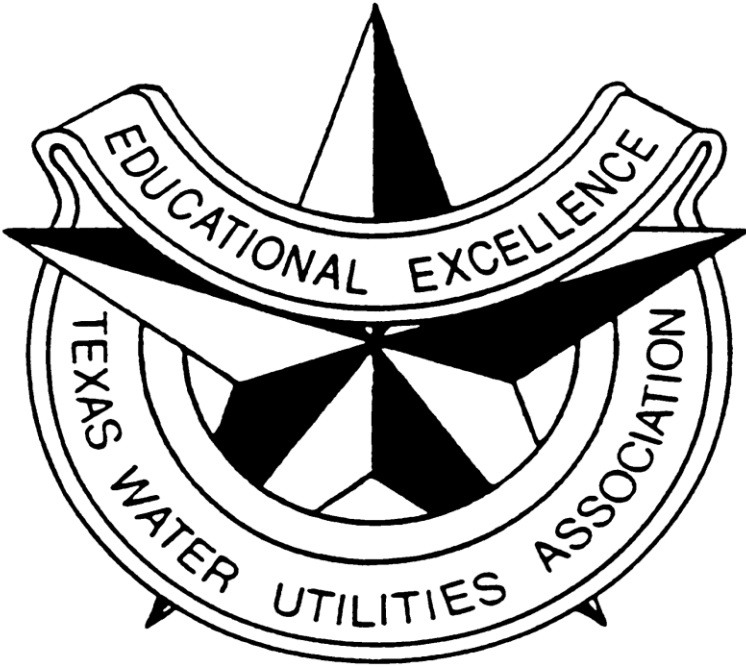


Texas Water Utilities Association

SURFACE 1 – Basic

Study Material



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.

TWUA staff has proofed the questions and answers. It is possible however 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.

These study questions **ARE NOT** actual TCEQ exam questions.

1. In Texas there are 207 “Major” reservoirs with a total capacity of 41.4 million acre feet – how many gallons of water does each acre foot equate to –
 - a. 1,760
 - b. 3,258
 - c. 5,280
 - d. 32,585
 - e. 325,851

2. According to the Texas Water Development Board there are ____ “Major” Texas Rivers and Basins –
 - a. 12
 - b. 13
 - c. 14
 - d. 15
 - e. 17

3. When referring to the Hydrologic Cycle, what is being discussed -
 - a. The movement of water through evaporation, precipitation, percolation, & runoff
 - b. The movement of water from one reservoir to another
 - c. The injection of rainwater into the aquifer for recharge
 - d. The use of reclaimed water for cooling towers
 - e. The movement of water through Photosynthesis - (Algae, Bacteria, & Organics)

4. The velocity of water and the ease in which the channel is eroded will influence the amount of _____ that must be removed in the treatment process
 - a. Calcium
 - b. Organics
 - c. Turbidity
 - d. Dissolved Solids
 - e. Dissolved Oxygen

5. Of the following which water source tends to be better quality and why –
 - a. Rivers – because of natural sedimentation, clarification, & bacterial removal
 - b. Reservoirs – because of natural sedimentation, clarification, & bacterial removal
 - c. Rivers – because moving or flowing water is not allowed to become stagnant
 - d. Streams – Nature's naturally way to process and clean water
 - e. None of the above

6. In Surface Water _____ and _____ can be traced to areas with decayed vegetation, high concentrations of limestone, and high organic matter –
 - a. Excessive iron & Hydrogen Sulfide
 - b. Taste & Odor
 - c. Trihalomethanes & Haloacetic Acids
 - d. Hardness & pH
 - e. Fluoride & Arsenic

7. Any water system that provides the public with water for human consumption or has 15 service connections or serves at least 25 individuals 60 days out of the year is a –
 - a. Private Water Supply System
 - b. Rural Water Supply
 - c. Public Water System
 - d. Special Municipal Control District
 - e. Water Conservation District

8. All surface water plants MUST have a licensed surface water operator on duty when the plant is in operation – the exceptions would be :
 - a. If the plant is within city limits and it is capable of remote shut down
 - b. If the plant has shutdown capabilities for no or low disinfectant & pH monitors,
 - c. If the plant has low flow demands, sufficient clear well storage, & remote monitoring
 - d. If the plant has continuous turbidity and disinfectant residual monitors , automatic shutdown capabilities, and alarms to summon operators
 - e. Currently no provision in the rules for unattended surface plants

9. _____ is a disease causing pathogen that lives in the intestines of animals and humans and is resistant to chlorine –
 - a. Pandemic Flu
 - b. Mumps, Measles, & Chicken Pox
 - c. Deoxyribonucleic acid
 - d. Pneumonia
 - e. Cryptosporidium

10. The following would be considered elements of a Pretreatment Program except –
 - a. Location of Intake
 - b. Screening
 - c. Destratification
 - d. Chemical Treatment of Reservoirs
 - e. All The Above

11. Intakes for surface water plants should be _____ feet from all boat ramps, docks, and piers, and should have a restricted zone of _____ radius around the intake.
- 500 feet and 100 feet restricted radius
 - 500 feet and 250 feet restricted radius
 - 750 feet and 100 feet restricted radius
 - 1000 feet and 200 feet restricted radius
 - 1000 feet and 50 feet restricted radius
12. Thermal Stratification causes the bottom layer of water in a reservoir to lose oxygen which leads to _____ decomposition of organic matter –
- Anaerobic
 - Aerobic
 - Facultative
 - Speculative
 - Only a theory supposedly tied to 100 year storms
13. When treating algae in reservoirs the chemical most commonly used is Copper Sulfate – if Copper Sulfate proves ineffective _____ is sometimes used –
- Sodium Hydroxide
 - Sodium Peroxide
 - Potassium Permanganate
 - Chlorine
 - Sodium Hypochlorite
14. The primary purpose of Sedimentation Basins is to _____ -
- Reduce the organic loading on treatment facilities
 - Reduce the silt loads on treatment facilities
 - Reduce pH of water going to treatment facilities
 - Increase holding capacities of treatment facilities
 - Reduce total hardness of water going to treatment facilities
15. _____ is the single MOST important aspect in the water treatment plant –
- Pretreatment
 - Sedimentation
 - Coagulation
 - Flocculation
 - Mixing

16. The single MOST important factor in coagulation effectiveness is –
- Temperature
 - Velocity of flow
 - pH
 - Turbidity
 - Dosage
17. Very fine suspended solids (low turbidity) will require –
- A decrease in coagulant dosage
 - A increase in coagulant dosage
 - The addition of Potassium Permanganate
 - The careful adjustment of pH
 - Reduced detention times
18. The chemical dosage should be such that No concentration over _____ NTU but preferably as low as _____ shall go to the filter
- 5 NTU & 2.5 NTU
 - 10 NTU & 5 NTU
 - 15 NTU & 5 NTU
 - 15 NTU & 10 NTU
 - None of the above
19. The MOST common pump used in the chemical dosing process is –
- Centrifugal pump
 - Peristaltic pump
 - Submersible pump
 - Diaphragm pump
 - Roller pump
20. 290.42(f)(1) (A) - Storage facilities at the treatment plant SHALL be adequate in size to store at least – (resupply ability could constitute more)
- 7 days of chemicals used
 - 15 days of chemicals used
 - 21 days of chemicals used
 - 45 days of chemicals used
 - 60 days of chemicals used

21. The single most widely used method to determine dosage and other parameters in Surface Water Treatment is –
- The Jar Test
 - The Detention Time Test
 - The Settleable Solids Test
 - The Dissolved Oxygen Test
 - The Coagulation Detention Time Test
22. The term “Zeta Potential” is defined as –
- A measure of the force facilitating the joining of particles
 - A measure of the force preventing particles from joining
 - A measure of the molecular weight of chemical added
 - A measure of the efficiency of the treatment plant
 - A measure of sludge generated by the addition of synthetic polymers
23. The Texas Hazard Communication Act of 1985 is also known as the –
- Americans with Disabilities Act
 - Texans Workplace Safety Act
 - Right to Know Law
 - Employee Equal Opportunity Law
 - Shoring and Trench Safety Law
24. The State of Texas regulatory authority is charged with enforcing the rules and regulations associated with Surface Water Treatment, this specific rule operators should be familiar with is known as -
- 30 TAC Chapter 26
 - 30 TAC Chapter 35
 - 30 TAC Chapter 283
 - 30 TAC Chapter 290
 - 30 TAC Chapter 217
25. The three MOST common flocculators found in surface water treatment are –
- Extended air, Paddle, & Propeller
 - Paddle, Propeller, & Turbine
 - Cascade, Propeller, & Turbine
 - Dry powder, Liquid feed, & Forced air
 - Hydraulic, Electric, & Hydrostatic

26. The best floc formation is made possible by -
- Correct stirring time, Correct stirring intensity, Uniform mixing, Correct detention time.
 - Correct polymers, Uniform mixing, & Correct pH of water
 - Correct flow pattern, Correct rotation of paddles, & Correct pH of water
 - Oversized basins, Correct usage of polymers, good pretreatment program
 - Correct stirring time, Correct stirring intensity, Uniform mixing, Correct turbidity of inflow.
27. In surface water treatment detention times are important so to be able to calculate detention time the operator would -
- Multiply the basin capacity in gallons by the flow into the basin in gpm
 - Divide the basin capacity in gallons by the flow into the basin in gpm
 - Take the pump gpm subtract head loss and divide by basin capacity in gallons
 - Multiply the basin capacity in gallons by 8.34 and divide by basin capacity in gallons
 - Divide the basin capacity in gallons by 8.34 and multiply by the flow into the basin
28. MOST of turbidity in surface water is removed in which process or phase of water treatment
- Mixing
 - Flocculation
 - Sedimentation
 - Filtration
 - Clear Wells
29. Sludge removal in the surface water treatment process is important because build up will cause -
- Short circuiting, Shortened filter runs, & reformation of floc
 - Overloading of mechanical rakes, Increased need for surface skimming, Increase in disinfection requirements
 - Decrease in pH, Decrease in Dissolved Oxygen, Increase in pathogens
 - Increase in pH, Decrease in Dissolved Oxygen, Pin floc going into final clarifier
 - Taste & Odor issues, Decreased detention times, Gas formation may re-suspend solids
30. One of the MOST important factors in filter design is -
- Properly sized under drains and Flow
 - Sand particle size and Filter bed depth
 - Quality of source water and Algae control
 - Source water protection and Adequate on site storage for backwash
 - Disinfection equipment and lab testing equipment

31. The most common factors influencing sedimentation are –
- pH, temperature, Specific gravity, Detention time, turbidity, Velocity & Short Circuiting
 - Detention Time, Temperature, Specific gravity, Velocity & Short Circuiting
 - Floc size & shape, Temperature, Specific gravity, Detention time, Velocity, & Short Circuiting
 - Floc formation, pH, Turbidity, Temperature, Flow velocity, & Short Circuiting
 - Correct polymer dosage, Detention time, Specific gravity, Velocity, & Short Circuiting
32. According to 30 TAC 290.42(d)(1) - all surface treatment process SHALL be designed to achieve at least a _____ log removal of Cryptosporidium, a _____ log removal or inactivation of Giardia and a _____ log removal or inactivation of viruses before the water is supplied to any customer
- 1 Log Cryptosporidium, 2 Log Giardia, and 3 Log Viruses
 - 2 Log Cryptosporidium, 3 Log Giardia, and 4 Log Viruses
 - 2 Log Cryptosporidium, 4 Log Giardia, and 6 Log Viruses
 - 1 Log Cryptosporidium, 3 Log Giardia, and 3 Log Viruses
 - 3 Log Cryptosporidium, 3 Log Giardia, and 5 Log Viruses
33. Loss of Head is the difficulty water has to pass through the filter sand. TCEQ requires filter backwash when _____ or effluent NTU reaches _____.
- Loss of Head is 4 to 8 feet and 0.5 NTU
 - Loss of Head is 6 to 10 feet and 1.0 NTU
 - Loss of Head is 8 to 12 feet and 1.5 NTU
 - Flow through the sand media is reduced by 50 % or 1.25 NTU
 - The Operator identifies Floc and Turbidity in the final clarifier
34. The rate of backflow shall not be less than _____ of vertical rise and usually not more than _____ of vertical rise
- Two feet and Three feet
 - 24 inches and 48 inches
 - 20 inches and 35 inches
 - 30 inches and 48 inches
 - Three feet and Five feet

35. In a sand filter “Mud Balls” are primarily caused by –
- Poor Filter design, Short Backwash cycles, Long Filter runs
 - Improper Sand Media, Too much sand in the filter, Too much polymer used
 - Hard water, High Turbidity, Not properly adjusting influent pH
 - Poor Quality Runoff from water shed, Short detention times, Short Circuiting
 - Poor preparation, Faulty Application of Wash Water, & Adherence of filtered material to sand
36. Treatment facilities serving less than _____ people MUST monitor the Combined Effluent turbidity at least _____ per day –
- 250 people & Once per day
 - 500 people & Once per day
 - 500 people & Twice per day
 - 750 people & Once per day
 - 750 people & Twice per day
37. A system that exceeds _____ in the combined final effluent SHALL notify the public drinking water program by next business day and all water customers of an Acute Violation because this will require a boil water notice.
- 2 NTU
 - 3 NTU
 - 4 NTU
 - 5 NTU
 - 10 NTU
38. _____, _____, _____, _____, _____ are all waterborne diseases that live in the intestinal track of people and animals –
- Typhoid, Paratyphoid, Cholera, Legionaires Disease, Giardiasis, & Cryptosporidiosis
 - Aids, Ulcers, Cholera, Legionaires Disease, Giardiasis, & Cryptosporidiosis
 - Hepatitis C, Tetanus, Cholera, Legionaires Disease, Giardiasis, & Cryptosporidiosis
 - Anemia, Hepatitis B, Cholera, Legionaires Disease, Giardiasis, & Cryptosporidiosis
 - Carcinoma, Psoriasis, Cholera, Legionaires Disease, Giardiasis, & Cryptosporidiosis
39. One of the MOST IMPORTANT responsibilities of the operator is –
- Daily Testing of disinfection levels in the Distribution System
 - Daily Testing of disinfection levels in the Storage Facilities
 - Collecting and submitting of water samples for testing
 - Collecting and submitting of water for Chemical Analysis
 - Collecting of representative samples from water source to verify quality

40. Treatment facilities serving more than _____ people MUST monitor turbidity at least _____
- 2,500 people & Have continuous on-line turbidimeter & recorder
 - 5,000 people & At least every 15 minutes
 - 7,500 people & Have continuous on-line turbidimeter & recorder
 - 10,000 people & Have continuous on-line turbidimeter & recorder
 - 10,000 people & At least every 15 minutes
41. The chemicals currently used to disinfect drinking water include -
- Bromine, Chlorine (& Chlorine Compounds) Chlorine Dioxide, Iodine, & Ozone
 - Chlorine (& Chlorine Compounds) Chlorine Dioxide, Ozone, & Silver Nitrate
 - Chlorine (& Chlorine Compounds) Chlorine Dioxide, Ozone, & Silver Nitrate
 - Bromine, Chlorine (Chlorine Compounds) Chlorine Dioxide, Ozone & Copper Sulfate
 - Chlorine (& Chlorine Compounds) Chlorine Dioxide, Potassium Permanganate & Ozone
42. When adding disinfection, Demand plus Desired Residual is equal to -
- Chlorine Demand
 - Breakpoint Chlorination
 - Chlorine Dosage
 - Desired Saturation
 - Minimum Contact Time
43. TAC 30-290.42(d)(11)(B0(i) - The design capacity of gravity rapid sand filters Shall not exceed a maximum filtration rate of -
- 2.0 gallons /per sq. ft /per minute
 - 2.5 gallons / per sq. ft / per minute
 - 4.0 gallons / per sq. ft / per minute
 - 5.0 gallons / per sq. ft / per minute
 - 6.0 gallons / per sq. ft. / per minute
44. TAC 30 - 290.43(d)(11)(f)(i) - When backwashing a filter only _____ Shall be used to backwash -
- Water with a chlorine residual of 0.05 or more
 - Water that has been filtered & disinfected
 - Water that has been tested for Nitrates
 - Water that has the proper pH
 - Water from the Chlorine Contact Basin

45. TAC 30 - 290.42(d)(15)(C) - All surface water treatment facilities SHALL be provided with equipment for making at least the following determinations -
- pH, Disinfectant residual, Alkalinity, Turbidity, Jar Test, Fluoride
 - ph, Disinfectant residual, Turbidity, Jar Test, Nitrites, Nitrates
 - pH, Dissolved Oxygen, Disinfectant residual, Alkalinity, Turbidity, Jar Test
 - pH, Temperature, Disinfectant residual, Alkalinity, Turbidity, Jar Test
 - Ph, Temperature, Disinfectant residual, Alkalinity, Jar Test, Sludge judge
46. TAC 30 - 290.42(d)(11)(B)(ii) - The design capacity of high rate gravity sand filters Shall not exceed a maximum filtration rate of -
- 2.0 gallons /per sq. ft /per minute
 - 2.5 gallons / per sq. ft / per minute
 - 4.0 gallons / per sq. ft / per minute
 - 5.0 gallons / per sq. ft / per minute
 - 6.0 gallons / per sq. ft. / per minute
47. TAC 30 - 290.42(e)(3)(A) - All disinfection equipment Shall have a capacity of at least _____ % greater than highest expected dosage -
- 20 %
 - 25 %
 - 50 %
 - 75 %
 - 100 %
48. TAC 30 - 290.45(b)(2)(A)&(B) - Surface water suppliers MUST have a raw water pump capacity of _____ gpm per connection and treatment plant capacity of _____ gpm per connection under normal design flow -
- 0.3 gpm & 0.3 gpm
 - 0.6 gpm & 0.6 gpm
 - 0.6 gpm & 0.3 gpm
 - 1.6 gpm & 0.6 gpm
 - 2.0 gpm & 2.0 gpm
49. Without applicable college credit to qualify for a "C" Surface Water License the worker / operator should have _____, & the license is valid for _____
- H.S. Grad or GED, 1 years experience, 40 hours training / 3 years
 - H.S. Grad or GED, 2 years experience, 64 hours training / 3 years
 - H.S. Grad or GED, 3 years experience, 20 hours training / 2 years
 - H.S. Grad or GED, 3 years experience, 100 hours training / 3 years
 - H.S. Grad or GED, 2 years experience, 120 hours training / 3 years

50. TAC 30 - 290.46(C) – Public Water Systems using Chlorine Dioxide shall place the operation of the chlorine dioxide under the direct supervision of a licensed operator who has a Class _____ or higher license.
- D
 - C
 - B
 - Class C Distribution
 - Class B Distribution
51. You have a sedimentation basin that measures 34 feet X 27 feet X 8 deep – The flow into this basin is 400 gpm – what is the detention time in hours –
- 1.37 hours
 - 1.83 hours
 - 2.28 hours
 - 5.49 hours
 - Not enough information to compute
52. Your final clear well at the treatment plant measures 21 feet in diameter and is 24 feet deep – how many gallon of water will this device hold -
- 19,792
 - 62,147
 - 79,168
 - 248,588
 - Not enough information to compute
53. Your plant has a clarifier that is 60 feet in diameter and 16 feet deep – the plant has a flow of 1.25 MGD what is the detention time in hours –
- 2.0 hours
 - 3.0 hours
 - 6.5 hours
 - 7.5 hours
54. Your Treatment Plant has a filter that is 24 feet X 14 feet X 8 feet deep – This filter is designed to produce 5 gpm/sq. ft how many gallons per minute will this structure produce –
- 1,224 gpm
 - 1,256 gpm
 - 1,344 gpm
 - 1,680 gpm
 - Not enough information to compute

55. At your plant there is a 500,000 gallon ground storage tank. The flow out of this tank today is 1,460 gpm and the plant is currently producing 1,000 gpm. Assuming the tank is full and flows remain constant – approximately how long will it take to empty this ground storage tank in hours.
- 6 hours
 - 8 hours
 - 10 hours
 - 18 hours
 - 28 hours
56. A study indicates that the flow in your sedimentation basin is 181 feet in 5 hours. What is the flow velocity in feet per second – (hint: you have to convert hrs.)
- .010 ft /sec
 - .603 ft / sec
 - 1.06 ft / sec
 - 1.65 ft / sec
 - Not enough information to compute
57. At your treatment facilities you know that you fed 16 pounds of 100 % chlorine in the past 24 hours. You also know that you treated 1.3 MGD – What is the chlorine dosage -
- 0.48 mg/L
 - 1.48 mg/L
 - 14.8 mg/L
 - 24.4 mg/L
 - Not enough information to compute
58. One of your Groundwater Storage Tanks has a capacity of 250,000 gallons and it was recently re-coated on the interior. Before placing this tank back in service it must be disinfected with 50mg/L chlorine for 24 hours. How many pounds of 65 % HTH would need to be added to this structure to comply with TCEQ rules and regulations –
- 32 lbs. HTH
 - 104 lbs. HTH
 - 130 lbs. HTH
 - 160 lbs. HTH
 - Not enough information to compute
- (hint: $\text{mgd} \times 8.34 \times \text{desired dosage} = \text{lbs divided by ?}$)

59. A surface water treatment plant is using Alum at the rate of 7 mg/L. The plant treats 1,250,000 gallons per day – How many pounds of Alum will be used each day & what is the minimum amount in total pounds that must be kept on hand ?
- a. 10.4 Lbs. per day & 156 Lbs. on hand
 - b. 58.3 Lbs. per day & 875 Lbs. on hand
 - c. 73 Lbs per day & 1095 Lbs on hand
 - d. 107 Lbs. per day & 1605 Lbs. on hand
 - e. Not enough information to compute
60. A filter is 21 feet long and 16 feet wide and is backwashed at the rate of 5,800 gpm – How many inches per minute does the wash water rise ?
- a. 17.4
 - b. 20.7
 - c. 23.0
 - d. 27.6
 - e. Not enough information to compute