

(5exam)

PRACTICE CLASS "5" CERTIFICATION EXAMINATION

(12th Edition – August 22, 2002)

1. How would you stop foaming in an anaerobic digester?
  - a. decrease the air feed to the digester.
  - b. add ferric chloride.
  - c. reduce the amount of sludge removed from the digester.
  - d. add alum.
  
2. The thickest sludge is obtained from a gravity thickener when
  - a. the temperature decreases.
  - b. seasonal rain increases.
  - c. gasification occurs.
  - d. the sludge rakes are stopped.
  
3. On a belt filter press, the pressure applied to the cake as it goes around a small roller
  - a. is less than around a larger roller.
  - b. is more than around a larger roller.
  - c. is equal to a larger roller.
  - d. varies with a larger roller.
  
4. If an operator normally loads a digester with 2,500 lbs/day of solids from a sludge with an MLSS concentration of 6,000 mg/L, how many gallons per minute of sludge must be pumped?
  - a. 29
  - b. 33
  - c. 35
  - d. 37
  
5. As wastewater is applied to a mixed media filter and the head pressure to the filter increases, the flow controller will
  - a. stop flow to the filter.
  - b. decrease filter area receiving flow.
  - c. increase filter area receiving flow.
  - d. keep the flow the same to the filter area.
  
6. If the F/M ratio is increased to an aeration basin and the operator wants to maintain the same dissolved oxygen level in the aerator, what action would the operator take?
  - a. increase the aeration rate.
  - b. decrease the aeration rate.
  - c. decrease the wasting rate.
  - d. increase the return sludge rate.

7. In a new activated sludge plant, billows of white sudsy foam appear on the aeration tank. What process control step should the operator take?
  - a. increase RAS.
  - b. decrease RAS.
  - c. increase WAS.
  - d. decrease WAS.
  
8. What effect would a worn impeller have on a centrifugal pump?
  - a. decrease the efficiency.
  - b. increase the efficiency.
  - c. increase the pressure generated by the pump.
  - d. decrease the voltage draw on the motor.
  
9. If an operating three phase motor is driving a pump and one phase is lost, what will happen?
  - a. if there are no thermal overloads the motor will be damaged.
  - b. the motor will increase its speed.
  - c. the motor will decrease its speed.
  - d. the motor will continue to operate normally.
  
10. What would be the cause of leaking around the seals and the plunger on a plunger pump?
  - a. excessive wear on the connecting rod.
  - b. discharge head pressure too high.
  - c. high temperature of the water being pumped.
  - d. pumping with a partially closed suction valve.
  
11. As grit accumulates in a grit chamber what happens to the velocity of the wastewater flow and the settleability of the grit?
  - a. velocity increases and settleability increases.
  - b. velocity increases and settleability decreases.
  - c. velocity decreases and settleability increases.
  - d. velocity decreases and settleability decreases.
  
12. How can you change the pumping volume of a centrifugal pump?
  - a. throttle the discharge valve.
  - b. change the speed of the pump.
  - c. lower the discharge head.
  - d. all of the above.
  
13. How would an increase in suspended solids effect the ultraviolet disinfection process?
  - a. this has no effect on the process.
  - b. process efficiency will be increased.
  - c. process efficiency will be decreased.

14. What effect would an overloading of BOD have on the biological growth in the aeration tank?
  - a. the oxygen uptake rate would increase.
  - b. the BOD removal efficiency would increase.
  - c. the F/M would decrease.
  - d. the pH would increase.
  
15. What combination of microorganisms would reflect a well balanced activated sludge?
  - a. flagellates, rotifers and nematodes.
  - b. amoeboids, ciliates and nematodes.
  - c. flagellates, ciliates and rotifers.
  - d. amoeboids, rotifers and nematodes.
  
16. What is the advantage of using a positive displacement pump for feeding chemicals?
  - a. they use less energy.
  - b. they discharge a consistent volume.
  - c. they are less expensive.
  - d. they don't clog as easily.
  
17. What type of solids does an Imhoff cone measure?
  - a. colloidal.
  - b. organic.
  - c. inorganic.
  - d. settleable.
  
18. What would cause a vacuum filter to produce a wet cake?
  - a. excessive vacuum.
  - b. drum speed too slow.
  - c. solids concentration in feed sludge too high.
  - d. drum speed too fast.
  
19. What type of fire extinguisher would you use for an oil & electrical fire?
  - a. soda acid.
  - b. water.
  - c. dry chemical.
  - d. foam.
  
20. Slaking is the process of
  - a. adding acid to water.
  - b. adding quicklime to water.
  - c. adding salt to water.
  - d. adding acid to base.

21. What is the first thing you do before starting work on a pump?
  - a. perform lockout / tagout.
  - b. notify your supervisor.
  - c. record activities in a log book.
  - d. get assistance.
  
22. When shutting down chlorine feed to a chlorinator, where do you start?
  - a. at the chlorinator.
  - b. at the vacuum regulator.
  - c. at the ejector.
  - d. at the chlorine container.
  
23. What stops water from entering a chlorinator?
  - a. rotometer.
  - b. pressure reducing valve.
  - c. backflow check valve.
  - d. evaporator.
  
24. What is the best type of sludge to use with a dissolved air flotation thickener?
  - a. primary sludge.
  - b. waste activated sludge.
  - c. digested sludge.
  - d. dewatered sludge.
  
25. If a pump is pumping 500 gallons per minute through an eight inch diameter pipe, what is the velocity of the flow in feet per second?
  - a. 0.033
  - b. 0.33
  - c. 3.3
  - d. 33
  
26. When starting a blower, when should the fan be engaged?
  - a. as soon as the motor is turned on.
  - b. after the blower reaches normal operating speed.
  - c. only after the suction and discharge valves are opened.
  - d. while the blower is coming up to speed.
  
27. What would be the ideal wastewater conditions for adding ferric chloride for coagulation?
  - a. low pH, low alkalinity.
  - b. low pH, high alkalinity.
  - c. high pH, high alkalinity.
  - d. high pH, low alkalinity.

28. On a manually cleaned barscreen, the wastewater is 9 inches higher on the influent side. What is the cause of the problem?
- the barscreen is clogged.
  - bars are missing from the barscreen..
  - low DO levels in the wastewater.
  - high hydrogen sulfide concentrations in the wastewater.
29. With a flow of 510,000 gallons per day, a chlorine feed of 250 pounds per day and a chlorine residual of 3 mg/L, what is the chlorine demand in mg/L?
- 0.56
  - 5.6
  - 56
  - 560
30. If you were obtaining a good chlorine residual but a low coliform kill, what could be causing this?
- short circuiting in the contact tank.
  - low pHs.
  - low DOs.
  - detention time in the contact tank too long.
31. How many gallons will a 12 inch diameter pipe hold if the inside of the pipe is uniformly coated with 1 inch of grease and is 300 feet long?
- 12
  - 122
  - 1,222
  - 12,222
32. When a sprocket of a chain drive mechanism on a screen starts to wear what do you do?
- turn the sprocket over and order a replacement.
  - bypass the screen.
  - continue operating the screen as is.
  - tighten the chain to keep it from dragging.
33. A gravity filter is 10 feet wide by 12 feet long and has 12 gallons per minute per square foot being applied. What is the total flow through this filter in gallons per minute?
- 14
  - 140
  - 1,440
  - 14,440

34. Chlorine is being fed at a rate of 150 pounds per day into a flow of 4 million gallons per day and the chlorine residual is 0.3 mg/L. What is the chlorine demand in pounds per day?
- 1.4
  - 14
  - 140
  - 1,440
35. Over lubrication of a shaft bearing can result in what?
- no problem - you cannot over lubricate a bearing.
  - the bearing will overheat and cause damage.
  - over time the excess lubricant will evaporate.
  - no problem - all bearings have a port to allow any excess lubricant to leak out.
36. What causes cavitation in centrifugal pumps?
- pump speed is lower than specifications.
  - the suction head is too high.
  - pumping against higher discharge head than specifications.
  - air is entering the pump.
37. When adjusting the packing gland after re-packing a pump, how should you tighten it?
- so that there is no weepage, then back off 1/8 turn.
  - slowly, over a period of hours until you obtain the desired weepage.
  - with a torque wrench to the manufacturer's specifications.
  - two full turns, then slowly until there is no weepage.
38. A cross connection is a direct connection between what?
- potable water and non-potable water.
  - an acid and a base.
  - a chemical and an electrical source.
  - an electrical source and water.
39. What DO level should be maintained in an activated sludge aeration tank?
- 0 - 1 mg/L
  - 1 - 2 mg/L
  - 3 - 5 mg/L
  - 5 - 7 mg/L
40. What should the velocity in a grit chamber be, in feet per second?
- 0.1
  - 1
  - 10
  - 100

41. How should you withdraw sludge from a fixed-dome digester?
  - a. as quickly as you need.
  - b. only as fast as you feed sludge into it.
  - c. empty the digester on each withdrawal.
  - d. only once per hour.
  
42. What causes rising sludge in a secondary clarifier?
  - a. sludge is being removed too quickly.
  - b. sludge is remaining in the clarifier too long.
  - c. the DO in the sludge is too high.
  - d. the sludge contains excessive filamentous bacteria.
  
43. In what process is the "solids to air ratio" used?
  - a. dissolved air flotation thickening.
  - b. dewatering by centrifuge.
  - c. activated sludge.
  - d. vacuum filtration.
  
44. What is the preferred method of wasting activated sludge?
  - a. once per hour.
  - b. once per shift.
  - c. once per day.
  - d. slowly, continuously.
  
45. How does biological activity in an oxidation ditch react to the winter?
  - a. increases.
  - b. decreases.
  - c. no change.
  
46. What are safety hazards found around the use of polymers?
  - a. high temperatures.
  - b. respiratory.
  - c. slipping.
  - d. biological.
  
47. A chlorinator normally delivers a constant volume of chlorine. What would cause the chlorine residual to suddenly drop and then rise?
  - a. ammonia nitrogen.
  - b. inorganic solids.
  - c. phosphorus.
  - d. temperature drop.



48. What should the operator do if the DO at the influent end of the aeration tank is 0.7 mg/L and at the effluent end it is 6.0 mg/L?
- decrease the air at the influent end and increase the air at the effluent end.
  - increase the air at the effluent end only.
  - adjust the air flow so it is tapered from influent end to effluent end.
  - no adjustment is needed.
49. If the pressure at the eye of the impeller of a pump is 35 PSI and the friction loss (head) from the eye to the force main is 74 feet, what is the pressure at the force main in PSI?
- 0.3
  - 3
  - 13
  - 30
50. What can cause sludge to get packed and clogged in a waste activated sludge pipe?
- wasting is too frequent.
  - waste sludge is too thin.
  - grit is settling in the line.
  - organic content of sludge is too high.
51. What is the F/M ratio of an activated sludge system given the following data?
- FLOW: 5 MGD      MLSS: 2500 mg/L      AERATOR VOLUME: 0.75 MG  
PRIMARY EFF SS: 120 mg/L      PRIMARY EFF BOD: 105 mg/L  
SECONDARY EFF SS: 20 mg/L      SECONDARY EFF BOD: 15 mg/L
- 0.03
  - 0.3
  - 1.3
  - 3.0
52. If the influent BOD remains the same and you want to keep the same DO in the aeration tank and the MLSS has increased, what adjustment would you make to your aeration rate?
- increase.
  - decrease.
  - no change.
53. What are the two major gases produced by a well operated anaerobic digester?
- nitrogen, oxygen.
  - hydrogen sulfide, methane.
  - methane, ammonia.
  - carbon dioxide, methane.

54. What is the typical per cent solids expected in a centrifuge dewatered sludge?
- 5 - 15.
  - 15 - 30.
  - 30 - 50.
  - 50 - 75.
55. Where is the "hydraulic center line" found on a centrifugal pump?
- at the lowest point on the suction line.
  - at the lowest point on the discharge line.
  - at the impeller vanes' tip.
  - at the suction eye of the impeller.
56. What type of pump is a "progressive cavity" pump?
- rotating positive displacement.
  - reciprocating positive displacement.
  - rotating centrifugal.
  - reciprocating centrifugal.
57. A method of controlling filamentous organisms in an activated sludge system is to dose the return sludge with which one of the following chemicals?
- aluminum sulfate.
  - sodium hydroxide.
  - chlorine.
  - sulfur dioxide.
58. What is the name of the activated sludge process control strategy that compares the amount of the influent BOD to the size of the biomass?
- mean cell residence time (MCRT).
  - sludge age.
  - sludge volume index (SVI)
  - food to mass ratio (F/M).
59. How many pounds of mixed liquor suspended solids must be wasted in order to reduce the MLSS from 3000 mg/L to 2750 mg/L in an aeration tank that is 50 feet long, 30 feet wide and 12 feet deep?
- 28
  - 280
  - 2,800
  - 28,000
60. Which of the following components of wastewater has the highest chlorine demand?
- phosphorus.
  - inorganic suspended solids.
  - ammonia.
  - pathogens.

61. Which of the following are two major characteristics of positive displacement pumps regarding their pumping ability?
- high pressure, consistent discharge volume.
  - high pressure, varying discharge volume.
  - low pressure, high discharge volume.
  - low pressure, low discharge volume.
62. What is the best method of cleaning an electric motor?
- cleaning solvents.
  - water stream.
  - kerosene.
  - compressed air.
63. What does the sludge volume index (SVI) measure in an activated sludge system?
- the density of the sludge.
  - the dissolved oxygen requirements of the sludge.
  - the comparison between the concentration and the settleability of the sludge.
  - the comparison between the relative age and the settleability of the sludge.
64. What is the molecular weight of a compound?
- total of all the protons in the molecule.
  - total of all the atomic weights in the molecule.
  - total number of electrons in the molecule.
  - total weight of the heaviest element in the molecule.
65. What are the two byproducts of aerobic digestion?
- carbon dioxide and oxygen.
  - carbon dioxide and methane.
  - carbon dioxide and sulfur.
  - carbon dioxide and nitrates.
66. How do you safely mix acid and water?
- acid into the water.
  - water into the acid.
  - it makes no difference.
67. Where does wear most commonly occur on a plunger pumps?
- cylinder.
  - stator.
  - rotor.
  - volute.

68. A piston pump has an 8 inch diameter piston with a stroke of 4 1/2 inches. It operates at 50 cycles per minute. How many minutes will it take to pump 750 gallons?
- 4
  - 16
  - 24
  - 32
69. If aluminum sulfate is added to a primary clarifier to improve settling, what chemical would you add to raise the pH?
- chlorine
  - sulfur dioxide
  - ferric chloride
  - sodium hydroxide
70. Which of the following has the most effect on the activated sludge process?
- food / sludge density / pH
  - food / digester temperature / pH
  - food / sludge density / Cl<sub>2</sub> residual
  - Cl<sub>2</sub> dosage / pH / temperature
71. What is the oxygen uptake rate if the initial DO of 6.0 mg/L dropped to 1.7 mg/L in 15 minutes?
- 17 mg/L / hour
  - 11 mg/L / hour
  - 7 mg/L / hour
  - 4 mg/L / hour
72. What is the definition of total head?
- the difference in vertical elevation.
  - the difference in vertical elevation and horizontal distance.
  - the overall resistance to flow.
  - the total amount of pressure created by flowing liquids.
73. When should sludge be removed from an anaerobic digester?
- sludge is brown and has 10 -15% solids.
  - sludge is brown and granular.
  - sludge is gray and has 70% volatile solids.
  - sludge is black and has 50% volatile solids.
74. An activated sludge MLVSS typically has what percentage volatile matter?
- 90%
  - 70 - 80%
  - 40 - 60%
  - less than 40%

75. Six pumps have the following discharges (in gpm):  
1) 110; 2) 714; 3) 325; 4) 411; 5) 296; 6) 570;  
What is the average discharge in MGD?
- 0.25
  - 0.58
  - 0.74
  - 1.10
76. What is the best way to provide lighting in a manhole?
- mirrors and explosion proof lighting.
  - lights run by gas generators and battery powered lanterns.
  - explosion resistant matches.
  - propane lanterns.
77. What can result from sludge billowing in the secondary clarifier?
- a decrease in turbidity of the secondary effluent.
  - a loss of solids through the secondary effluent.
  - the sludge in the clarifier may turn septic.
  - the sludge density in the clarifier will increase.
78. Which substance is most toxic to an activated sludge process?
- sodium hydroxide.
  - sodium chloride.
  - ferrous sulfate.
  - copper sulfate.
79. How can you check for internal wear on a progressive cavity pump?
- listen for rotor / stator scraping noises.
  - operate the pump with the suction valve closed while monitoring the discharge pressure gage.
  - operate the pump with the valves open while monitoring the discharge pressure gage.
  - use a vibration meter to check for excessive rotor / stator clearance.
80. What could cause sludge floc to break up in air flotation thickeners?
- excessive sludge withdrawal rate.
  - insufficient flow to the thickener.
  - incorrect flocculant dosage.
  - insufficient subnatant drawoff.
81. What is the correct sequence of the microorganism growth phases?
- endogenous, declining growth, logarithmic.
  - endogenous, logarithmic, declining growth.
  - logarithmic, endogenous, declining growth.
  - logarithmic, declining growth, endogenous.

82. What are three of the most important operational variables in the activated sludge system?
- BOD loading, temperature, return sludge rate.
  - BOD loading, pH, solids settleability.
  - BOD loading, quantity of microorganisms, dissolved oxygen.
  - BOD loading, return sludge rate, pH.
83. Which of the following is the best lab test to measure solids in the aeration basin?
- settleometer.
  - mixed liquor volatile suspended solids.
  - total dissolved solids.
  - total organic carbon.
84. What effect would adding lime to an aerobic digester cause?
- raise alkalinity.
  - increase organic solids.
  - increase DO.
  - lower pH.
85. If the sludge depth in a secondary sedimentation tank is too high, what will happen?
- turbidity will decrease in the effluent.
  - return activated sludge will have lower oxygen demand.
  - settleable solids from aeration tank will increase.
  - sludge may become septic.
86. Which chemical is used to control the pH in an anaerobic digester?
- aluminum sulfate.
  - chlorine.
  - lime.
  - sulfur dioxide.
87. Calculate the pounds of BOD / day entering the activated sludge system.

Flow = 2.75 MGD; Primary effluent SS = 110 mg/L; Primary effluent BOD = 85 mg/L  
Secondary effluent SS = 20 mg/L; Secondary effluent BOD = 25 mg/L  
Primary sludge flow = 0.25 MGD; RAS flow = 1.0 MGD; WAS flow = 0.15 MGD

- 195
- 1,950
- 19,500
- 195,000

88. Which test is best to measure the effectiveness of polymer?
- leaf test.
  - jar test.
  - centrifuge test.
  - pH test.
89. If short circuiting is discovered in a secondary clarifier, what action should be taken?
- reduce influent flow.
  - turn off the sludge collector.
  - increase sludge withdrawal rate.
  - level the effluent weirs.
90. Although carbon dioxide gas is not poisonous, it can cause
- asphyxiation.
  - burning.
  - corrosion.
  - combustion.
91. What is the best test to perform to measure the bio-mass?
- total suspended solids.
  - settleometer.
  - pH.
  - total dissolved solids.
92. What chemical would you add to improve settling in a primary clarifier?
- sodium hydroxide.
  - carbon dioxide.
  - aluminum sulfate.
  - calcium carbonate.
93. Find the Mean Cell Residence Time (MCRT), in days, of this activated sludge plant.

Raw flow = 7.5 MGD; Raw SS = 225 mg/L; Raw BOD = 175 mg/L;  
Secondary effluent SS = 15 mg/L; Secondary effluent BOD = 25 mg/L  
RAS flow = 3.0 MGD; RAS SS = 6500 mg/L; WAS flow = 0.05 MGD;  
MLSS = 1850 mg/L; Aerator volume = 2.0 MG; Secondary clarifier volume = 1.0 MG

- 4.6
- 8.3
- 10.5
- 12.7

94. Where should you take a sample in an aeration tank to measure solids settleability?
- beginning.
  - middle.
  - end.
95. What conditions can cause a filamentous problem in activated sludge?
- low F/M ratio.
  - low dissolved oxygen in the aeration tank.
  - a toxic substance in the influent.
  - excessive aluminum sulfate addition.
96. Which of the following chemicals is used to control hydrogen sulfide in sewers?
- sodium sulfate.
  - sodium azide.
  - chlorine.
  - sulfur dioxide.
97. What action should be taken to correct a noisy drive chain?
- tighten and align the chain.
  - loosen and align the chain.
  - slow the chain speed.
  - lubricate the gear reducers.
98. A wetwell is 8 feet x 7 feet. With the influent flow to the wetwell stopped, a pump lowers the wetwell level 2 feet in 5 minutes. How many gallons per minute is the pumping rate?
- 11
  - 83
  - 93
  - 168
99. Which of the following can be used to put out a gasoline fire?
- water.
  - soda water.
  - carbon dioxide.
  - sodium hydroxide.
100. What is the purpose of a lantern ring?
- provide illumination while repacking a pump.
  - separates different sizes of packing in a stuffing box.
  - provides a lubrication channel in the stuffing box.
  - supports the shaft of a centrifugal pump.



101. Which type of sludge is best for dewatering?
  - a. old
  - b. young
  - c. makes no difference
  
102. Which of the following will affect pressure in a pipe?
  - a. alkalinity / hardness
  - b. elevation / friction
  - c. dissolved oxygen / pH
  - d. solids content / specific gravity
  
103. What chemical is typically used to pretreat sludge prior to dewatering?
  - a. carbon dioxide
  - b. sulfur dioxide
  - c. chlorine
  - d. lime
  
104. As the biomass activity slows in the winter, what action should the operator take?
  - a. maintain an older sludge
  - b. maintain a younger sludge
  - c. increase the sludge wasting rate
  - d. increase the sludge blanket in the clarifier

ANSWERS FOR PRACTICE "5" EXAM  
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- |     |   |     |   |      |    |
|-----|---|-----|---|------|----|
| 1.  | C | 36. | C | 71.  | A. |
| 2.  | A | 37. | B | 72.  | C  |
| 3.  | B | 38. | A | 73.  | D  |
| 4.  | C | 39. | B | 74.  | B  |
| 5.  | D | 40. | B | 75.  | B  |
| 6.  | A | 41. | B | 76.  | A  |
| 7.  | D | 42. | B | 77.  | B  |
| 8.  | A | 43. | A | 78.  | D  |
| 9.  | A | 44. | D | 79.  | C  |
| 10. | B | 45. | B | 80.  | C  |
| 11. | B | 46. | C | 81.  | D  |
| 12. | D | 47. | A | 82.  | C  |
| 13. | C | 48. | C | 83.  | B  |
| 14. | A | 49. | B | 84.  | A  |
| 15. | C | 50. | C | 85.  | D  |
| 16. | B | 51. | B | 86.  | C  |
| 17. | D | 52. | A | 87.  | B  |
| 18. | D | 53. | D | 88.  | B  |
| 19. | C | 54. | B | 89.  | D  |
| 20. | B | 55. | D | 90.  | A  |
| 21. | A | 56. | A | 91.  | A  |
| 22. | D | 57. | C | 92.  | C  |
| 23. | C | 58. | D | 93.  | D  |
| 24. | B | 59. | B | 94.  | C  |
| 25. | C | 60. | C | 95.  | B  |
| 26. | B | 61. | A | 96.  | C  |
| 27. | C | 62. | D | 97.  | A  |
| 28. | A | 63. | C | 98.  | D  |
| 29. | C | 64. | B | 99.  | C  |
| 30. | A | 65. | D | 100. | C  |
| 31. | C | 66. | A | 101. | A  |
| 32. | A | 67. | A | 102. | B  |
| 33. | C | 68. | B | 103. | D  |
| 34. | C | 69. | D | 104. | A  |
| 35. | B | 70. | A |      |    |