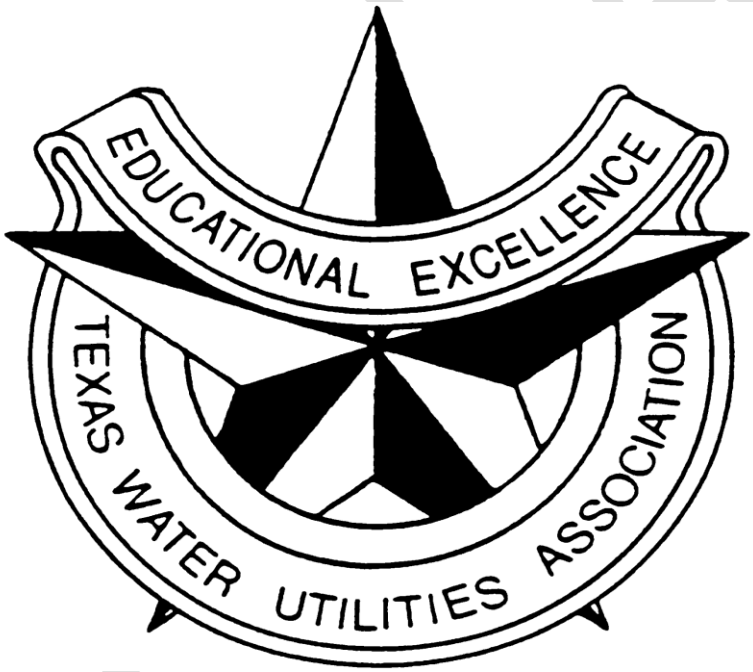
Wastewater Operator

Study Material



Test Questions Made Possible By TWUA

Answer Key Available To TWUA Members – Contact d.moore@twua.org

The following study questions were developed to assist the operator in the preparation process for taking a state licensing exam. While we feel the questions provide a broad sample of the type of questions one might expect on the state exam. TWUA and staff in no way implies, guarantees, or suggests that an operator who uses, studies, or knows the following material will pass the state exam. The following is only intended to offer an additional study tool.

While TWUA and staff have proofed the questions and answers it is possible that some of the answers could be found in conflict with written materials. If you doubt or question the answer key PLEASE refer to written materials and use the answer that YOU feel best fits the question.

We hope that you will find this study guide useful and we wish you the best of luck on your state exam.

Wastewater Questions

1. The name of the State Agency responsible for enforcing pollution control laws in Texas is –
    a. Texas Water Development Board
    b. Texas Water Commission
    c. Texas Section of EPA
    d. Texas Commission on Environmental Quality
    e. Texas Water Resource and Conservation Commission

2. The term pathogenic means –
    a. Aerobic Bacteria
    b. Anaerobic Bacteria
    c. Fecal Matter
    d. Coliform Bacteria
    e. Capable of Causing Disease

3. The minimum separation between sewer lines and potable water lines is –
    a. 5 feet
    b. 7 feet
    c. 9 feet
    d. 11 feet
    e. 24 feet

4. A licensed wastewater operator is a professional who –
    a. Consistently does the best job possible
    b. Practices personal safety
    c. Strives to improve job knowledge
    d. Strives to keep the plant and collection system in the best appearance and working order
    e. All the above

5. An important step in testing a sample for Total Suspended Solids (TSS) is –
    a. Settling the sample
    b. Filtering the sample
    c. Incubating the sample
    d. Burning the sample
    e. Evaporating the sample

6. The Biochemical Oxygen Demand (BOD) of a sample is based on –
    a. pH readings
    b. Measuring Total Suspended Solids (TSS) of a sample
    c. Measuring the Dissolved Oxygen (DO) used
    d. Measuring the anaerobic decomposition
    e. Measuring total detention time

7. The results of a Biochemical Oxygen Demand (BOD) sample taken at a treatment plant tells the operator –
    a. How the plant is currently operating
    b. How the plant was operating 5 days ago
    c. How the plant was operating 10 days ago
    d. Is of no benefit to the operator
    e. How the plant will be performing at TCEQ inspection time

8. Which of the following are dangerous gases that are likely to be present in lift stations and or manholes?
    a. Natural gas and Gasoline fumes
    b. Hydrogen Sulfide and Carbon Dioxide
    c. Hydrogen, Sulfur, and Argon
    d. Oxygen, Nitrogen and Helium
    e. Both a & b

9. A preferred hydraulic method of cleaning sewer lines is –
    a. Cable & Auger
    b. Continuous Roding Machine
    c. Hydro Jet Cleaner
    d. Bucket & Belt Press
    e. Both a & d

10. Which of the following are ways to reduce bad odors coming from a collection system?
    a. Aeration & Air Scrubbers
    b. Adding Enzymes To The Collection System
    c. Routinely cleaning slow running or low flow lines
    d. Adding Chlorine or Hydrogen Peroxide to the Collection System
    e. Both c & d

11. Which of the following types of pipe are commonly used in a wastewater collection system?
    a. Vitrified Clay
    b. Poly Vinyl Chloride (PVC)
    c. Ductile Iron
    d. Stainless Steel
    e. Both a & b

12. Before entering a confined space a worker should –
    a. Use approved monitoring device and check for the presence of dangerous gases
    b. Ventilate the space with a blower
    c. Wear a safety harness and attach a life line
    d. Enter the confined space even if another co-worker in not present
    e. a, b, & c

13. A properly designed and operated primary sedimentation tank should remove _____ percent of incoming BOD?
    a. 10 to 15 %
    b. 20 to 30 %
    c. 30 to 40 %
    d. 35 to 50%
    e. None of the above

14. Which device may be used to determine the level of sewage in a lift station?
    a. Air bubbler tube
    b. Parshall Flume
    c. Altitude Valve
    d. Air Actuated Valve
    e. All the above

15. What is the most important role of aerobic bacteria in the treatment of wastewater?
    a. Enhance organic matter
    b. Decompose organic matter
    c. Introduce workers to dangerous diseases
    d. Enhance oxygen production
    e. Produces Odor and Offensive Smells

16. The hydraulic loading of a trickling filter may be determined by –
    a. BOD and depth of filter media
    b. Organic loading and filter volume
    c. Total pounds of BOD removed
    d. Total pounds of suspended solids applied daily
    e. Flow rate and filter area

17. Which of the following is typically used to dewater sludge?
    a. Belt press
    b. Drying beds
    c. Solid bowl centrifuge
    d. Gravity thickener
    e. All the above

18. Which of the following are the most important to providing adequate sewage treatment in a stabilization pond?
    a. Protozoa, rotifers and turtles
    b. Sunlight, algae, bacteria, and Time
    c. Aeration, Sedimentation, and Chlorine Contact
    d. Nitrification, Sedimentation, Recirculation, & Detention
    e. Blowers, Diffusers, & Ultraviolet Disinfection

19. Offensive and objectionable odors which sometimes occur in trickling filters usually indicate that –
    a. The filter should be backwashed
    b. The flow is too great for the filter area
    c. Chlorinator is not working properly & algae is growing on the media
    d. Septic conditions are present
    e. All the above

20. Dissolved Oxygen (DO) in the aeration tank of an activated sludge plant should be maintained at or about –
    a. 1 to 2 mg/L
    b. 2 to 3 mg/L
    c. 2 to 4 mg/L
    d. 4 to 6 mg/L
    e. 0.5 to 0.75 mg/L

21. Which of the following would contribute to infiltration in a collection system?
    a. Breaks in the main lines
    b. High ground water levels
    c. Heavy rains
    d. Hydro jet cleaning plugged mains
    e. a, b, & c

22. When a centrifugal pump loses prime, which of the following is most likely to result?
    a. Pump sounds as though it is pumping gravel
    b. Pump is no longer moving liquid
    c. Check valve on the suction side of the pump slams closed
    d. RPM of motor increases to compensate
    e. a, b, & c

23. A Rotating Biological Contactor (RBC) is –
    a. Fixed film biological treatment process
    b. Addition to most Activated Sludge Plants
    c. New filter media aerobic digester
    d. Variable speed Recirculating Biological Contact Unit
    e. Reconditioned Biological Containment Unit

24. Which of the following need to be checked regularly to properly operate an activated sludge treatment plant?
    a. De-foaming agents
    b. Overflow rate in the primary clarifier
    c. Aeration equipment and mixed liquor solids
    d. Aeration equipment, Chlorine concentration, and Suspended solids
    e. All the above

25. An aeration basin holds 5000 gallons of mixed liquor, the MLSS is 4000 mg/l and the inflow is 200 gallons per hour. Calculate the detention time of the aeration tank in hours. **(D.T. = V divided by Q)**
    a. 2 hours
    b. 4 hours
    c. 12 hours
    d. 24 hours
    e. 25 hours

26. Calculate the volume in gallons of a rectangular aeration tank that is 60 feet long, 30 feet wide, and 20 feet deep. **(V=L X W X H X 7.48)**
    a. 26,928
    b. 269,280
    c. 36,000
    d. 360,000
    e. 4,812

27. An operator's flow meter at the plant indicates there was 2.6 MGD flow through the plant. What is the GPM?
    a. 1805
    b. 18,055
    c. 1083
    d. 10,833
    e. None of the above

28. Point source discharges are –
    a. Discharges that show up in the system and at the plant from an unidentified or explained source.
    b. Discharges that come from pipes or ditches that are monitored, controlled and inspected.
    c. Discharges that have Intermittent, dispersed flows having little or no control.
    d. Discharges that contribute greatly to the BOD and COD and typically come from dairies and farm related activities.
    e. None of the above

29. Non-Point Source Discharges are –
    a. Discharges that have Intermittent, dispersed flows having little or no control.
    b. Discharges that come from pipes or ditches that are monitored, controlled and inspected.
    c. Discharges that come from municipalities, or industry.
    d. Discharges that are high in BOD & typically come from food establishments.
    e. None of the above

30. The Texas Water Code establishes the protection of water quality and quantity of the state by –
    a. Limiting what farmers can use for irrigation.
    b. Establishing minimum standards for how close cattle or dairy operations can be to a lake or receiving stream.
    c. Setting stream standards, issues permits for discharges, identifies non-point source controls, and establishes water reuse.
    d. Making it almost impossible to meet effluent discharge standards.
    e. None of the above.

31. The wastewater plant operator is primarily responsible for –
    a. Treating potable water to Safe Water Standards
    b. Treating wastewater discharged from the community
    c. Developing, implementing, and complying with budget
    d. Collection and Containment of all non-point source water
    e. Traffic law compliance while vehicles are on plant property

32. Chapter ____ of the Texas Water Code is the state law controlling water pollution and _____ authority to control discharges in Texas.
    a. Chapter 30 & Texas Commission on Environmental Quality
    b. Chapter 30 & Texas Water Commission
    c. Chapter 26 & Texas Commission on Environmental Quality
    d. Chapter 26 & Texas Water Commission
    e. Chapter 290 & Texas Commission on Environmental Quality

33. The Texas Commission on Environmental Quality can revoke an Operator's license if the operator –
    a. Causes a permit violation, Falsifies records, or Neglects their duty
    b. Causes a permit violation, is convicted of a Felony, or DWI
    c. Knowingly violates plant permit under authority of the mayor
    d. Causes an environmental impact event under direction of supervisor
    e. TCEQ cannot revoke a license once it has been issued

34. If an accidental discharge, bypass, or spill (SSO) of wastewater occurs the responsible party MUST notify TCEQ regional offices within _____ hours.
    a. 12 hours
    b. 24 hours
    c. 36 hours
    d. 48 hours
    e. 72 hours

35. Aerobic Bacteria require _____ in the water for their metabolism
    a. Nitrogen
    b. Hydrogen
    c. Oxygen
    d. Either aerobic or anaerobic conditions
    e. Cannot live with O2 present

36. Anaerobic Bacteria require _____ in the water for their metabolism
    a. Nitrogen
    b. Hydrogen
    c. Oxygen
    d. Either aerobic or anaerobic conditions
    e. Cannot live with O2 present

37. Facultative Bacteria require _____ in the water for their metabolism
    a. Nitrogen
    b. Hydrogen
    c. Oxygen
    d. Either aerobic or anaerobic conditions
    e. Cannot live with O2 present

38. Chemical characteristics of sewage include –
    a. Solids, Grease, Dissolved Oxygen, O2 Demand, pH, & gases
    b. Liquids, Grease, BOD, Oxygen, pH, & gases
    c. Solids, Grease, Oxygen, pH, & Organics
    d. Water, Dissolved solids, Organics, Suspended Solids, & gases
    e. Varies from system to system therefore there is no uniformity

39. _____ removes Total Suspended Solids (TSS)
    a. Chemicals
    b. Aeration
    c. Sedimentation
    d. Detention
    e. Filtration

40. Inorganic Solids include –
    a. Sand, Grit, & Minerals
    b. Sand, Grease, & Organics
    c. Grease, Grit, & Organic Solids
    d. Organic materials from Plants, Animals, or Humans
    e. Both a & d

41. Organic Solids Include –
    a. Sand, Grit, & Minerals
    b. Sand, Grease, & Inorganics
    c. Grease, Grit, & Minerals
    d. Organic materials from Plants, Animals, or Humans
    e. Both a & d

42. A good plant influent pH is about _____
    a. 6.5
    b. 7.0
    c. 7.2
    d. 7.5
    e. 8.0

43. Dangerous gases are produced during bacterial decomposition of organics in wastewater. The main gases are –
    a. Hydrogen Sulfide, Carbon Dioxide, & Methane
    b. Hydrogen Sulfide, Carbon Monoxide, & Methane
    c. Natural gas, Methane, & Hydrogen Sulfide
    d. Ammonia, Methane, & Hydrogen Sulfide
    e. Carbon Dioxide, Methane, & Ammonia

44. The majority of Dissolved Oxygen in raw sewage come from _____
    a. Inorganic Decomposition
    b. Facultative Decomposition
    c. Organic Decomposition
    d. Organic Solids
    e. Potable Drinking Water

45. Each person contributes approximately _____ lbs of BOD to the system daily.
    a. 0.17
    b. 0.71
    c. 1.7
    d. 17
    e. 17.4

46. Sources of wastewater include –
    a. Domestic, Storm Water, Commercial, Food Processing, Agricultural, & Industrial.
    b. Domestic, Storm Water, Commercial, Agricultural & Hazardous
    c. Domestic, Commercial, Agricultural, & Industrial
    d. Commercial, Storm Water, Food Processing, & Industrial
    e. Domestic, Commercial, Agricultural, & Industrial

47. A sewer manhole provides access into the system for cleaning or service. A manhole is located –
    a. At changes in pipe composition, grade, direction & intersection
    b. At changes in pipe composition, grade, direction, & intersection
    c. At changes in alignment, diameter, grade, direction, & intersection
    d. At the discretion of the engineer & public works director
    e. Where a sewer clean out is not feasible

48. New manholes must have an inside diameter of at least _____ feet and the entry access must be at least _____ inches.
    a. 3 feet and 24 inches
    b. 4 feet and 24 inches
    c. 4 feet and 30 inches
    d. 5 feet and 30 inches
    e. There is no current standard or requirement

49. In the past _____ was used to construct manholes. This product is prohibited for construction or grading today.
    a. Concrete
    b. Fiberglass
    c. Poly Vinyl Chloride (PVC)
    d. Brick & Mortar
    e. Ductile Iron or Cast

50. Vitrified clay and Poly Vinyl Chloride (PVC) are the most common pipe materials used for sewer lines but other materials are available such as –
    a. Ductile Iron, Cast Iron, Acrylonitrile Butadiene Styrene(ABS) Concrete, Polyethylene & Asbestos Concrete
    b. Stainless Steel, Galvanized, Fiberglass, Orangeburg & Copper
    c. Ductile Iron, Cast Iron, Stainless Steel, & Galvanized
    d. Poly, SDR-35, Orangeburg, C-900, & Schedule 80 PVC
    e. Both a & b

51. In order to maintain two (2) feet per second velocity in a six (6) inch main line, the fall per 100 feet of pipe will be –
    a. 0.25 percent or 3 inches
    b. 0.33 percent or 4 inches
    c. 0.50 percent or 6 inches
    d. 0.75 percent or 8 inches
    e. 1.00 percent or 10 inches

52. Whenever wastewater cannot flow to the treatment plant by _____ a _____ is typically used.
    a. Gravity / Lift Station
    b. Pressure / Pressure Pump
    c. Gravity / Booster Pump
    d. Pressure / Lift Station
    e. Gravity / Positive Displacement Pump

53. The primary cause of stoppage in a collection system is _____ and _____
    a. Line breakage / Roots
    b. Grit / Roots
    c. Grease / Roots
    d. Poor Construction / Roots
    e. Customer Abuse / Grease

54. The _____ pump is most commonly used in a lift station
    a. Positive Displacement
    b. Diaphragm
    c. Vertical Shaft Turbine
    d. Centrifugal
    e. Roller

55. A centrifugal pump must be _____ or it will not pump.
    a. Vented
    b. Flushed Periodically
    c. Primed
    d. Phased to proper rotation
    e. Properly Packed

56. You are instructed to install 1,000 feet of 8-inch diameter main line. The percent of fall is 0.33 %. How many feet of fall will there be in the 1,000 feet?
    a. 2.3 feet of fall
    b. 3.3 feet of fall
    c. 4.3 feet of fall
    d. 30.3 feet of fall
    e. Not enough information to compute

57. _____ gas is very toxic and deadens the sense of _____.
    a. Hydrogen Sulfide / Smell
    b. Hydrogen Peroxide / Smell
    c. Hydrogen Sulfide / Taste
    d. Chlorine / Taste
    e. Methane / Smell

58. _____ gas is colorless, odorless, and heavier than air
    a. Hydrogen Sulfide
    b. Chlorine
    c. Methane
    d. Nitrogen
    e. Petroleum

59. _____ gas is greenish-yellow, pungent, heavier than air and highly toxic
    a. Hydrogen Sulfide
    b. Chlorine
    c. Methane
    d. Nitrogen
    e. Hydrogen Peroxide

60. One common type of weir design for measuring flow is –
    a. B-Knotch
    b. C-Knotch
    c. Z-Knotch
    d. V-Knotch
    e. Inverted Siphon

61. Inflow and Infiltration (I&I) typically refers to –
    a. Plant load & Filter Capacity
    b. Unaccounted for water in the system after heavy rains
    c. Unaccounted for load typically from a septic tank waste hauler
    d. The amount of chemical change in the system after heavy rains
    e. The direction of flow into the plant and flow through the various treatment processes

62. If the _____ loading on the plant is high, the operator would need to _____ Dissolved Oxygen (DO) levels.
    a. Inorganic / Decrease
    b. Inorganic / Increase
    c. Organic / Decrease
    d. Organic / Increase
    e. Surface / Restrict

63. A simple method for indicating when to waste sludge is –
    a. Mixed liquor suspended solids test
    b. Sludge volume index test
    c. Total Sedimentation Test
    d. BOD Test
    e. 30 minute settling test

64. _____ are the smallest, most numerous, and most important of the activated sludge microorganisms.
    a. Bacteria
    b. Fungi
    c. Protozoa
    d. Amoebic
    e. Rotifers

65. Organic loading refers to the pounds per day of _____ per acre feet or 1,000 cubic feet of filter media
    a. DO
    b. BOD
    c. TSS
    d. Filtered Solids
    e. Unsettleable Solids

66. Hydraulic loading refers to the volume of _____, including recirculation, applied to the filter.
    a. Sludge
    b. Air or Oxygen
    c. Water
    d. Mixed Liquor
    e. Total Suspended Solids

67. The most common type(s) of trickling filters are –
    a. Standard rate (1-4 mgd) & High rate (10-40 mgd)
    b. Standard rate (2-6 mgd) & High rate (12-50 mgd)
    c. Pressure rate (1-4 mgd) & Super High Rate (15-70 mgd)
    d. Sand (.5 to 2 mgd) & Higher rate (7-40mgd)
    e. Being replaced by Micro Filtration and are no longer being used

68. Odors occur when treatment becomes –
    a. Aerobic
    b. Anaerobic
    c. Clogged
    d. Overloaded
    e. Infiltrated

69. Organic loading of a stabilization pond is about _____ pounds of BOD/acre/day with a detention time of at least _____ days.
    a. 30 BOD / 30 Days
    b. 30 BOD / 45 Days
    c. 35 BOD / 30 Days
    d. 35 BOD / 35 Days
    e. 35 BOD / 45 Days

70. Using the above numbers (question 68) BOD will be reduced –
    a. 50 to 75 %
    b. 75 to 80 %
    c. 80 to 85 %
    d. 85 to 90 %
    e. 90 to 95 %

71. Anaerobic digesters are covered to keep out _____, and to trap useful methane which can be used to keep the digester warm.
    a. Free Oxygen
    b. Free Carbon Dioxide
    c. Flies, Mosquitoes, and unwanted insects
    d. Trespassers
    e. TCEQ Field Inspectors

72. Unstable anaerobic sludge contains streaks of _____ or _____.
    a. Brown / Black
    b. Brown / Green
    c. Green / Black
    d. Gray / Black
    e. Gray / Green

73. Aerobic digestion is an _____ process whereby the aerobic bacteria consume themselves.
    a. Endemic
    b. Endogenous
    c. Endothermic
    d. Endocrine
    e. Endorphin

74. Approved disposal methods for digested, dewatered, sludge's are landfill, _____ and _____.
    a. Incineration & Land Application
    b. Belt Press & Centrifuges
    c. Incineration & Solid Waste Disposal (dumpster)
    d. Compost & Land Application
    e. Compost & Using as a fertilizer

75. Landfill applied sludge must have a solids content of at least _____ %
    a. 10 %
    b. 15 %
    c. 20 %
    d. 25 %
    e. There is no requirement or stipulation

76. Calcium Hypochlorite (HTH) is a strong _____ and reacts violently with _____.
    a. Disinfectant / Bacteria
    b. Oxidizer / Oil & hydrocarbons
    c. Neutralizer / Ozone
    d. Oxidizer / microorganisms
    e. Disinfectant / microorganisms

77. When added to water chlorine forms _____ & _____ acid.
    a. Muriatic & Hypochloric
    b. Sulfuric & Muriatic
    c. Hypochlorous & Sulfuric
    d. Hydochlorous & Hydrochloric
    e. Hydrochloric & Muriatic

78. When ammonia is present in wastewater and reacts with chlorine _____ are formed.
    a. Chloramines
    b. Floc
    c. Methane gas
    d. Hydrogen Sulfide gas
    e. Nothing happens when the two are combined

79. Effluent dosage of chlorine in the contact chamber must produce a total combine residual of –
    a. 0.5 mg/L after 15 minutes
    b. 0.5 mg/L after 20 minutes
    c. 1.0 mg/L after 10 minutes
    d. 1.0 mg/L after 20 minutes
    e. 2.0 mg/L after 20 minutes

80. Besides disinfection, chlorine has other uses at the wastewater treatment plant such as –
    a. Reduce flies & need for other chemicals
    b. Reduces BOD, Odor, Algae growth, Helps with grease
    c. Reduces COD, Aids in Algae growth, & the need for other chemicals
    d. Good antiseptic scrub for floors in the office & lab
    e. Operators can take it home for household use

81. TCEQ allows the reuse of wastewater, some of these uses include –
    a. Irrigation, Aquifer Recharge, Cooling Towers, & Fire Protection
    b. Irrigation, Cooling Towers & Fire Protection
    c. Irrigation, Consumption by livestock, Gardens
    d. Irrigation Only
    e. Effluent water must be evaporated or used for irrigation only

82. All reclaimed water piping must be _____ in color.
    a. White
    b. Blue
    c. Red
    d. Brown
    e. Purple

83. Before entering a manhole the operator should test for _____ and oxygen levels and _____ the manhole before entering.
    a. Methane & Washout
    b. Hydrogen Sulfide & Ventilate
    c. All Hazardous Gases & Ventilate
    d. Gases & Put on a SCBA & life line
    e. Chlorine & Wait for a co-worker

84. How many gallons will a pump pumping 650-gpm produce in 24 hours?
    a. 15,600
    b. 39,000
    c. 93,600
    d. 936,000
    e. 9,360,000

85. If an operator does not have an electronic flow measuring device but knows that the population of his entity is 3,250 he could determine that approximately _____ gallons per day is being discharged to the collection system.
    a. 10,140
    b. 42,250
    c. 422,500
    d. 1,014,000
    e. Not enough information to compute

86. An operator knows his / her entity has a total population of 26,540. Approximately how many pounds of BOD is discharged to the distribution system every 24 hours?
    a. 451
    b. 4,511
    c. 45,110
    d. 1,105
    e. 11,050

87. How many hours will it take to fill a 400,000 gallon wet well if the flow is 250 GPM ?
    a. 16.6
    b. 24.6
    c. 26.4
    d. 26.6
    e. 28.6

88. When a municipal wastewater effluent has a high nitrate level and low ammonia level this most likely means that –
    a. The effluent has received a high degree of aerobic treatment
    b. The effluent has received anaerobic treatment
    c. The effluent has received very little treatment
    d. Nitrification has been stopped most likely by toxic materials
    e. Nitrogen is being consumed by algae.

89. Total solids in wastewater are the sum of –
    a. Settleable and Volatile Solids
    b. Dissolved and Suspended Solids
    c. Suspended and Grease Solids
    d. BOD and COD Tests
    e. Volatile and Inorganic

90. Which of the following treatment devices is commonly used to separate and remove large solids form raw wastewater?
    a. A Grit Chamber
    b. A Comminuter
    c. A Mechanically raked bar screen
    d. A Grease Trap
    e. A Primary Clarifier

91. Which of the following would have an adverse effect on the proper settling of solids in a clarifier?
    a. Warm Temperature
    b. A Two hour flow detention time in the clarifier
    c. A Low surface loading rate
    d. A Low sludge blanket
    e. A Short Circuiting flow pattern

92. Which of the following tests would give the best information on how efficiently a trickling filter was operating?
    a. Color of surface rocks
    b. Influent Dissolved Oxygen (DO) Removal
    c. Effluent pH
    d. Percent BOD Removal
    e. Total Suspended Solids (TSS) Removal

93. Which of the following trickling filter problems could be reduced by increasing the recirculation ratio?
    a. Mudballs
    b. Filter Flies
    c. Filter Ponding
    d. pH Stabilization
    e. Both b & c

94. What gases are produced by the controlled anaerobic digestion of wastewater sludge's?
    a. Methane & Sulfur Dioxide
    b. Methane & Carbon Dioxide
    c. Methane & Carbon Monoxide
    d. Hydrogen Sulfide & Carbon Dioxide
    e. Hydrogen Sulfide & Carbon Monoxide

95. Which of the following diseases are caused by pathogenic organisms that may be present in raw wastewater?
    a. Hepatitis, Typhoid, Paratyphoid, Dysentery, Cholera
    b. Gastroenteritis, Polio, Hookworm, & Giardiasis
    c. Yellow fever, Scarlet fever, Smallpox, Chickenpox, Mumps,
    d. a & b only
    e. All the above

96. During a heavy rain it is possible that manholes and lift stations may overflow, discharging waste materials into roadways or ditches. This type of discharge (SSO) would be –
    a. Considered an unauthorized discharge
    b. A violation of the Texas Water Code
    c. A bypass that must be reported within 24 hours
    d. Considered a health hazard
    e. All the above

97. An effective way for the collection system worker to prevent infection by waterborn pathogenic organism is to –
    a. Wear protective clothing and avoid direct contact with wastewater
    b. Receive a vaccination and booster shot each year
    c. Wash hands with Antiseptic Soap & follow with Alcohol
    d. Keep exposure brief until antibodies are built up and immunity increases.
    e. All the above

98. Which of the following will increase the chances that sewage will turn septic
    a. Cold weather
    b. High Dissolved Oxygen levels
    c. Stoppages in the main line
    d. High flow from infiltration after a rain
    e. Jet Roding mains following odor complaints

99. Extensive use of garbage disposals (grinders) in a community would likely have the following effect on the collection system –
    a. Absolutely none
    b. Lower the overall BOD & pH
    c. Increase the amount of flow, solids, and grease
    d. Aid the operator in the treatment of septic conditions
    e. Give the lift stations a good cleaning and increase pumping capacity

100. The minimum size for a gravity flow sewer line on city right-of-way and the minimum grade is -
    a. 4 inch and a grade of 0.25 percent
    b. 4 inch and a grade of 0.33 percent
    c. 6 inch and a grade of 0.33 percent
    d. 6 inch and a grade of 0.50 percent
    e. 8 inch and a grade of 0.25 percent

101. Which of the following would be the most accurate way to find the average wastewater flow rate in an existing 10-inch sewer main?
    a. Internal Video Inspection
    b. Floating a ping-pong ball from one manhole to another and timing
    c. Obtaining actual flow data & verifying with field data
    d. Installing a temporary 24 hour sampling station
    e. Ask the engineer who designed the system

102. What is the greatest advantage for using fiberglass manholes in areas with high groundwater?
    a. Fiberglass can be installed to a much greater depth
    b. Fiberglass can support traffic loads
    c. Fiberglass manholes do not require additional bottoms
    d. Fiberglass is not subject to infiltration
    e. Both b & c

103. Which of the following type of pumps would most likely be used when discharging into a 10” inch diameter pressure sewer main?
    a. Centrifugal pump
    b. Screw pump
    c. Diaphragm pump
    d. Roller pump
    e. Submersible pump

104. Excessive power consumption by a pump could be caused by –
    a. Undersized Electrical fuses
    b. Worn bearings
    c. Worn impeller
    d. Suction side check valve closed
    e. Both b & c

105. Trench safety is a great concern in Texas. OSHA requires that anytime an excavation is greater than _____ feet deep it must be protected by _____.
    a. 4 feet & An Approved Trench Box or Shoring
    b. 5 feet & An Approved Trench Box, Shoring, or Sloping
    c. 4 feet & Plywood with 2 X 4 bracing
    d. 5 feet & Local Law Enforcement & Emergency Services
    e. OSHA has no requirement

106. In an excavation if a ladder is used as a means of exit, it must extend _____ feet above the ground and be secured and within _____ feet laterally of anyone in the excavation.
    a. 3 feet above & 10 feet laterally
    b. 3 feet above & 50 feet laterally
    c. 3 feet above & 25 feet laterally
    d. 4 feet above & 25 feet laterally
    e. 4 feet above & 50 feet laterally

107. Which of the following inspection methods would be the best to determine if a storm drain is connected to a sanitary sewer line?
    a. Smoke Test
    b. Internal Video Inspection
    c. Low Pressure Air Test
    d. Excavating all the customers line
    e. All the above

108. Which of the following sewer rehabilitation methods would most commonly be used to seal a number of joint leaks on a main with minimal interruption?
    a. Slip Lining
    b. Inversion Lining
    c. Internal Grouting
    d. Excavation and Replacement
    e. All the above

109. Pre-treatment of wastewater would include –
    a. Coarse or Fine Screening
    b. Grinding and Grit Removal
    c. Grease Removal and Pre-aeration
    d. Adding Chlorine
    e. a, b, & c

110. Primary treatment of wastewater would include –
    a. Settling tanks or basins
    b. Scum collection & removal
    c. Sludge collection & removal
    d. Chlorination
    e. a, b, & c

111. Secondary treatment typically used today would include –
    a. Stabilization Ponds, Trickling Filters, Rotating Biological Contactors (RBC) & Activated Sludge
    b. Facultative Lagoons, Trickling Filters, & Imhoff Tank
    c. Rotating Biological Contactors (RBC), Imhoff Tank, & Facultative Lagoons
    d. Activated Sludge Process, Ponds, & Grit removal
    e. All the above

112. Essential components of the wastewater collection system include –
    a. Sewer Mains & Piping, Lift Stations, Pumps, Grease & Sand Traps, & Manholes
    b. Sewer Mains & Piping, Lift Stations, Grease Traps & Sand Traps,
    c. Sewer Mains & Piping, Lift Stations, Pumps, Grease & Sand Traps, Manholes, & Grit Removal Equipment
    d. Sewer Mains, Piping, Lift Stations & Manholes
    e. Sewer Mains, Piping, Lift Stations, Manholes, Grit Removal, & Chlorination equipment

113. Grit removal would be considered –
    a. A part of the Collection System
    b. A part of Primary Treatment
    c. A part of Secondary Treatment
    d. Overrated and is not cost effective to perform
    e. Job duties for the beginning operator

114. The protozoa that causes dysentery would most likely be destroyed by –
    a. Aeration
    b. Sun Light & Algae Blooms
    c. Primary Treatment
    d. Disinfection
    e. Recirculation & Mixing with Influent

115. Using final plant effluent in cooling towers would be –
    a. Strictly prohibited by TCEQ Rules & Regulations
    b. Beneficial way to reuse treated effluent
    c. Obnoxious due to algae & odor issues
    d. Acceptable but the water would have to be treated again before use
    e. Chlorinated to 50mg/L for 2 hours before using

116. TCEQ may authorize discharge of untreated wastewater into or near a receiving stream in extreme cases. This is referred to as –
    a. Beneficial Nutrients in a receiving stream
    b. Avoiding Treatment
    c. Bypass
    d. Operator Screw Up
    e. Not possible without a hugh fine from TCEQ

117. Enforcement action from TCEQ may be taken if pollution or waste violates the Texas Water Code. Violations of the Water Code may include –
    a. Unauthorized Discharge, Accidental Discharge, & Health Hazard
    b. Authorized Discharge, Accidental Discharge, & Health Hazard
    c. Unreported Discharge, or Health Code Violation
    d. Bypass, Unreported Discharge, or Health Hazard
    e. Enforcement is not typically imposed for Water Code Violations

118. Solids in wastewater are classified as –
    a. Total (TR), Suspended (TSS), Dissolved (TDS), Settleable (SS), Non-settleable, Floatable, Organic & Inorganic.
    b. Total (TR), Dissolved (TDS) Organic, Inorganic, & Unknown
    c. Treatable, Non-treatable, Volatile, Non-Volatile, & Unknown
    d. Total, In suspension, Settleable, Organic & Inorganic
    e. Household, Industrial, Agricultural, or inert

119. Total Suspended Solids (TSS) are those that –
    a. Cannot be filtered out
    b. Are removed in Pre Treatment
    c. Bind with greases and cause blockage in the collection system
    d. Can be filtered out
    e. Are removed in Secondary Treatment

120. Total Dissolved Solids (TDS) are those that –
    a. Cannot be filtered out
    b. Bind with grease and cause blockage in the collection system
    c. Pass through a filter with the water
    d. Cause filter plugging & increase maintenance costs
    e. Removed along with Grit & Sand

121. Settable Solids (SS) are those that –
    a. Cannot be filtered out
    b. Settle out when left standing for extended periods of time
    c. Pass through a filter with the water
    d. Bind with grease and cause blockage in the collection system
    e. Are typically removed in Pre Treatment

122. Non-settleable Solids are those that –
    a. Bind with grease to cause blockage in the collection system
    b. Settle out when left standing for extended periods of time
    c. Are volatile and come from inorganic matter
    d. Small particles that do not settle
    e. Cause filter plugging & increase maintenance costs

123. Volatile Solids (VSS) are those that –
    a. Are determined by burning the residue from the Total Solids determination.
    b. Are dangerous to the operator because of the flash point
    c. Are hazardous to Aquatic Life
    d. Small particles that do not settle
    e. Bind with grease to cause blockage in the collection system

124. Inorganic Solids (ash) are those that –
    a. Are determined by burning the residue from the Total Solids determination.
    b. Are beneficial to the operator and Aquatic life
    c. Consist of sand, grit, & minerals and can be suspended or dissolved
    d. Cannot be filtered out
    e. Cause filter plugging and increase maintenance costs

125. Organic matter in wastewater can be _____ or _____ and makes up approximately _____ % of the total solids.
    a. Dissolved or Suspended / 40 %
    b. Dissolved or Suspended / 65 %
    c. Septic or Fresh / 85 %
    d. Domestic or Industrial / 45 %
    e. None of the above

126. The typical pH of an influent entering the plant will vary from –
    a. 6.0 to 9.0
    b. 6.5 to 7.5
    c. 6.5 to 8.0
    d. 6.5 to 9.0
    e. 7.5 to 9.5

127. Acute toxicity occurs when –
    a. There is a slow die off of treatment organisms
    b. There is a rapid die off of treatment organisms
    c. A spill occurs and herbicides end up in the collection system
    d. Septic conditions exist due to blockage in the collection system
    e. Operators take extended leave with a "hottie"

128. Chronic toxicity occurs when –
    a. There is a rapid die off of treatment organisms
    b. Septic conditions exist due to blockage in the collection system
    c. Illegal dumping occurs typically from a private waste hauler
    d. Certain microorganisms become inactivated but others continue to work resulting in a sick biological process
    e. Operators are continually exposed to concentrated levels of unknown chemicals in the waste.

129. A comminutor would be –
    a. A mechanical device that screens & cuts large solids in small particles
    b. A electrical device that channels inflow from on trough to another
    c. A hydraulic driven device that is used to recycle sludge
    d. A mechanical device that is used when bypassing secondary treatment
    e. A submersed mechanical air blower

130. Detention time in wastewater typically refers to –
    a. The amount of time that it takes for sewage to make it through all treatment steps in the plant.
    b. The amount of time in the collection system from customer discharge until it reaches the treatment facilities.
    c. The amount of time it takes between starting and completing a BOD test.
    d. The time sewage is kept in a sedimentation basin
    e. The amount of time given an operator convicted of DWI.

131. There are five (5) major components to a tricking filter and they are –
    a. Filter floor, Underdrain, Walls, Filter Media, & Distributor Arms
    b. Filter floor, Underdrain, Walls, Sand or Plastic Media, & Aerator
    c. Filter floor, Underdrain, Walls, Filter media, Loss of Head Gauge
    d. Filter Floor, Underdrain, Walls, Recycling Pump, Telescoping Valve
    e. Filter, Underdrain, Walls, Weirs, Media, & Distributor Arm

132. Zoogleal Mass refers to –
    a. A thick layer of slime that is typically treated with high concentrations of chlorine to improve filter flow.
    b. A thick layer of jelly like slime where organisms, bacteria, fungi, protozoa, and ciliates thrive.
    c. A thin layer of plastic filter media that helps reduce flies, snails, and larva on the filter.
    d. A thick layer of grease that is placed on the distributing arms to prevent wear.
    e. A Church service typically offered prior to Good Friday

133. The efficiency of a trickling filter is measured in –
    a. Percent of electricity reduction
    b. Percent of Chemical versus Flow
    c. Percent of Mixed Liquor Re-circulated
    d. Percent COD Reduction
    e. Percent BOD Removed

134. Common operating problems with a trickling filter include –
    a. Ponding, Filter flies, Odors, Clogging of Nozzles, & Snails
    b. Grit removal, Ponding, Filter flies, Snails, & Short cycling
    c. Mudballs, Snails, Filter flies, Odors, & Clogging of nozzles
    d. Hydraulic motors have short life, Odors, & Clogging of nozzles
    e. Bearing wear, distributor arm fatigue, corrosion, Filter flies & snails

135. The raw influent to a filter plant has a BOD of 150mg/L and the effluent leaving the plant has a BOD of 20mg/L. What is the BOD reduction in percent?
    a. 13.3 %
    b. 20.7 %
    c. 86.7 %
    d. 96.7 %
    e. Not enough information to compute

136. Wastewater Stabilization Ponds are an approved process for wastewater treatment. Organic loading of Stabilization Ponds is typically –
    a. 30 Lbs BOD/Acre/Day with a minimum of 30 days detention time
    b. 35 Lbs BOD/Acre/Day with a minimum of 30 days detention time
    c. 35 Lbs BOD/Acre/Day with a minimum of 45 days detention time
    d. 45 Lbs BOD/Acre/Day with a minimum of 45 days detention time
    e. 75 Lbs BOD/Acre/Day with a minimum of 30 days detention time

137. Wastewater Stabilization Ponds work through a complex process which includes –
    a. Sunlight, Oxygen, Nutrients, Algae, and Bacteria
    b. Submersed Powered Air diffusers, Nutrients, Algae, and Bacteria
    c. Sunlight, Wind, Algae, Bacteria, & Sludge Wasting
    d. Surface aeration, Sunlight, Bacteria, Sludge Mixers, & Belt Press
    e. Solar Pond Cover, Air diffusers, Methane recovery, & Anaerobic Bacteria

138. Facultative Lagoons have two zones of treatment –
    a. An anaerobic surface layer & Aerobic bottom layer
    b. An aerobic surface layer & Anaerobic bottom layer
    c. An aerobic surface layer & Zoogleal Mass bottom layer
    d. An anaerobic surface layer & Septic bottom layer
    e. A Surface layer & Bottom layer

139. Typically one could expect _____ % BOD removal in a Facultative Lagoon.
    a. 25 %
    b. 30 %
    c. 50 %
    d. 75 %
    e. Less than 25 %

140. Aerated Lagoons rely on _____ to provide _____ and _____
    a. Sunlight & Wind / Agitation & Mixing
    b. Mechanical aeration / Flow & Circulation
    c. Hydraulic power / Agitation & Circulation
    d. Mechanical aeration / Aeration & Mixing
    e. Injected liquid oxygen / Aeration & Circulation

141. The most common method of dewatering and drying sludge is –
    a. Belt Press
    b. Drying Bed
    c. Methane fired furnaces
    d. High Speed Centrifugal Slinger
    e. Hydraulic Pressure Press

142. Digester gas typically contains about _____ % _____
    a. 50 to 60 % Carbon Monoxide
    b. 50 to 75 % Carbon Dioxide
    c. 60 to 70 % Methane
    d. 65 to 75 % Methane
    e. 50 % Hydrogen Sulfide

143. The depth of sludge drawn to a drying bed should be –
    a. Approximately 4 inches
    b. Approximately 6 inches
    c. Approximately 9 inches
    d. Approximately 12 inches
    e. Approximately 18 inches

144. Newly hired personnel have _____ to become licensed.
    a. 6 months
    b. 1 year
    c. 2 years
    d. 3 years
    e. There is no requirement from TCEQ

145. Force Mains and fittings must have a pressure rating of at least –
    a. 80 psi
    b. 100 psi
    c. 125 psi
    d. 150 psi
    e. 200 psi

146. Most pumping stations and electrical equipment used today in wastewater collection or treatment is _____ and typically either _____ or _____ volts
    a. A.C. (Alternating Current) & 220 or 440
    b. D.C. (Direct Current) & 110 or 220
    c. A.C. (Alternating Current) & 110 or 440
    d. A.C. (Alternating Current) & 100 or 208
    e. a & in some cases c

147. To avoid electrical shock, the operator should _____ if they are experiencing equipment failures or power related issues.
    a. Refer the problem to a trained electrical repairperson and do not attempt to check fuses or open the disconnect box.
    b. Retrieve a Volt / Ohmmeter and open the disconnect box to check for incoming voltage and to make sure fuses are not blown.
    c. Call the newbie and let him sort out what might be the problem
    d. Notify the power provider and let them send out a serviceman to assure the problem is not on the provider's side.
    e. Both a & d

148. When using Hydraulic Hydro Jetting sewer cleaning equipment the operator will want to go from a _____ manhole and clean toward the stoppage to avoid _____.
    a. Clear or open / Forcing sewage into customer homes or businesses
    b. Full or clogged / Adding unaccounted for water to treatment plant
    c. Clear or open / The possibility of personal contact with untreated sewage.
    d. TCEQ approved / The possibility of a sewer spill or overflow
    e. First accessible / Customer inconvenience

149. You as a new operator are directed by your supervisor to enter a sewer manhole to retrieve large grease balls that are restricting flow. The entity you work for does not have air monitoring / sampling equipment, external blower to ventilate the manhole, safety line, or other safety equipment. You voice your concerns to the supervisor and his reply is – "I have been in this business more than 20 years and I have never experience methane or hydrogen sulfide gas in this system, so if you value your job you will get in that manhole and retrieve those grease balls" the operator should –

    a. Respectfully tell the supervisor to go to hell
    b. Respectfully tell the supervisor that you are concerned for your personal safety and if they provide the necessary safety equipment you would comply with the directive.
    c. Respectfully and tactfully, inform the supervisor that in your training the instructors have warned about the dangers of entering a confined space without proper safety equipment or testing air quality.
    d. Refuse to enter and threaten the supervisor with reporting his action to the city manager, TCEQ, and OSHA.
    e. Both b & c

150. You as a new operator are working at the wastewater treatment plant that discharges into a receiving stream and several issues over the month have caused the plant to be out of compliance with the TCEQ permit. The supervisor tells you to change the results of the testing so that TCEQ does not find out about the issues or fine the entity. The operator should –
   a. Comply with the supervisor since the supervisor has a higher TCEQ license than you.
   b. Comply with the supervisor but retain original copies of the test results to CYA.
   c. Respectfully inform the supervisor that that is grounds for TCEQ to revoke a license
   d. Respectfully hand the test results to the supervisor and tell him to change whatever he wants
   e. Both b & c

151. The Activated Sludge Process can produce a high degree of treatment. Typically one could expect a _____ to _____ % BOD removal
   a. 50 to 75 %
   b. 75 to 85 %
   c. 80 to 90 %
   d. 90 to 99 %
   e. Properly maintained a AS Plant should produce 100 % BOD removal

152. The Activated Sludge plant has five (5) Critical Components. They are –
   a. Oxygen supply, Aeration tanks, Clarifiers, Return, & Waste
   b. Chlorinate, Oxygenate, Aerate, Sedimentation, & Waste
   c. Chlorinate, Oxygenate, Sedimentation, Clarification, & Return
   d. Oxygen supply, Aeration, Sedimentation, Clarification, & Waster
   e. Microorganisms, Oxygen, Aeration, Clarification, & Waste

153. The Activated Sludge process is an _____ process.
   a. Anaerobic
   b. Aerobic
   c. Facultative
   d. Zoogleal Mass
   e. Chemically Demanding

154. In the activated sludge process aeration tanks provide the space necessary to _____, _____, & _____ and return biological solids.
    a. Mix, Aerate, & Hold Influent
    b. Chlorinate, Aerate, & Settle
    c. Mix, Chlorinate, & Hold Influent
    d. Oxygenate, Settle, & Hold Effluent
    e. Mix, Aerate, & Hold Effluent

155. In the active sludge process, Utilization is the process of –
    a. Food digestion that changes food source into waste
    b. Food supply that changes food sources into waste
    c. Food supply that is changed into a liquid state for use
    d. Microorganisms getting rid of unusable food source
    e. None of the above

156. In the activated sludge process, Stabilization is –
    a. Food sources biologically converted to water, carbon dioxide, or cells
    b. Food sources that are changes into a liquid state for use
    c. The biological process whereby excess food supply is converted to waste.
    d. Wastes biologically converted to water, carbon dioxide, or new cells
    e. None of the above

157. In the activated sludge process, the _____ is called the heart of the activated sludge process.
    a. Contact Stabilization
    b. Mechanical Bar Screen & Grit Removal
    c. Clarifier
    d. Sludge Recycling
    e. Sludge Waste

158. In the activated sludge process, factors that will influence the operation of the final clarifier are –
    a. Loading, Solids applied, Settling, Thickness of solids, Rate of return & Wasting
    b. COD of solids applied, Sedimentation time, Thickness of sludge blanket, & Sludge wasting.
    c. Liquids applied, Settling time, Thickness of sludge, Recirculation, & Wasting
    d. Chlorine Contact time, Thickness of sludge, Rate of return & Wasting
    e. Time, Temperature, Loading, Settling, & Wasting

159. In the activated sludge process, the clarifier will concentrate return sludge and waste sludge about _____ to _____ times the solids concentration of the mixed liquor.
   a. One (1) to Three (3)
   b. One (1) to Four (4)
   c. Two (2) to Three (3)
   d. Two (2) to Four (4)
   e. Two (2) to Five (5)

160. In the activated sludge process, for the clarifier to do its job, the _____ must be retained long enough to allow _____ to settle and liquid to rise.
   a. Solids / Water
   b. Supernatant / Water
   c. Water / Solids
   d. Solids / Waste Sludge
   e. Solids / Floc

161. In the activated sludge process, as more mixed liquor flows to the clarifier, the thickness of the sludge blanket will –
   a. Increase as solids accumulate
   b. Decrease as solids are used
   c. Stay constant
   d. Require more recycling & waste to drying beds
   e. Mixed liquor flow has no effect on the sludge blanket

162. In the activated sludge process, biological solids from the bottom of the clarifier must be returned to the aeration basin for re-seed. This process is accomplished by –
   a. Hydraulic pump, Roller pump, Split case pumps, Screw pumps & Gravity flow.
   b. Air lift pumps, Centrifugal pumps, Diaphragm pumps, Screw pumps & Gravity flow.
   c. Pressure pump, Submersible pump, Centrifugal pump, Screw pump & Gravity flow.
   d. Vertical turbine pump, Centrifugal pump, Screw pump, & Gravity flow.
   e. The only way to move the solids without damaging microorganisms is Gravity flow.

163. In the activated sludge process, no sludge process will work properly without –
    a. Regular injection of fresh enzymes to keep the process functioning
    b. Regularly dewatering the sludge blanket
    c. Periodically lowering the telescoping valve to get rid of suspended particles.
    d. Aerating the solids that are being recycled
    e. Regular removal of excess solids

164. In the activated sludge process, Mass Balance refers to –
    a. Maintaining the balance between Return Sludge Flow, Return Sludge, Aeration tank volume, Mixed liquor suspended solids
    b. Maintaining the balance between Returned sludge flow and the total amount of chemicals used monthly
    c. Maintaining the balance between in-flow and sludge waste outflow
    d. Maintaining the microorganisms in the aeration basin
    e. Mass Balance has nothing to do with the activated sludge process

165. In the activated sludge process, the term F/M ratio is important because this refers to –
    a. Front loading to Middle processing ratio
    b. Frequent to Minimal Ratio
    c. Female micros to Male micros Ratio
    d. Food to Macro-organism Ratio
    e. Food to Microorganism Ratio

166. In the activated sludge process, the F/M Ratio is calculated by _____ the pounds of _____ by the pounds of MLVSS in the _____
    a. Dividing / Incoming BOD / aeration tank
    b. Dividing / Outgoing BOD / aeration tank
    c. Dividing / Outgoing BOD / Final Clarifier
    d. Multiplying / Incoming BOD / aeration tank
    e. Subtracting / Outgoing BOD / Final Clarifier

167. In the activated sludge process, the term Gould Sludge Age refers to –
    a. How long in minutes a pound of solids stays in the aerator
    b. How long in hours a pound of solids stays in the aerator
    c. How long in days a pound of solids stays in the aerator
    d. How long in total time sludge has been in the aeration chamber
    e. How long it takes for sludge to make it through all treatment processes

168. In the activated sludge process, Gould Sludge Age (GSA) is calculated by
    a. Subtracting the total pounds of TSS in the aerator by the pounds of TSS entering the aerator as raw
    b. Dividing the total pounds of TSS in the aerator by the pounds of TSS entering the aerator as raw
    c. Adding the total pounds of TSS in the aerator by the pounds of TSS entering the aerator as raw
    d. Dividing the BOD of treated sludge in aerator by the BOD of sludge entering the aerator as raw
    e. Taking a sample of the sludge in the aerator and estimating in days how long it will take to break down.

169. In the activated sludge process, the term Mean Cell Residence Time (MCRT) refers to –
    a. The longer a cell is kept in the aeration the more resistant it becomes
    b. The number of times that a living cell is circulated
    c. The amount of time the living cells are kept in the plant
    d. The amount of time that it takes to draw sludge to a drying bed
    e. The amount of time that it takes from raw sludge entering the plant to processed sludge being wasted to dewatering.

170. In the activated sludge process, daily observation of the aeration basin treatment processes are essential. The operator should pay close attention to –
    a. Temperature, Foaming, Color, & Inflow
    b. Inflow, Sludge floating, Recirculation, Chlorination, & Odors
    c. Flies, Snails, Foaming, Odors, & Effluent quality
    d. Surface turbulence, Foam, Odors, & Color
    e. The activated sludge plant requires very little maintenance or daily care

171. In the activated sludge process, daily observation of the final clarifier is also essential. The operator should pay close attention to –
    a. Temperature, Sludge blanket, Weir Flow, Clarifier Sloughing, & Outflow
    b. Surface scum, Sludge blanket, Weir flow, Rising solids, & Clarifier overflow
    c. Floating solids, Sludge going over the weir, Rising solids, & Clarifier overflow
    d. Microorganisms, Surface scum, Weir flow, Rising solids, & Clarifier Overflow
    e. Color, Odor, Foaming, Surface scum, Weir flow, Rising solids, & Outflow quality

172. In the activated sludge process, five (5) important control parameters are
    a. BOD level, Aerator solids level, Solids quality, Rate of returned sludge, & Wasting rate
    b. TSS levels of inflow, Aerator detention time, Solids quality, Rate of returned sludge, & Wasting rate
    c. Dissolved Oxygen level, Aerator solids level, Solids quality, Rate of returned sludge, & Wasting rate
    d. Total suspended solids, Total settled solids, Detention time, Sludge quality, amount of sludge sent to dewatering
    e. Floating solids, Dissolved Oxygen levels, Foaming, Odor, Weir Overflow

173. In the activated sludge process, Dissolved Oxygen levels throughout the aeration basins are measured using a portable DO Meter. The operator should keep DO levels between _____ and _____.
    a. 0.5 mg/L and 1.5 mg/L
    b. 1.0 mg/L and 3.0 mg/L
    c. 1.75 mg/L and 5.0 mg/L
    d. 2 mg/L and 4.0 mg/L
    e. 2.5mg/L and 5.0 mg/L

174. In the activated sludge process, "Classic Bulking" is a common problem typically caused by –
    a. Low density sludge
    b. High density sludge
    c. Low Detention Times
    d. Unexpected High BOD loading
    e. Dying microorganisms

175. In the activated sludge process, Sludge Rising differs from "Sludge Bulking" and "Sludge Rising" is typically associated –
   a. Carbon Dioxide trapped in the sludge blanket
   b. Nitrification – De-nitrification process
   c. Ammonia & Oxygen released from the sludge blanket
   d. Too much chlorine in the influent
   e. Dissolved Oxygen level in the final clarifier too high

176. In the activated sludge process, techniques used to reduce "Frothing & Foaming" typically include –
   a. Adjusting sludge age, Reducing the amount of air, Spraying the frothing area with water, Applying de-foaming agents
   b. Adjusting recycle rate, Increasing DO, Spraying the frothing area with Ammonia, & Wasting sludge
   c. Reducing sludge age, Increasing air, Increasing detention times, & wasting more of the sludge blanket
   d. Adjusting sludge age, Increasing DO, Return more processed sludge and mix with raw inflow
   e. Frothing only occurs in extreme cases and typically takes care of itself without operator interference

177. In the activated sludge process, floc is very important to the settling process. Floc is composed primarily of –
   a. Bacteria, Synthetic polymers, & Fungi
   b. Enzymes, Bacteria, Synthetic polymers & Fungi
   c. Microtopes, Protozoa, & Fungi
   d. Bacteria, Protozoa, Microscopic Animals, & Fungi
   e. Chemically injected after the grit chamber but prior to sedimentation

178. In the activated sludge plants, the operator will experience problems. Some of the common **Treatment** plant problems include –
   a. Poor plant design, Insufficient capacities, Age & Equipment failures, and inadequate preventative maintenance
   b. Detention basin too small, Final clarifier undersized, Inflow too great for treatment facilities & mechanical failures
   c. Insufficient capacity, Equipment failures, Design inadequacies, Poor maintenance, & Inflow rates exceed plant capacities
   d. Activated sludge is an old technology and should be replaced
   e. Operator training, Plants typically undersized, Too many moving parts so maintenance is always expensive, not expandable with population growths.

179. In the activated sludge plants the operator will experience problems. Some of the common **Influen**t problems include –
   a. Organic overloading, Pump stations have more capacity than plant, Inflow & Infiltration typically not considered in plant design so short cycle times are a problem, Shock loading, & Toxic substances
   b. Septic inflow, Organic overloading or under loading, Hydraulic overloading, Solids washout during storm inflow, Toxic substances, Shock loads, & Nutrient deficiencies
   c. Grease, chemicals, chlorine residual too high, BOD too low, need a constant supply & level of solids, Inflow & Infiltration & Nutrient deficiencies
   d. Inflow to a activated sludge plant has very little effect on operation but the operator should watch for illegal dumping of toxic materials
   e. No consistency, high flow & low flows create a surging in the plant which disrupts sludge sedimentation and causes bulking

180. In the activated sludge plants, the operator will experience problems. Some of the common **Operationa**l problems include –
   a. Sludge quality, Foaming, Improper operating techniques
   b. Sludge consistency, Mechanical failures, Microorganisms die off
   c. Odors, Foaming, Operators not understanding lab analysis or how to correct deficiencies
   d. Recycling pumps and lines are typically undersized causing septic sludge, foaming, Operator training & Understanding of the plant
   e. Both a & d

181. In the activated sludge plants, the operator will experience problems. Some of the common **Environmental** problems include –
   a. High temperatures, High pH, & Excessive algae growth
   b. Sunlight, Wind, temperatures & pH
   c. Temperature fluctuations , Odor discharges, & pH on effluent
   d. Low temperatures, Odors, System pH out of range, & sludge wasting
   e. Low temperatures, System pH out of range, & Excessive algae growth

182. In the activated sludge plants, to properly set the clarifier return rate the operator must know three things –
    a. Waste sludge rate, Detention time, & TSS
    b. Return activated sludge rate, Sludge blanket thickness, & the Solids concentration of the return flow
    c. Inflow BOD, Detention time, Outflow DO level
    d. Return activated sludge rate, DO level in the final clarifier, & Total Solids in the return flow
    e. Sludge flows downhill, Keep your mouth shut around filter flies, & The Boss is a grouchy SOB.

183. The typical sludge age for extended aeration plants is –
    a. 10 to 30 days
    b. 15 to 45 days
    c. 20 to 30 days
    d. 20 to 40 days
    e. 40 to 90 days

184. In the activated sludge plant, good quality sludge will settle _____ & _____ over _____ minute period.
    a. Gently & Uniformly over 20 to 30 minutes
    b. Gently & Uniformly over 15 to 20 minutes
    c. Rapidly and ragged over 10 to 15 minutes
    d. Rapidly and uniformly over 10 to 20 minutes
    e. Evenly and stacked over 15 to 20 minutes

185. In the activated sludge plant, old sludge quality will settle _____ & _____ over _____ minute period.
    a. Rapidly and ragged over 5 minutes
    b. Rapidly and ragged over 10 minutes
    c. Gently and ragged over 5 minutes
    d. Gently and ragged over 10 minutes
    e. Rapidly and uniformly over 5 minutes

186. In the activated sludge plant, there are five (5) important nitrogen transformation processes that occur by microorganisms. They are –
   a. Assumption, Nitrification, Denitrification, Nitrogen Fixation, & Neutralization
   b. Binding, Ammonification, Nitrification, Denitrification, Nitrogen Fixation
   c. Assumilation, Ammonification, Nitrification, Denitrification, & Nitrogen fixation
   d. Ammonification, Nitrification, Denitrification, Absorption, & Neutralization
   e. Assumilation, Absorption, Ammonification, Nitrification, & Fixation

187. _____ in the effluent from an activated sludge process is a pollutant and may create toxic conditions for aquatic life in the receiving stream
   a. Ammonia
   b. Nitrates
   c. Nitrides
   d. Nitrogen
   e. Alkalinity

188. Denitrification occurs in an activated sludge system when there is _____ to maintain the aerobic metabolism of the carbon stabilizing bacteria.
   a. Too high BOD in plant influent
   b. Too low BOD in plant influent
   c. Abundant Dissolved Oxygen
   d. Nitrite level is too low
   e. Insufficient Dissolved Oxygen

189. The lack of _____ triggers the facultative bacteria to change from aerobic to anaerobic.
   a. Compressed Oxygen
   b. Nitrogen Source
   c. Carbon Source
   d. Dissolved Oxygen
   e. Floc

190. In an activated sludge system, "Hydraulic Wash Out" is –
    a. When the downward movement of the water in the clarifier exceeds the upward settling velocity
    b. When the upward movement of the water in the clarifier exceeds the downward settling velocity
    c. When the operator spends too much time with a hose combating a foaming issue
    d. When the operator needs to change the hydraulic fluids in the equipment.
    e. When the upward movement of water in the clarifier brings with it large chunks of partially digested sludge.

191. In the activated sludge system, Hydraulic Wash Out can be controlled by
    a. Flow equalization, Additional clarifier capacity or inflow reduction
    b. Flow equalization, Additional clarifier capacity, or Longer recycle cycles
    c. Flow restrictions, Baffling in the clarifier, & Increasing Sludge Waste
    d. Service and planned maintenance to the plant
    e. Adding defoaming agents to the clarifier instead of water use

192. In the activated sludge system, if the operator observed Boiling action, Violent turbulence throughout the aeration tank surface, Large air bubbles ½ inch or greater, the operator would suspect –
    a. Not enough aeration and low Do therefore the operator should increase the air SCFM to get DO into the proper range
    b. Not enough settling time for the sludge to decompose therefore the operator should shorten the recycle time and extend settling time
    c. Over aeration resulting in high DO and or floc shearing therefore the operator should reduce the air SCFM to get DO into the proper range
    d. Too much sludge was drawn from the sludge blanket and in a few days the problem should correct itself
    e. Not enough sludge was drawn from the sludge blanket and more sludge should be sent to waste

193. In the activated sludge system if the operator observed uneven surface aeration, dead spots or inadequate mixing in some areas, the operator would suspect –
   a. Plugged diffusers
   b. Not enough air in the treatment process so increase air SCFM to retain more DO
   c. Inflow greater than treatment capacity of unit
   d. Someone has dumped toxic chemicals and microorganisms are dying
   e. The power outage to the plant is effecting the decomposition rate

194. In the activated sludge system, if the operator observes white thick billowing sudsy foam on the aeration tank, the operator would suspect –
   a. Low flow to the aeration tank and or not enough sludge wasting
   b. Low flow to the aeration tank and or excessive sludge wasting
   c. Overloaded aeration tank and or excessive sludge wasting
   d. Overloaded aeration tank and not enough sludge wasting
   e. Organics in the inflow have changed and the entire process will need to be recalibrated.

195. In the activated sludge system, if the operator observes excessive air being used with no apparent change in organic or hydraulic loading, the operator would suspect –
   a. Sludge blanket is turning over, Plugged air diffusers & High inorganic loading
   b. Leaks in the system piping, Plugged air diffusers & High organic loading
   c. Short circuit in detention basin, Plugged air diffusers & High organic loading
   d. Plugged air diffusers, High organic loading, & Time to waste sludge
   e. Temperature has dropped, plugged air diffusers, & too much sludge was wasted

196. During the month of July, the average daily flow of a wastewater treatment plant was 2,768,000 GPD, and the BOD was 417 mg/L. What is the total pounds of BOD contributed and what is the approximate population of the community served?
   a. 55 lbs / 3,256 population
   b. 962 lbs / 5,658 population
   c. 9,626 lbs. / 56,626 population
   d. 9,626 lbs / 163,650 population
   e. Not enough information to compute

197. As an operator of a wastewater plant you are treating a flow of 21 MGD, what is the flow in gallons per minute?
    a. 1,458
    b. 5,833
    c. 8,750
    d. 14,583
    e. 87,500

198. The maximum safe withdrawal rate for a 150 lb. chlorine cylinder is –
    a. 25 lbs
    b. 30 lbs
    c. 35 lbs
    d. 40 lbs
    e. Draw as much as needed or until the cylinder lines freeze

199. A dosage of 5 mg/L of chlorine is added to 2.0 MGD of wastewater. How many pounds of chlorine is added? (Hint: Chlorine= MG X 8.34 X dosage)
    a. 8.34 pounds
    b. 16.68 pounds
    c. 83.4 pounds
    d. 834 pounds
    e. None of the above

200. The BOD inflow of a wastewater treatment plant is 260 mg/L and the BOD of the outflow effluent is 9 mg/L. What is the percentage of BOD removed?
    (Hint: Inflow – Outflow X 100 divided by inflow)

    a. .96
    b. 15.0
    c. 28.8
    d. 96.5
    e. Not enough information to compute