c. Logbook
    d. Time Clock

70. If a Trickling Filter has an influent BOD of 175 mg/L and an effluent of 45 mg/l, what is the efficiency of removal?
    a. 25%
    b. 50%
    c. 75%
    d. 100%

71. Aeration Basin foaming can be reduced by
    a. Increased wasting
    b. Surface spray
    c. Chlorinating the RAS
    d. All the above

72. Clarifier hydraulic detention is impacted by
    a. Flow rate
    b. RAS flow rate
    c. Peak flow periods
    d. All the above

73. For a small secondary clarifier, increasing RAS flow rates under high flow conditions will…
    a. Decrease clarifier blankets
    b. Increase clarifier blankets
    c. Have no effect
    d. Under high flow conditions there is nothing an Operator can do

74. High nutrients discharged into the receiving stream will
    a. Improve the aquatic environment with added nutrients and oxygen
    b. Deteriorate the aquatic environment by reducing available oxygen
    c. Be diluted and have no effect on the environment
    d. Improve the fishing

75. A restaurant discharging a lot of grease can have adverse effects on the…
    a. Collection System
    b. Lift Stations
    c. Wastewater Facility
    d. All the above

76. Headwork screens tend to be highly impacted during high flow periods (True or False)

77. Primary sludge helps the anaerobic digestion process (True or False)

78. Wastewater process tends to perform better under _____ conditions
    a. Stable
    b. Fluctuating
    c. High Flow
    d. Septic

79. A microscopic examination revealing clumps of stalked ciliates is a sign of…
    a. Bulking
    b. Young Sludge
    c. Healthy Biomass
    d. A need to increase wasting

80. An aeration basin covered in brown foam is a symptom of…
    a. Proactive process control
    b. Reactive process control
    c. Too high of a return activated sludge rate
    d. Too high of a wasting rate

81. Process short circuiting is when water or solids seeks a path of least resistance to the effluent. (True or False)

82. Lift Stations typically have
    a. Centrifugal pumps
    b. Positive Displacement Pumps
    c. Progressive Cavity Pumps
    d. Archimedes Pumps

83. Under normal circumstances process control meetings should occur
    a. Daily
    b. Weekly
    c. Monthly
    d. As needed

84. How much biomass would need to be wasted from 100,000 pounds of inventory if the SRT target is 2 days
    a. 50,000 pounds
    b. 25,000 pounds
    c. 10,000 pounds
    d. 500 pounds

85. Straggler floc is an indicator of
    a. Old sludge
    b. Young sludge
    c. Too long of a clarifier detention
    d. Filaments

86. Pin floc is an indicator of
    a. Old sludge
    b. Young sludge
    c. Too long of a clarifier detention
    d. Filaments

87. Bulking is an indicator of
    a. Old sludge
    b. Young sludge
    c. Too long of a clarifier detention
    d. Filaments

88. Ashing is an indicator of
    a. Bulking
    b. Young sludge
    c. Too long of a clarifier detention
    d. Filaments

89. Log notes are more effectively entered at the end of the day (True or False)

90. Operator Rounds should start at…
    a. The effluent working upstream to the headworks
    b. The headworks working downstream to the effluent
    c. Control Room Logbook/SCADA
    d. The closest treatment system to the administration building

Influent flow 2.5 MGD
Influent TSS 183 mg/L
Influent BOD 205 mg/L
Influent Ammonia 27 mg/L
Effluent TSS 5 mg/L
Effluent BOD 7 mg/L

91. How many pounds of TSS are in the influent?
    a. 3,816 lbs
    b. 3,422 lbs
    c. 3,302 lbs
    d. None of the above

92. How many pounds of BOD are in the influent?
    a. 4,274 lbs
    b. 3,659 lbs
    c. 3,834 lbs
    d. 2,714 lbs

93. How many pounds of ammonia are in the influent?
    a. 563 lbs
    b. 643 lbs
    c. 404 lbs
    d. 377 lbs

94. How many pounds of TSS is in the effluent?
    a. 104 lbs
    b. 94 lbs
    c. 89 lbs
    d. 216 lbs

95. How many pounds of BOD is in the effluent?
    a. 131 lbs
    b. 146 lbs
    c. 124 lbs
    d. 90 lbs

96. What is the efficiency of TSS removal?
    a. 91%
    b. 93%
    c. 95%
    d. 97%

97. What is the efficiency of BOD removal?
    a. 93%
    b. 95%
    c. 97%
    d. 99%

98. The permit acronym NPDES means…
    a. National Priority Discharge Effluent System
    b. National Pollutant Discharge Elimination System
    c. National Priority Pollutant District Effluent System
    d. National Pollutant Discharge Effluent Sanitation

99. Permit sample locations are regulated and cannot be moved for convenience (True or False)

100. In wastewater treatment our goals are to…
    a. Meet permit
    b. Report permit violations promptly
    c. Optimize wastewater process and be accountable for chemicals
    d. All the above