

Water Operator

Study Material

Ground Water



TWUA

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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.

The following **ARE NOT Actual Test Questions.**
Study Guide For Ground Water Production

1. The transfer or exchange of water between the earth and atmosphere is best described as:
 - a. Recycle Concept
 - b. Hydrologic Cycle
 - c. Anticipated Use Cycle
 - d. Spent Water Recovery Cycle
 - e. Geological Cycle

2. A porous water bearing geological formation below the surface of the earth is known as a:
 - a. Hydrological Marvel
 - b. Seismic Anomaly
 - c. Aquifer
 - d. Ecological Hydrology
 - e. Environmental Abnormality

3. The level to which groundwater rises beneath the earth's surface is known as the:
 - a. Cone of Depression
 - b. Production Draw Down
 - c. The Marvel of Natural Flowing Springs
 - d. Recharge Cycle
 - e. Water Table

4. Ground Water in Texas is regulated through the:
 - a. Texas Water Use & Contingency Plan of 1947
 - b. The Clean Water Act of 1980
 - c. Environmental Protection Agency (EPA)
 - d. Rule of Eminent Domain
 - e. Rule of Capture & Ground Water Conservation Districts

5. The state agency charged with the regulation of public water supplies in Texas is the:
 - a. Texas Water Development Board
 - b. Texas Commission on Environmental Quality
 - c. Texas Department of Health and Human Services
 - d. Texas Railroad Commission
 - e. Texas Department of Wildlife and Environmental Services

6. The MOST important federal law that impacts the water utility industry is the:
 - a. Safe Drinking Water Act of 1974
 - b. Environmental Compliance Act of 1981
 - c. Environmental Pollution Reduction and Recovery Act of 1973
 - d. Ecological Impact Assessment and Reform Act of 2000
 - e. None of the above

7. In 1997 Texas Senate Bill 1 created an:
 - a. Exclusive Right of Capture for Home Owners
 - b. Comprehensive State Water Plan
 - c. 100 Year Water Assurance Plan
 - d. Detailed Funding Mechanism for Infrastructure Replacement
 - e. Requirement for Water Conservation & Backflow Protection

8. A Public Water System is one that:
 - a. Serves at least 15 people and at least 30 days of the year
 - b. Serves at least 50 people and comes from a single water source
 - c. Sells water for human consumption; no size or usage minimum
 - d. Serves at least 25 people daily at least 60 days of the year
 - e. All of the above

9. Example of a Non - Community Water System are:
 - a. Schools, Hospitals, Nursing Homes
 - b. Prisons, Jails, Private Clubs
 - c. Hotels, Service Stations, RV sites
 - d. Manufacturing Facilities, Commercial Food Processing, Meat Packers, Breweries
 - e. Apartment Complexes over 50 units, Restaurants, & Anywhere Alcohol is sold

10. The MOST important factors affecting aquifer yield are:
 - a. Geographical Location within The State & Rate Of Recharge
 - b. Gravity and Mineral Content Of Source Water
 - c. Molecular Density & Temperature Of water
 - d. Thickness of Aquifer and Permeability of Media
 - e. Size of Well Casing & Horsepower of Motor Driving the Pump

11. When groundwater is withdrawn in quantities large enough to cause clay layers within the aquifer to compact permanently; this concept is referred to as:
 - a. Well Yield
 - b. Subsidence
 - c. Recharge Impedance
 - d. Critical Pumping Capacity
 - e. Well Drawdown

12. Your primary ground water well is responsible for 1,330,000 gallons of production per day on the average. What is the approximate production in gallons per minute for this well?
 - a. 923 GPM
 - b. 1,440 GPM
 - c. 1,760 GPM
 - d. 2,216 GPM
 - e. 5,958 GPM

13. The beginning reading of a Master Meter reads 10,324,844 and seven days later this same meter reads 32,017,998. What is the Total Gallons Pumped and What is the Daily Average?
 - a. 20,631,688 Gallons Pumped / 2,947,384 Average Gallons Per Day
 - b. 21,693,154 Gallons Pumped / 3,099,022 Average Gallons Per Day
 - c. 27,327,238 Gallons Pumped / 3,903,961 Average Gallons Per Day
 - d. 42,324,842 Gallons Pumped / 6,048,977 Average Gallons Per Day
 - e. Not enough information to correctly calculate

14. Water within an aquifer that rises above the confining layer can reach the ground surface naturally and free flow. This is referred to as an:
 - a. Spring Well
 - b. Drilled Well
 - c. Stripper Well
 - d. Artesian Well
 - e. Ground Water Well Under The Influence

15. No ground water well shall be located within _____ feet of a tile or concrete sewage line, septic tank, storm sewer or cemetery.
 - a. 25 feet
 - b. 50 feet
 - c. 100 feet
 - d. 150 feet
 - e. 500 feet

16. No ground water well shall be located within _____ feet of a sewage treatment plant
- 25 feet
 - 50 feet
 - 100 feet
 - 150 feet
 - 500 feet
17. No ground water well shall be located within _____ feet of a animal feed lot and livestock shall not be allowed within ____ feet of a water supply well.
- 50 / 50
 - 100 / 100
 - 150 / 50
 - 250 / 150
 - 500 / 50
18. Underground fuel storage tanks shall not be allowed within _____ feet of a water supply well.
- 50 feet
 - 100 feet
 - 250 feet
 - 300 feet
 - 500 feet
19. A mechanism or requirement that requires no pollution hazards or facilities than might create a danger of pollution to water produced by a water supply well; is referred to as:
- A Local Zoning Law
 - A Sanitary Control Easement
 - A Municipal Ordinance
 - A Rule of TAC Chapter 21
 - A Texas Supreme Court Ruling
20. The most common type of well used in municipal applications is:
- Dug Well
 - Bored Well
 - Drilled
 - Driven
 - Jetted

21. In the process of developing a water well the well casing is used to:
- Protect the Hole From Collapse and Contamination
 - Screen the Sand and Gravel from Water Production
 - Mount the Pump
 - Mount the Motor
 - Establish Pumping Levels When Placed Into Production
22. By rule the well casing is required to extend a minimum of _____ inches above the natural ground surface.
- 12 inches
 - 14 inches
 - 18 inches
 - 24 inches
 - 36 inches
23. By rule the space between the casing and bore hole must be:
- Gravel Packet
 - Filled By Drillers Mud
 - Filled By Epoxy and Resin
 - Filled By Pressure Cement
 - Used As Air Gap So Well Can "Breath"
24. Well screens are installed in the well development process and keep _____ from entering the pump.
- Insects
 - Sand
 - Aquatic Contamination
 - Both B & C
 - All The Above
25. The level water stands in a well when the pump is off, is referred to as:
- Drawdown
 - Static Water Level
 - Pumping Water Level
 - Radius of Influence
 - Specific Capacity

26. The difference in feet, between the Static Water Level and Pumping Level is referred to as:
- Drawdown
 - Static Water Level
 - Pumping Water Level
 - Radius of Influence
 - Specific Capacity
27. Upon completion of a well or after existing wells have been pulled for maintenance TCEQ requires:
- The Structure Be Inspected By A Professional Engineer
 - The Work Be Performed By A Licensed, Registered, & Bonded Company
 - The Structure Be Properly Disinfected
 - Both A & C
 - Both B & C
28. State rules require water production, storage, and treatment facilities to be fenced with an intruder resistant fence. This fence shall be a minimum of _____ feet high with _____ strands of barbed wire at a 45 degree angle. In lieu of barbed wire the fence must be _____ feet high or higher.
- 5 feet high / 2 strands / 7 feet high
 - 6 feet high / 2 strands / 7 feet high
 - 6 feet high / 3 strands / 8 feet high
 - 7 feet high / 1 strand / 8 feet high
 - 8 feet high / 2 strands / 9 feet high
29. The term "pathogen" means:
- Disease Causing
 - Viral Indicators
 - Bacterial Indicators
 - Microorganism Contamination
 - Fecal Cyst Indicators

30. _____ live in the intestines of humans and warm blooded animals and _____ live primarily in soil.
- Non-Fecal Coliform Bacteria / Fecal Coliform Bacteria
 - Fecal Coliform Bacteria / Non-Fecal Coliform Bacteria
 - Viral Coliform Bacteria / Non-Viral Coliform Bacteria
 - Organic Bacteria / Inorganic Bacteria
 - Fecal Coliform Bacteria / Viral Coliform Bacteria
31. _____ solids are those which can be removed by filtration.
- Total
 - Dissolved
 - Suspended
 - Combined
 - inert
32. _____ solids are those which cannot be removed by filtration.
- Total
 - Dissolved
 - Suspended
 - Combined
 - inert
33. Hardness in water is typically caused by the presence of:
- Turbidity
 - Organics
 - Zinc and Copper
 - Sodium and Potassium
 - Calcium and Magnesium
34. Taste and Odor issues in groundwater are typically caused by:
- High pH
 - Low pH
 - Hydrogen Sulfide
 - Carbon Dioxide
 - Zinc and Copper

35. Two waterborne protozoa that have the ability to form a protective cyst thereby making them resistant to common chlorine dosages are:
- Giardia and Cryptosporidium
 - Typhoid and Paratyphoid
 - Cholera and Dysentery
 - Hepatitis and Poliomyelitis
 - None of the above
36. The process that involves mixing of water with air in a chamber or tower to remove certain contaminations is known as:
- Sedimentation
 - Filtration
 - Coagulation
 - Aeration
 - Absorption
37. Aeration removes gases such as:
- Methane, Hydrogen Sulfide, Carbon Dioxide, & Radon
 - Petroleum, Hydrogen Sulfide, Carbon Dioxide, & Radon
 - Methane, Hydrogen Peroxide, Carbon Dioxide, & Radon
 - Methane, Hydrogen Sulfide, Carbon Monoxide, & Radon
 - Methane, Hydrogen Sulfide, Carbon Dioxide, & Xenon
38. Oxidation in water treatment typically removes:
- Taste, Odor, & Color
 - Turbidity, Dissolved Solids, & Color
 - Dissolved Solids, Taste & Odor
 - Taste, Odor, & Bicarbonates
 - Taste, Odor, & Inorganics
39. Common oxidizing Chemicals are Chlorine, Chlorine Dioxide, Potassium Permanganate and Ozone and of these chemicals _____ is the most powerful.
- Chlorine
 - Chlorine Dioxide
 - Potassium Permanganate
 - Ozone
 - All are equal in strength

40. Hard Water may be softened by the use of _____ or _____.
- Chlorine or Ozone
 - Calcium or Magnesium
 - Lime or Lime & Soda Ash
 - Potassium or Ash
 - None of the above
41. The removal of suspended solids involves the following steps in the correct order:
- Flocculation, Coagulation, Sedimentation, & Filtration
 - Coagulation, Flocculation, Sedimentation, & Filtration
 - Flocculation, Sedimentation, Coagulation & Filtration
 - Filtration, Sedimentation, Flocculation, & Coagulation
 - Order makes no difference as long as all steps are performed
42. Scale on the inside of water pipes is primarily caused by:
- Manganese
 - Sodium
 - Calcium Carbonate
 - Sulfides
 - Low pH
43. Karst aquifers are formed in formations such as limestone and allows ground water to:
- Move slowly through and provides prolonged filtration
 - Moves rapidly through and provides little natural filtration
 - Be stored in natural underground caverns for future use
 - Be filtered of impurities without increasing mineral content
 - Be filtered of impurities but it increases mineral content
44. In most surface water one will find the following indicators:
- Chemicals, Petroleum byproducts, Algae, Bacteria
 - Protozoa, Nematodes, Nitrates, Algae Petroleum
 - Turbidity, Organics, Chemicals, Algae, Magnesium
 - Protozoa, Nematodes, Diatoms, Algae, Bacteria
 - Both B & C

45. Coliform Bacteria present in water indicates:
- Fecal Contamination
 - Water Source Probably Surface
 - Water Source Probably Ground Water
 - Water Safe For Human Consumption
 - Water Has Too Much Chlorine
46. In the far reaches of the Distribution System there must be a minimum free chlorine residual of:
- 0.2 mg/L or 0.5 mg/L Chloramine
 - 2.0 mg/L or 5.0 mg/L Chloramine
 - 0.2 mg/L or 4.0 mg/L Chloramine
 - 0.5 mg/L or 1.0 mg/L Chloramine
 - 4.0 mg/L or 5.0 mg/L Chloramine
47. Ground Water Under The Influence (GUI) must meet disinfection that achieves at least _____ log removal of cryptosporidium & _____ log removal or inactivation of Giardia and a _____ log removal of viruses:
- 50% (2 log) / 95% (3 log) / 99% (4 log)
 - 76 % (2log) / 99% (4 log) / 99.9% (5log)
 - 99.0 % (2-log) / 99.9% (3 log) / 99.99% (4 log)
 - 98 % (2log) / 99 % (3 log) / 99.9 (4 log)
 - 99.999% (4 log) / 99.999% (4 log) / 99.999 (5 log)
48. The maximum residual level for Chlorine Dioxide is _____ and daily monitoring is the same as chlorine.
- 0.2 mg/L
 - 0.4 mg/L
 - 0.5 mg/L
 - 0.6 mg/L
 - 0.8 mg/L
49. Ammonia is present in most surface water and is added at surface water and GUI plants. The ammonia reacts with hypochlorous acid to form:
- Chlorine
 - Chloramines
 - Ozone
 - Chlorine Dioxide
 - None of the above

50. A major advantage to using Chlorine Dioxide as a disinfectant is:
- Does not combine with ammonia or form THM's or HAA's
 - Does not cost as much as chlorine to produce
 - It is not water soluble and remains in warm water
 - Does not have explosive properties
 - Both B & D
51. The amount of chlorine used to reduce all bacteria and viruses is known as _____. Once this is met, any additional chlorine added will produce a _____. These two added together will equal _____.
- Demand / Dosage / Residual
 - Dosage / Demand / Residual
 - Residual / Dosage / Demand
 - Demand / Residual / Dosage
 - Residual / Demand / Dosage
52. All Trihalomethane(s) THM's are suspected carcinogens (cancer causing). The Maximum Contaminate Level (MCL) for total THM's is:
- 0.0080 mg/L
 - 0.080 mg/L
 - 0.80 mg/L
 - 0.800 mg/L
 - No MCL has been established
53. Another regulated byproduct is Haloacetic Acids (HAA5) and it is a suspected carcinogen (cancer causing). The Maximum Contaminate Level (MCL) for HAA5 is:
- 0.0060 mg/L
 - 0.600 mg/L
 - 0.060 mg/L
 - 0.60 mg/L
 - No MCL has been established
54. Iron, Manganese, Nitrates, and Hydrogen Sulfide are common _____ that react with chlorine.
- Organics
 - Inorganics
 - Turbidity
 - Settleable Solids
 - Volatile Solids

55. A _____ percent ammonia solution is required for testing for chlorine leaks.
- 0.05 %
 - 0.10%
 - 0.25 %
 - 0.50 %
 - 0.75 %
56. Disinfection equipment shall have a capacity of at least _____ % greater than the highest expected dosage:
- 15 %
 - 25 %
 - 50 %
 - 75 %
 - 80 %
57. To avoid Trihalomethane (THM) formation one should add ammonia _____ chlorine at appropriate rate to produce chloramines
- Before
 - After
 - With
 - In lieu of
 - None of the above
58. If you enter a pump structure and hear a noise that sounds like there is gravel going through the pump or a distinctive pinging sounds; this pump is:
- In need of bearings
 - In need of packing
 - Experiencing Low Voltage
 - Most likely single phasing
 - Cavitating
59. Water Hammer is pressure surges typically caused by:
- Abrupt stopping of a pump or rapid closing of a valve
 - Improper pump rotation or malfunctioning valves
 - Pressure too high on discharge & improper sized check valve
 - Malfunctioning Air Relief Valve & Partially closed gate valve
 - All the above

60. The MOST common type of pump that you will find in the water system is:
- Positive Displacement
 - Submersible
 - Centrifugal
 - Gear Reduction
 - Diaphragm
61. _____ predict how a pump will perform with changes in head, rpm, impeller speed, impeller diameter, pump efficiency and suction head.
- Pump Curves
 - Manufacturers
 - System Dynamics
 - Elevations
 - All the above
62. Most electric motors that you come in contact with are known as:
- Hamster Cage Induction
 - DC Initiation
 - Synchronous
 - Squirrel Cage Induction
 - None of the above
63. A pump and motor combination that is found at the bottom of a well and pushes the water to the surface is known as:
- Hollow shaft turbine
 - Split case centrifugal
 - Submersible
 - Diaphragm
 - Air Induction
64. The purpose of a safety program in the workplace is:
- Prevent Accidents
 - Begin with a proper state of mind
 - Change the mindset of the worker
 - Trains and educates the worker
 - All the above

65. Personal Protective Equipment (PPE) is:
- Anything attached to your body for protection
 - Suggested by OSHA but not required
 - Gloves, Face Shields, Hearing Protection, Hard Hats,
 - Not typically needed in most utility provider workplaces
 - Both A & C
66. For information concerning chemicals in the workplace you would check:
- The Material Safety Data Sheet (MSDS)
 - The Substance Safety Data Sheet (SSDS)
 - The OSHA Daily Use Guide (ODUG)
 - The Texas One Call Society (TOCS)
 - Both A & D
67. If you know the chlorine dosage of your water is 4.6 mg/L and the residual at the far reaches of the distribution system is 0.3 - What is the demand?
- 1.6 mg/L
 - 4.3 mg/L
 - 4.9 mg/L
 - 7.6 mg/L
 - Not enough information to calculate
68. If you are instructed to install a main line extension – the ditch will be 600 feet long, it is 2 feet wide and 4 feet deep? How many cubic yards of soil will the excavated?
- 17
 - 129
 - 178
 - 480
 - Not enough information to calculate
69. If you have a ground storage tank that has a 250,000 gallon capacity and you have a well pumping into this tank that pumps 450 gallons per minute. How long in hours will it take to fill the tank if it is completely empty?
- 7.25 hours
 - 8.25 hours
 - 9.25 hours
 - 10.25 hours
 - 12.25 hours

70. In a groundwater system according to the well drillers report the hole was drilled 338 feet deep - the static level of water in the well is 108 feet - the pumping level is 171 feet. What is the drawdown?
- 179 feet
 - 279 feet
 - 63 feet
 - 167 feet
71. You have a ground storage tank that has a diameter of 50 feet and it is 32 feet high - what is the total capacity of this tank in gallons?
- 14,679 gallons
 - 62,800 gallons
 - 146,790 gallons
 - 469,744 gallons
 - 4,697,440 gallons
72. You have 6,300 feet of 8 inch PVC pipe - how many gallons of water will this water pipe hold?
- 16,114 gallons
 - 23,675 gallons
 - 64,455 gallons
 - 84,250 gallons
 - 94,700 gallons
73. Convert 681,000 gallons to Million Gallons Per Day (MGD)
- .34 MGD
 - .68 MGD
 - 6.80 MGD
 - 68.88 MGD
 - Not enough information to calculate
74. An overhead storage tank holds 150,000 gallons of water - how much total water weight is suspended in air? How many tons would this be?
- 1,251,000 pounds / 62 tons
 - 1,251,000 pounds / 625 tons
 - 12,510,000 pounds / 6,255 tons
 - 125,100,000 pounds / 62,550 tons

75. At the base of an elevated storage tank the PSI gauge reads 53 PSI – how many feet above this gauge is the highest water level?
- a. 22.9
 - b. 61.0
 - c. 122
 - d. 229
 - e. Not enough information to calculate

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