



ABC

Exam Review

This study review guide is not a replacement for study materials gained through course work, classes and job experience. This publication is provided as an aide to prepare for the ABC Wastewater Certification exam.

*Study guide courtesy of Morrisville State College

Practice

Exam

COMPOSITE WASTEWATER TREATMENT OPERATOR
PRACTICE EXAMINATION
GRADE III

MULTIPLE CHOICE QUESTIONS

Instructions: The following questions are multiple choice and should be marked on the corresponding number of your answer sheet, choosing either a, b, c, d, or e, whichever is more nearly correct.

1. With domestic sewage, approximately what percent of the total BOD is satisfied after 5 days?
 - a. 20%
 - b. 68%
 - c. 33%
 - d. 90%

2. Seeding BOD dilution water is done to:
 - a. Neutralize the pH of the solution
 - b. Provide the nutrients for the bacteria
 - c. Raise the dissolved oxygen of the sample
 - d. Supply bacteria to decompose the organic matter
 - e. Provide buffering to stabilize the temperature

STATEMENT: (Questions 3-6)

The items that follow might be found from a set of tests performed in an activated sludge plant. Mark the most nearly proper value for each.

3. MLSS

- a. 2.0 mg/l
- b. 100
- c. 25%
- d. 1500 mg/l
- e. 15%

4. SVI

- a. 2.0 mg/l
- b. 200
- c. 25%
- d. 1500 mg/l
- e. 15%

5. Rate of Return
- a. 2.0 mg/l
 - b. 100
 - c. 25%
 - d. 1500 mg/l
 - e. 0.15 mg/l
6. D.O.
- a. 2.0 mg/l
 - b. 100
 - c. 25%
 - d. 1500 mg/l
 - e. 0.15 mg/l
7. The significance of the MLSS determination is:
- a. That it tells how much sludge to draw to the beds
 - b. It indicates the settling of the inorganic solids
 - c. It tells the operator when and how much mixed liquor is going over the waste
 - d. It is an indication of bacterial population available for utilizing organic waste
 - e. None of the above
8. A medium-sized industry wants to locate in your town and discharge its waste into your sewer system. Of the four items listed, which would be most important with respect to the sewage treatment process?
- a. Sludge discharges
 - b. Low pH waste
 - c. Toxic plating waste
 - d. High suspended solids waste
9. A potato processing plant uses a caustic peeling process. One phase of pretreatment might be:
- a. Addition of sodium hydroxide to neutralize the acid
 - b. Addition of acid to neutralize the base
 - c. Application of calcium carbonate to stabilize the wash water
 - d. Injection of ozone to control the odor
 - e. Use of chlorine to bleach the peel
10. Which of the following is considered to be the active agent in the destruction of micro-organisms?
- a. Hypochlorite ion
 - b. Calcium hypochlorite
 - c. Hypochlorous acid
 - d. Mono chloramine
 - e. Hydrogen ions

11. Bacteria that can be either aerobic or anaerobic are said to be:
 - a. Indicators
 - b. Psychrophilic
 - c. Facultative
 - d. Enteric
 - e. Homophilic

12. C.O.D.
 - a. Is most usually found to be equal to BOD multiplied by 1.2 for a well-run treatment facility
 - b. Is calculated by subtracting the BOD efficiency of a treatment facility from 100% COD - 100% BOD
 - c. Is a term used to describe the total oxygen which will be consumed in a sample required for oxidation
 - d. Is the same as BOD except COD is an abbreviation for calculated oxygen demander

13. The explosion danger of digester gas is greatly increased if it is mixed with:
 - a. Chlorine gas
 - b. Hydrogen sulfide
 - c. Air
 - d. Carbon dioxide
 - e. Methane

14. The weir overflow rate per day for a settling tank is:
 - a. The product of the weir length and the volume of flow
 - b. The volume of flow divided by the length of the weir
 - c. The volume of flow divided by the volume of the tank
 - d. The sum of the volume of flow and the weir length

15. A small river flowing at a rate of 20 cfs receives a treatment plant effluent of 2 mgd. The dilution factor, river to effluent, is most nearly:
 - a. 6.6 to 1
 - b. 10 to 1
 - c. 4.0 to 1
 - d. 10 to 1

16. To which of the following temperatures on the centigrade scale does a reading of 95 degrees F. most closely correspond?
 - a. 35 degrees C
 - b. 40 degrees C
 - c. 63 degrees C
 - d. 120 degrees C

17. One part per million of dissolved oxygen in water means that amount present is:
- 1 percent of the water
 - 1 gallon of oxygen in 1,000,000 gallons of water
 - 1 pound of oxygen in 1,000,000 gallons of water
 - 1 pound of oxygen in 1,000,000 pounds of water
18. Reports are valuable in the determination of the policies and the plans of an organization chiefly because:
- They can help to reveal existing trends and to predict future problems in plant operation
 - They can be read by all persons who help in the formation of policies
 - They serve to acquaint the employees with the decisions made as soon as they are made
 - They take the place of many individual communications
19. The main advantage for good, sound public relations is to:
- Increase public interest in building projects
 - Attain a friendly and sympathetic press
 - Build up a good feeling and understanding between the Department and the public
 - Gain public support for wage increases and better working conditions
20. In dealing with the public it is helpful to know that, generally, people are more willing to do that for which they:
- Will be given a little assistance
 - Must learn a new skill
 - Are not responsible
 - Understand the reason
21. Of the following, it is most important for municipal employees to:
- Be trained to realize that their jobs are more important to the community than the jobs of private citizens
 - Have a basic knowledge of the state and federal constitutions
 - Be imbued with the importance of courtesy in dealing with the public
 - Have an intimate knowledge of the history of the city

22. In preparing a report aimed at giving information concerning a complex and extensive matter, which of the following devices will, in general, do the most to provide clarity and ease of reading?
- Short sentences
 - Repetition and paraphrasing
 - One idea to a paragraph
 - Personalized style
23. When writing reports, the simplest and most direct way of focusing the reader's attention on the topic under discussion is to:
- Place all important points in italics
 - Begin with the report in a humorous vein
 - Use simple language
 - Put the topic idea in the first sentence of the paragraph
24. The modern concept of supervision is that it should be:
- Concerned only with the needs of management
 - Concerned with training and guidance
 - Dogmatic and authoritative
 - Limited and non-critical
25. If water is added to concentrated acid, instead of acid to water:
- Water will sink to bottom immediately
 - Dilution is faster
 - Temperature goes down and the mixture tends to form ice
 - Heat is generated and the mixture tends to splash acid
 - There is no difference
26. When one is working on any piece of electrical equipment, the circuit breaker should be:
- Open
 - Closed
 - Tagged
 - Locked out
 - Locked out and tagged
27. The dangerous gases most likely encountered in the wastewater industry are:
- Oxygen, hydrogen, and ozone
 - Carbon monoxide, methane, and hydrogen sulfide
 - Fluorine, bromine, and iodine
 - Freon, nitrogen, and cyanide

28. Saw-toothed weirs are used on uncovered circular sedimentation tanks to:
- Catch floating material
 - Save metal
 - Break up the overflow
 - Provide better flow distribution
 - Maintain a cleansing velocity
29. If you have an excessive DO drop across a primary clarifier, what is the most probable cause?
- Too heavy a wastewater flow
 - Too infrequent sludge pumping
 - Excessive BOD removal
 - Poor adjustment on the weirs
30. A water sample is "fixed" in the field by:
- Keeping the sample in a Cippolletti device
 - Anchoring the container to the stream bed
 - Adding chemicals to prevent the changing of water quality
 - Maintaining a constant sample temperature of 95 degrees F.
31. The SS content of wastewater is most accurately measured by:
- Filtering the sample through a specially prepared filter; drying the filter and material retained on it in an oven at 103 degrees C; weighing the filter; and determining its added weight caused by the solids retained
 - Evaporating the sample and weighing the residue
 - Centrifuging the sample and measuring the volume of solids separated from the liquid
 - Distilling the sample after acidification with sulfuric acid and titrating the distillate with 0.1 N sodium hydroxide
32. Buffer capacity in water is a measure of:
- Ability to resist change in pH
 - Ability to hold settleable solids
 - Saturation DO
 - Ability to treat fluctuating BOD load

33. A chlorine demand test for various time periods on plant effluent samples will show:
- The safe amount of chlorine that may be fed without killing the fish
 - The number of pounds of chlorine required to kill 100% of the coliform
 - The amount of chlorine required to give a desired residual after a given time
 - The amount of chlorine required to reduce the BOD to 10 mg/l in the effluent
34. The COD test is a measure of:
- Concentrated oxygen demand
 - Chemical odor demand
 - Clinical oxygen dosage
 - Chemical oxygen demand
35. How should pH electrodes be stored when not in use?
- In a strong acid solution
 - In a strong caustic solution
 - In distilled water
 - In a detergent and water solution
36. The result of overaeration in the aeration basin on the secondary sedimentation basin would be:
- Small floc particles floating on tank surface
 - Decrease in return sludge suspended solids concentration
 - Decrease in waste sludge suspended in solids concentration
 - Increased suspended solids concentration in tank effluent
 - All of the above
37. Which one of the following best describes the contents of a balanced, good settling mixed liquor?
- Flagellate and amoeboid organisms
 - Flagellates and free-swimming ciliates and some stalked ciliates and rotifers
 - Free-swimming and stalked ciliates and some flagellates and rotifers
 - Nematodes and rotifers and some ciliates, flagellates and amoeboids

38. An operator observes a dense and somewhat greasy, scummy layer of deep tan or brown foam on his aeration tank. One probable explanation is that:
- The mixed liquor solids are too old
 - The mixed liquor solids are too young
 - The brown color indicates everything is okay
 - None of the above
39. Under which one of the following circumstances should sludge wasting normally be reduced?
- Mixed liquor settling values in the 60 minutes settleometer fail to 10% or less
 - A dark brown scummy foam appears on the aeration tank
 - "Ash" or "clumps" start rising to the final clarifier surface
 - All of the above
 - None of the above
40. In a new activated sludge plant the aeration tanks become covered with thick billows of white sudsy foam. Which of the following operational control changes should the operator make?
- Increase sludge return rate
 - Decrease sludge return rate
 - Decrease sludge wasting
 - Increase sludge wasting
 - None of the above - as this is due to high detergent levels
41. During cold weather operation of an activated sludge plant, biological activity will be reduced, resulting in:
- Increased sludge particle density
 - Decreasing the rate of solids accumulation
 - Increasing the rate of solids accumulation
 - Decreasing sludge age
42. If you encounter a liquid chlorine leak in a one-ton cylinder, what action will help to reduce the effect of the leak?
- Spray it with water
 - Spray it with ammonia solution
 - Apply ice to leaking area
 - Rotate cylinder so leak is in uppermost possible position

43. When using an evaporator, the chlorine pressure reducing valve should be located where?
- Inside the evaporator
 - Upstream of the evaporator
 - Downstream of the evaporator
 - Next to the rotameter

44. Given the following data concerning the condition of a gas chlorinator, select the problem which needs the most immediate attention.

DATA: Chlorine gas pressure chlorinator normal
Chlorine gas pressure at header normal
All manually operated valves open
Chlorine control valve open
Injector vacuum gauge high

- Supply line clogged
 - Reducing valve clogged
 - Chlorine injector clogged
 - Injector water pressure low
45. Given the following data concerning the condition of a gas chlorinator, select the problem which needs the most immediate attention.

DATA: Rotameter tube iced over
Feed rate indicator erratic
Supply from ton containers, gas phase
Frost on supply line of only one container
Pair of ton containers on line

- Broken dip tube inside chlorine container
 - Supply line clogged
 - Excessive feed rate
 - Pressure relief valve diaphragm ruptured
46. Given the following data concerning the condition of a gas chlorinator, select the problem which needs the most immediate attention.

DATA: Feed rate response sluggish
Maximum feed rate not reached
Injector water low at high feed rate
Injector water supply pressure normal
Injector vacuum stays low with low feed rate

- Clogged supply line
- Injector clogged
- Feed rate indicator clogged
- Vacuum loss

47. Which of the following factors would lower the effectiveness of chlorination and cause higher effluent fecal coliform concentrations?
- High temperature (85-95 degrees F)
 - High pH (8.5-9.5)
 - High dissolved oxygen (10.0-20.0 mg/l)
 - High iron concentration (3.0 mg/l)
 - All of the above
 - None of the above
48. Which one of the following will be observed first by an upset of the anaerobic digestion process?
- Methane production
 - pH
 - Volatile acid concentration
 - Alkalinity
 - A ratio of "C" divided by "D"
49. Which of the following most completely describes methane gas?
- It is lighter than air, thus will be found near the ceiling of a closed room
 - It is heavier than air, thus will accumulate near the floor of a closed room
 - It is flammable and/or explosive in certain mixtures with oxygen
 - Both "b" and "c"
 - Both "a" and "c"
50. If the volatile acid/alkalinity ratio is increasing and the pH is dropping, which of the following should be done?
- Increase the raw sludge feed to that digested
 - Decrease the raw sludge feed to that digested
 - Increase the digester loading ratio (lbs. volatile solids/cubic feet)
 - Both "a" and "c"
 - Both "b" and "c"
51. What is the purpose of heating and mixing a primary anaerobic digester?
- To prevent settling of grit to the bottom of the digester
 - To eliminate all oxygen present
 - To increase the reaction rate
 - To keep methane gas in suspension

53. Which one of the following is a true statement that applies to the aerobic digestion process?
- The air should be turned off for 8 hours each night to permit the sludge to stabilize
 - Sufficient air must be used to place all solids in the aeration tank in suspension
 - The dissolved oxygen level in the digestion tank should not exceed 0.5 mg/l
 - All of the above
54. The chief purpose in preparing an outline for a report is usually:
- To insure that the report will be the desired length
 - To insure that every point will be given equal emphasis
 - To insure that principal and secondary points will be properly related to the framework of the whole
 - To insure that the language of the report will be appropriate to its contents and that technical terms will be clearly explained
55. One of the best methods of presenting a recommendation in a report is to do so in such a manner that:
- It comes as a surprise to the reader
 - The evidence is presented in such a way that the recommendation is suggested to the reader before it is definitely disclosed to him/her
 - It magnifies the aspect of the problem the researcher finds most interesting
 - It appears to urge the reader to change his opinions
56. The term "public relations" has been defined as the aggregate of every effort made to create and maintain good will and to prevent the growth of ill will. This concept assumes particular importance with regard to public agencies because:
- Public relations become satisfactory in inverse ratio to the number of personnel employed in the public agency
 - Legislators may react unfavorably to the public agency
 - They are much more dependent upon public good will than are commercial organizations
 - They are tax supported and depend on the active and intelligent support of an informed public

MATHEMATICAL PROBLEMS

Instructions: The questions which follow are multiple choice, but require calculations to determine the correct answer. Choose either a, b, c, d, or e of the listed answers (whichever is most nearly correct) and mark that on the corresponding question number on the answer sheet. Please do not make any marks on the examination. Use the "blue book" provided for your calculations.

1. Calculate the BOD loading in pounds per cubic yard applied to a circular filter 170 ft. in diameter (D) and 6 ft. deep. The sewage flow is 15.0 mgd per day, and BOD of the raw sewage is 200 mg/l, and the primary clarifier removes 35% of the BOD before it is applied to the filter.
(1 cu. yd. = 27 cu. ft.; 1 gal. sewage = 8.34 lbs.)
 - a. 8.6 lbs/cu yd
 - b. 2.0 lbs/cu yd
 - c. 0.32 lbs/cu yd
 - d. 3.2 lbs/cu yd

2. A chlorinated effluent which was dechlorinated and then tested for BOD shows the following results:

<u>Dilution</u>	<u>Initial D.O.</u>	<u>5-Day Final D.O.</u>
1/20	7.2	5.6
1/20	7.1	4.0
Seeded Dilution Water	7.2	7.1

Assume an acceptable seed correction of .8 mg/L

The 5-day BOD of the effluent is most nearly:

- a. 46 mg/L
- b. 26 mg/L
- c. 29 mg/L
- d. 30 mg/L
- e. None of the above

STATEMENT (Questions 3-5)

Two samples were taken from a treatment plant, one from the raw influent, the other from the secondary effluent. BOD determinations of both samples gave the following results:

Sample Description	Dilution	Dissolved Oxygen Initial Reading	Dissolved Oxygen 5-Day Reading
Raw Influent	1/100	7.4	4.2
Raw Influent	1/80	7.2	3.1
Secondary Effluent	1/40	7.3	6.3
Secondary Effluent	1/20	7.2	5.3
Dilution of Water	----	7.6	7.6

3. The 5-day BOD for the raw influent is most nearly:
- 324 mg/l
 - 420 mg/l
 - 386 mg/l
 - 130 mg/l
 - 240 mg/l
4. The t-day BOD for the secondary effluent is most nearly:
- 47 mg/l
 - 39 mg/l
 - 26 mg/l
 - 18 mg/l
 - 56 mg/l
5. The percent of the t-day BOD removal (see Question #3) is most nearly:
- 88%
 - 92%
 - 76%
 - 96%
 - 17.5%
6. If the desired DO depletion is 4.0 mg/l in the BOD test and the expected BOD strength of the wastewater sample is 200 mg/l, how much of the sample should be added to the 300 ml BOD bottle?
- 2.0 ml
 - 4.0 ml
 - 6.0 ml
 - 8.0 ml
 - 10.0 ml

7. The initial DO of an industrial waste sample being analyzed for 5-day BOD was 7.4 mg/l. The final DO after 5 days incubation was 3.3 mg/l, and the dilution was 1/300. If the quantity of industrial waste was 250,000 gallons, the lbs. of BOD present would be most nearly:
- 2,050 lbs.
 - 2,300 lbs.
 - 1,850 lbs.
 - 2,560 lbs.
 - None of the above
8. A trickling filter is 100 ft. in diameter and 6 ft. deep. The raw sewage has a BOD of 230 mg/l, and a flow of 0.5 mgd. The primary clarifier removes 35% of the BOD. The lbs. of BOD applied per cu. yd. of filter media is most nearly:
- 0.36
 - 0.32
 - 0.55
 - 0.47
 - None of the above
9. The initial DO of a sample being analyzed for 5-day BOD was 6.8 mg/l. At the end of 5 days, the DO was 2.9 mg/l. If the dilution was 1/40 and no DO was lost in the blank, the BOD would be most nearly:
- 156 mg/l
 - 116 mg/l
 - 170 mg/l
 - 136 mg/l
 - None of the above
10. A sewage treatment plant was found to have a flow of 3/4 mgd, and a BOD of 250 mg/l. Based on a national average of 0.2 lbs. BOD pcd., what is the population equivalent of the plant?
- 10,800 PE
 - 24,200 PE
 - 35,445 PE
 - 27,000 PE
 - 15,000 PE

11. If the above plant was 85% efficient, the lbs. of BOD discharged daily would be:
- a. 210 lbs.
 - b. 1,063 lbs.
 - c. 960 lbs.
 - d. 1,525 lbs.
 - e. None of the above
12. Your average chlorine dosage is 1 mg/l, and your average daily flow is 3 million gallons. Chlorine costs 4 cents per pounds. Your yearly chlorine cost would be about:
- a. \$ 285/year
 - b. \$ 365/year
 - c. \$4,650/year
 - d. \$5,450/year
13. The raw sewage to a plant was found to have a BOD of 250 mg/l. The final effluent had a BOD of 30 mg/l. If the flow rate is 0.5 mgd, how much BOD in pounds would be discharged each day?
- a. 125 lbs.
 - b. 250 lbs.
 - c. 88%
 - d. 12%
14. How many pounds of chlorine of lime with 17% available chlorine are needed to treat 1 million gallons of water at a dosage of 4 mg/l?
- a. 150 lbs.
 - b. 200 lbs.
 - c. 167 lbs.
 - d. 133 lbs.
 - e. None of the above
15. What concentration of chlorine in mg/l is applied to a flow of 4 mgd, if the total weight of chlorine used was 120 lbs?
- a. 7.2 mg/l
 - b. 3.6 mg/l
 - c. 14.4 mg/l
 - d. 28.8 mg/l
 - e. None of the above

16. The raw sewage of a plant had 285 mg/l suspended solids. The final effluent had 12 mg/l. Flow of the plant was 3.8 mgd. How many pounds of suspended solids were removed per day?
- a. 5,500 lbs/day
 - b. 5,873 lbs/day
 - c. 8,650 lbs/day
 - d. 5,030 lbs/day
17. A stream has a DO of 8 mg/l and a flow of 60 cfs. How many pounds of oxygen are available per day for waste assimilation if a 4 mg/l residual is required?
- a. 5,010 lbs.
 - b. 1,290 lbs.
 - c. 3,880 lbs.
 - d. 3,200 lbs.

STATEMENT: (Questions 18-20)

Raw sewage is passed through a lift station at a rate of 3 mgd. If the lift or difference of elevation is 35 feet:
(1 HP = 746 watts; 1 HP = 550 ft. - 1 lb/second)

18. What is the pump rate in gallons per minute?
- a. 4,320 gpm
 - b. 480 gpm
 - c. 2,080 gpm
 - d. 650 gpm
19. What size (horsepower) motor would be necessary to drive the pump if the pump and motor combination is 62% efficient?
- a. 10.5 HP
 - b. 26.5 HP
 - c. 20.0 HP
 - d. 30.0 HP
 - e. 16.5 HP
20. What would it cost per year if electricity costs are 2.0 cents per kilowatt hour?
- a. \$3,900/year
 - b. \$2,500/year
 - c. \$1,500/year
 - d. \$3,460/year
 - e. \$5,200/year

21. The capacity of a pump in gallons per minute that requires 4 hours to fill a tank 32 ft. long by 12 ft. wide to a depth of 10 ft. would be most nearly:
- a. 120 gal/min
 - b. 150 gal/min
 - c. 167 gal/min
 - d. 300 gal/min
 - e. 240 gal/min
22. A plant is designed for a flow of 1 mgd. Three pumps are employed to return final clarifier effluent to a point just ahead of the filter. These pumps have a capacity of 232 gpm each. What is the recirculation ratio?
- a. 1 to 1
 - b. 4 to 1
 - c. 0.7 to 1
 - d. 1.4 to 1
 - e. 1 to 2

STATEMENT: (Questions 23-25)

A settleable solids test and a suspended solids test are performed on a sewage sample. Settleable solids are found to be 20 milliliters per liter and suspended solids are 300 mg/l in the unsettled sample. After one hour settling in the Imhoff cone, a test is made on the clarified liquid, and it is found to contain 100 mg/l of suspended solids.

23. What volume of sludge is being produced per million gallons at the above water content? (See STATEMENT above.)
- a. 3,000 gallons
 - b. 20,000 gallons
 - c. 10,000 gallons
 - d. 1,000 gallons
24. What is the percent solids in the sludge in the Imhoff cone? (See STATEMENT above.)
- a. 2.0%
 - b. 30.0%
 - c. 66.0%
 - d. 98.0%

25. The fixed solids are determined by igniting the sample at 600 degrees C. Upon ignition of the sample described in the STATEMENT above, the sludge ash weighed 1.4 grams. The percent of fixed solids is most nearly:
- a. 1.4%
 - b. 20.0%
 - c. 98.6%
 - d. 80.0%
 - e. Not enough data to calculate
26. You are preparing 1 liter of 0.025 N. sodium thiosulfate for titrating dissolved oxygen samples from a 0.250 N stock sodium thiosulfate solution. How much of the stock would be needed?
- a. 25 ml
 - b. 100 ml
 - c. 400 ml
 - d. 250 ml
 - e. 167 ml
27. A dissolved oxygen sample is titrated using N/40 thiosulfate. If it takes 4 ml of thiosulfate to titrate 200 ml of sample, the dissolved oxygen concentration of the sample would be:
- a. 4 mg/l
 - b. 6 mg/l
 - c. 2 mg/l
 - d. 8 mg/l
 - e. None of the above
28. A sludge sample of 100 grams was evaporated to dryness having a dry weight of 7 gm. The moisture content of this sample in percent is most nearly:
- a. 7%
 - b. 93%
 - c. 68%
 - d. 34%
 - e. None of the above
29. 50,000 gallons of wastewater, having a suspended solids content of 40 mg/l are intimately mixed with 100,000 gallons of wastewater with a suspended solids content of 130 mg/l. The suspended solids content of the mixture would be:
- a. 50 mg/l
 - b. 100 mg/l
 - c. 150 mg/l
 - d. 170 mg/l

30. The flow through a 90 degree "V" notch weir is measured and found to be 4.5 inches. From a curve, this depth corresponds to 97 gpm. The flow in MGD would be most nearly:
- 0.23 mgd
 - 0.35 mgd
 - 0.14 mgd
 - 0.44 mgd
 - None of the above
31. A community has wastewater stabilization ponds with a total area of 15 acres (650,000 sq. ft). What rate of liquid loss by evaporation and percolation into the soil would equal the rate of inflow of 120,000 gpd?
- 0.205 in/day
 - 0.462 in/day
 - 1.60 in/day
 - 0.295 in/day
32. A digester contains 20,000 cu. ft. of gas at 6 psi. The gas outlet valve is accidentally closed and sludge is pumped to the digester compressing the gas to 3,000 cu. ft. The resultant gas pressure in psi is:
- 200 psi
 - 40 psi
 - 27 psi
 - 32 psi
 - None of the above
33. If the water content of your sludge is 98% upon leaving the clarifier and you have 5,000 gallons per day of sludge, what volume would you reduce the day's sludge to, if you installed a holding tank which concentrated the sludge to 94% water content?
- 1,667 gallons
 - 5.333 gallons
 - 2,667 gallons
 - 3,330 gallons
 - None of the above
34. A paper converting plant discharges 140,000 gpd process water. The BOD - 1,250 mg/l and the suspended solids - 1,000 mg/l. What is the PE (based on BOD only) of this plant?
($PE_{[BOD]} = 0.2$ pcd)
- 720
 - 2,625
 - 7,300
 - 1,460

35. When a trickling filter has a recirculation ratio of 0.5 to 1, this indicates that the flow of wastewater over the filter is _____ times the flow of raw wastewater.

- a. 1.5
- b. 2.5
- c. 3.0
- d. 4.5

36. Given the following data, calculate the organic loading rate.

(Pounds BOD₅/1,000 feet³).

DATA: Filter is 75' in diameter x 5' deep
BOD to filter = 270 mg/l
Flow = 0.790 MGD

- a. 40 lbs/1000 cu. ft.
- b. 80 lbs/1000 cu. ft.
- c. 120 lbs/1000 cu. ft.
- d. 140 lbs/1000 cu. ft.

37. Given the following data, mark the answer that most nearly approximates the suspended solids required to maintain a food to micro-organism (F/M) ratio of 0.3 assuming 75% volatile solids.

DATA: Daily flow = 1.0 MGD
Average primary effluent BOD = 150 mg/l
Aeration tank capacity - 200,000 gal

- a. 2,500 mg/l
- b. 3,300 mg/l
- c. 4,200 mg/l
- d. 6,700 mg/l

38. Given the data below calculate the pounds of volatile solids under aeration.

DATA: Aeration tank 25' x 75' x 12'
Clarifier 35' diameter
10 mean depth
Raw sewage flow = 510,000 gal/day
Return sludge flow = 170,000 gal/day
Primary effluent BOD = 160 mg/l
(MLVSS) Mixed liquor volatile suspended solids
= 2200 mg/l

- a. 1,936 lbs.
- b. 124,777 lbs.
- c. 3,096 lbs.
- d. 8,166 lbs.
- e. 43,868 lbs.

42. Given the following data, calculate the return sludge pumping rate.

DATA: Influent flow - 1.0 MGD
BAS = 0.25 MGD

In 60 minutes solids settle to a volume of 340 ml in a 2-liter volume in a settleometer

- a. 590 gpm
- b. 148 gpm
- c. 295 gpm
- d. 174 gpm

This is the end of the WWT III examination. Please check your answers, then place your exam, answer sheet, blue book and any other used scratch paper in the envelope and turn the envelope in to the proctor.

Wastewater Treatment Practice Examination Series

Answer Sheet: Grade III 1990

Multiple Choice Questions:

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

Math Problems:

- | | | | | |
|------|-------|-------|-------|-------|
| 1. D | 10. A | 19. D | 27. E | 35. A |
| 2. A | 11. E | 20. A | 28. B | 36. B |
| 3. A | 12. B | 21. A | 29. B | 37. B |
| 4. B | 13. A | 22. A | 30. C | 38. C |
| 5. A | 14. E | 23. B | 31. D | 39. B |
| 6. C | 15. B | 24. A | 32. B | 40. B |
| 7. D | 16. C | 25. E | 33. A | 41. — |
| 8. A | 17. B | 26. B | 34. C | 42. D |
| 9. A | 18. C | | | |

4.7 days