

*Registration form*

**Distribution Primer 5 Training Course \$100.00  
48 HOUR RUSH ORDER PROCESSING FEE ADDITIONAL \$50.00**

**Start and Finish Dates:** \_\_\_\_\_  
*You will have 90 days from this date in order to complete this course*

**Name** \_\_\_\_\_ **Signature** \_\_\_\_\_  
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List hours worked on assignment must match State Requirement. \_\_\_\_\_

Please circle/check which certification you are applying the course CEU's/PDH's.

Water Treatment \_\_\_\_\_ Distribution \_\_\_\_\_ Other \_\_\_\_\_

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## **State Approval Listing URL...**

<http://www.ABCTLC.com/downloads/PDF/CEU%20State%20Approvals.pdf>

*You can obtain a printed version from TLC for an additional \$129.95 plus shipping charges.*

## **AFFIDAVIT OF EXAM COMPLETION**

I affirm that I personally completed the entire text of the course. I also affirm that I completed the exam without assistance from any outside source. I understand that it is my responsibility to file or maintain my certificate of completion as required by the state or by the designation organization.

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For security purposes, please fax or e-mail a copy of your driver's license and always call us to confirm we've received your assignment and to confirm your identity.

Thank you...

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# Distribution Primer 5 Answer Key

Name \_\_\_\_\_

Phone \_\_\_\_\_

**You are solely responsible in ensuring that this course is accepted for credit by your State. No refunds. Did you check with your State agency to ensure this course is accepted for credit?**

**Method of Course acceptance confirmation. Please fill this section**

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**You can use Adobe Acrobat DC Program to complete the assignment.**

**Please circle, underline, bold or X only one correct answer**

1. A B C D E F

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150. A B C D E F

**Please fax the answer key to TLC Western Campus Fax (928) 272-0747.  
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**Please Sign that you understand and will abide with TLC's Rules.**

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**Signature**

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If you need this assignment graded and the results mailed to you within a 48-hour period, prepare to pay an additional rush service handling fee of \$50.00. This fee may not cover postage costs. If you need this service, simply write RUSH on the top of your Registration Form. We will place you in the front of the grading and processing line.

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*Please e-mail or fax this survey along with your final exam*

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## Distribution Primer 5 CEU Training Course Assignment

***The Assignment (Exam) is also available in Word on the Internet for your Convenience, please visit [www.ABCTLC.com](http://www.ABCTLC.com) and download the assignment and e- mail it back to TLC.***

You'll have 90 days from the start of this course to complete in order to receive your Professional Development Hours (**PDHs**) or Continuing Education Unit (**CEU**). A score of 70 % is necessary to pass this course. We prefer if this exam is proctored. No intentional trick questions. If you should need any assistance, please email all concerns and the completed manual to [info@tlch2o.com](mailto:info@tlch2o.com).

We would prefer that you utilize the enclosed answer sheet in the front, but if you are unable to do so, type out your own answer key. Please include your name and address on your manual and make copy for yourself. You can e-mail or fax your Answer Key along with the Registration Form to TLC. **(S) Means answer may be plural or singular. Multiple Choice Section, One answer per question and please use the answer key.**

### Well Dilling/Pumping Section

1. Basically, a well is a hole drilled into?
- A. Consolidated or rock wells
  - B. An unconfined water source
  - C. An aquifer
  - D. Unconsolidated or sand wells
  - E. Water Table
  - F. None of the Above

### Three Basic Types of Wells

2. Bored or shallow wells are usually bored into \_\_\_\_\_, generally found at depths of 100 feet or less.

- A. Consolidated or rock wells
- B. An unconfined water source
- C. Aquifer
- D. Unconsolidated or sand wells
- E. Water Table
- F. None of the Above

3. Which of the following terms are drilled into a formation consisting entirely of a natural rock formation that contains no soil and does not collapse?

- A. Unconfined aquifers
- B. Aquifer(s)
- C. Saturated zone
- D. Unconsolidated or sand wells
- E. Consolidated or rock wells
- F. None of the Above

4. Which of the following terms are drilled into a formation consisting of soil, sand, gravel, or clay material that collapses upon itself?

- A. Unconfined aquifers
- B. Aquifer(s)
- C. Saturated zone
- D. Unconsolidated or sand wells
- E. Consolidated or rock wells
- F. None of the Above

### Selection of Pumping Equipment

5. The proper selection of pumping equipment for a well is of great importance. The primary factors that must be considered before selecting the well pump are: \_\_\_\_\_, line pressure, pumping lift, power requirements, and size of piping.

- A. Head
- B. Flow rate
- C. Total vertical distance
- D. Total dynamic head
- E. Total static head
- F. None of the Above

### **Pumping Lift and Total Dynamic or Discharge Head**

6. The most important components in selecting the correct pump for your application are: total pumping lift and?
- A. Head
  - B. Total head
  - C. Total vertical distance
  - D. Total dynamic head
  - E. Total dynamic or discharge head
  - F. None of the Above

### **Basic Pump Operating Characteristics**

7. "Head" is a term commonly used with pumps. \_\_\_\_\_ refers to the height of a vertical column of water.

- A. Head
- B. Total head
- C. Total vertical distance
- D. Total dynamic head
- E. Total static head
- F. None of the Above

8. Which of the following terms of a pump is composed of several types of head that help define the pump's operating characteristics?

- A. Head
- B. Total head
- C. Total vertical distance
- D. Total dynamic head
- E. Total static head
- F. None of the Above

### **Total Dynamic Head**

9. The total dynamic head of a pump is the sum of the \_\_\_\_\_, the pressure head, the friction head, and the velocity head.

- A. Head
- B. Total head
- C. Total vertical distance
- D. Total dynamic head
- E. Total static head
- F. None of the Above

### **Total Static Head**

10. Which of the following terms is the total vertical distance the pump must lift the water?

- A. Head
- B. Total head
- C. Total vertical distance
- D. Total dynamic head
- E. Total static head
- F. None of the Above

11. When pumping from an open water surface, it would be the \_\_\_\_\_ from the water surface to the discharge point.

- A. Head
- B. Total head
- C. Total vertical distance
- D. Total dynamic head
- E. Total static head
- F. None of the Above

### **Friction Head**

12. Which of the following terms is the energy loss or pressure decrease due to friction when water flows through pipe networks?

- A. Head
- B. Friction
- C. Cavitation
- D. Friction head
- E. Suction head
- F. None of the Above

13. Which of the following terms of the water has a significant effect on friction loss?

- A. Head
- B. Friction
- C. Cavitation
- D. Velocity
- E. Suction head
- F. None of the Above

14. Values for these losses can be calculated or obtained from friction loss tables. The friction head for a piping system is the sum of all the \_\_\_\_\_ losses.

- A. Head
- B. Friction
- C. Cavitation
- D. Velocity
- E. Suction head
- F. None of the Above

### Velocity Head

15. Which of the following terms is the energy of the water due to its velocity?

- A. Head
- B. Friction
- C. Velocity head
- D. Velocity
- E. Suction head
- F. None of the Above

### Suction Head

16. The suction head includes not only the vertical suction lift, but also the \_\_\_\_\_ losses through the pipe, elbows, foot valves, and other fittings on the suction side of the pump.

- A. Head
- B. Friction
- C. Cavitation
- D. Velocity
- E. Suction head
- F. None of the Above

17. There is an allowable limit to the \_\_\_\_\_ on a pump and the net positive suction head of a pump sets that limit.

- A. Head
- B. Friction
- C. Cavitation
- D. Velocity
- E. Suction head
- F. None of the Above

18. The theoretical maximum height that water can be lifted using suction is 33 feet. Through controlled laboratory tests, manufacturers determine the \_\_\_\_\_ for their pumps.

- A. Head
- B. Friction
- C. Cavitation
- D. Velocity
- E. Suction head
- F. None of the Above

19. The NPSH curve will increase with increasing \_\_\_\_\_ through the pump.

- A. Head
- B. Friction
- C. Flow rate
- D. Velocity
- E. Suction head
- F. None of the Above

20. To minimize the suction pipeline \_\_\_\_\_ losses, the suction pipe should have a larger diameter than the discharge pipe.

- A. Head
- B. Friction
- C. Cavitation
- D. Velocity
- E. Suction head
- F. None of the Above

21. Operating a pump with \_\_\_\_\_ greater than it was designed for, or under conditions with excessive vacuum at some point in the impeller, may cause cavitation.

- A. Head
- B. Friction
- C. Suction lift
- D. Velocity
- E. Suction head
- F. None of the Above

22. Which of the following terms is the implosion of bubbles of air and water vapor and makes a very distinct noise like gravel in the pump?
- A. Head                      D. Velocity  
 B. Friction                  E. Suction head  
 C. Cavitation              F. None of the Above

**Pump Efficiency**

23. Manufacturers determine by tests the operating characteristics of their pumps and publish the results in pump performance charts commonly called?

- A. Pump curve(s)              D. TDH relationship              (S) MEANS PLURAL OR SINGUAL  
 B. Peak efficiency              E. Friction loss is almost negligible  
 C. Cavitation                  F. None of the Above

24. All pump curves are plotted with the flow rate on the horizontal axis and the TDH on the vertical axis. The curves in a \_\_\_\_\_ are for a centrifugal pump tested at different RPM.

- A. Pump curve(s)              D. TDH relationship              (S) MEANS PLURAL OR SINGUAL  
 B. Peak efficiency              E. Friction loss is almost negligible  
 C. Cavitation                  F. None of the Above

25. Each curve indicates the GPM versus \_\_\_\_\_ at the tested RPM. In addition, pump efficiency lines have been added and wherever the efficiency line crosses the pump curve lines that number is what the efficiency is at that point.

- A. Pump curve(s)              D. TDH relationship  
 B. Peak efficiency              E. Friction loss is almost negligible  
 C. Cavitation                  F. None of the Above

26. Brake horsepower curves have also been added; they slant down from left to right. The BHP curves are calculated using the values from the?

- A. Efficiency lines              D. TDH relationship  
 B. Peak efficiency              E. Friction loss is almost negligible  
 C. Cavitation                  F. None of the Above

**Reading a Pump Curve**

27. When the desired flow rate and TDH are known, these curves are used to select a pump. The pump curve shows that a pump will operate over a wide range of conditions. However, it will operate at peak efficiency only in a narrow range of flow rate and?

- A. Pump curve(s)              D. TDH  
 B. Peak efficiency              E. Friction loss is almost negligible  
 C. Cavitation                  F. None of the Above

**Determining Friction Losses**

28. There are numerous \_\_\_\_\_ tables with values of equivalent feet of head for given flow rates and types and diameters of pipe available.

- A. Pump curve(s)              D. TDH relationship  
 B. Peak efficiency              E. Friction loss  
 C. Cavitation                  F. None of the Above

29. The lift requirements for the pump primarily include the height to which the pump must deliver the water from the wellhead, plus the distance from the \_\_\_\_\_ to the land surface.

- A. Pump curve(s)              D. TDH relationship  
 B. Peak efficiency              E. Friction loss  
 C. Pumping level              F. None of the Above

### The Well Head Assembly

30. When the well is completed with pumping equipment a \_\_\_\_\_ is also required.

- A. Frost protection
- B. Variance permit
- C. Well manifold
- D. Well vent
- E. Approved well casing material
- F. None of the Above

31. Which of the following terms should be at least ½ inch in diameter, 8 inches above the finished grade, and be turned down, with the opening screened with a minimum 24-mesh durable screen to prevent entry of insects?

- A. Frost protection
- B. Variance permit
- C. Well manifold
- D. Well vent pipe
- E. Approved well casing material
- F. None of the Above

32. Any pressure, vent, and electric lines to and from the pump should enter the casing only through a?

- A. Watertight seal
- B. Variance permit
- C. Well manifold
- D. Well vent pipe
- E. Approved well casing material
- F. None of the Above

33. Wells should not be located within vaults or pits, except with a?

- A. Frost protection
- B. Variance permit
- C. Well manifold
- D. Well vent pipe
- E. Approved well casing material
- F. None of the Above

34. If the pump discharge line passes through the \_\_\_\_\_ underground, an approved pitless adapter should be installed.

- A. Well casing
- B. Variance permit
- C. Well manifold
- D. Well vent pipe
- E. Approved well casing material
- F. None of the Above

35. Which of the following terms should include an air relief valve, flow meter, sample port, isolation valve, and a check valve?

- A. Frost protection
- B. Variance permit
- C. Well manifold
- D. Well vent pipe
- E. Approved well casing material
- F. None of the Above

### Water Use or Demand

36. Water system \_\_\_\_\_ comes from a number of sources including residential, commercial, industrial and public consumers as well as some unavoidable loss and waste.

- A. Leakage
- B. Minimum use
- C. Maximum daily use
- D. Some unavoidable loss and waste
- E. Demand
- F. None of the Above

37. If fire protection is desired, that could also represent a rather significant (although not continuous)?

- A. Leakage
- B. Minimum use
- C. Maximum daily use
- D. Some unavoidable loss and waste
- E. Demand upon the system
- F. None of the Above

38. The quantity of water used in any community varies from \_\_\_\_\_ per person per day.

- A. 500 gallons
- B. 100 to 150 gallons
- C. Maximum daily use
- D. Some unavoidable loss and waste
- E. Demand
- F. None of the Above

39. A common design assumption is to use from \_\_\_\_\_ per person per day for average domestic use.

- A. 500 gallons
- B. 100 to 150 gallons
- C. Maximum daily use
- D. Some unavoidable loss and waste
- E. Demand
- F. None of the Above

40. Which of the following terms is usually encountered during the summer months and can vary widely depending on irrigation practices?

- A. Leakage
- B. Minimum use
- C. Maximum daily use
- D. Some unavoidable loss and waste
- E. Demand upon the system
- F. None of the Above

### Water Pressure

41. For ordinary domestic use, water pressure should be between \_\_\_\_\_ psi.

- A. 20
- B. 25 and 45
- C. 2.31
- D. 75
- E. .433
- F. None of the Above

42. A minimum of 60 psi at a fire hydrant is usually adequate, since that allows for up to \_\_\_\_\_ psi pressure drop in fire hoses.

- A. 20
- B. 25 and 45
- C. 2.31 and 45
- D. 75
- E. .433
- F. None of the Above

43. In commercial and industrial districts, it may be common to have \_\_\_\_\_ psi or higher.

- A. 20
- B. 25 and 45
- C. 2.31
- D. 75
- E. .433
- F. None of the Above

44. Which of the following terms is provided by the direct force of the water, or by the height of the water?

- A. Leakage
- B. Minimum use
- C. Maximum daily use
- D. Pressure
- E. Demand upon the system
- F. None of the Above

45. 2.31 feet of water is equal to \_\_\_\_\_ is equal to about a half a pound (.433 pounds to be exact).

- A. 20
- B. 25 and 45
- C. 2.31
- D. 75
- E. .433
- F. None of the Above

### Storage and Distribution

46. The cost of supplying water to the users of any water system includes the installation of?

- A. Stand pipes
- B. An elevated tank
- C. Tower
- D. Water storage
- E. Storage and distribution facilities
- F. None of the Above

47. The distribution system must also protect water quality between the source and the customer's tap. Proper construction is important in maintaining?

- A. A turbulence
- B. Shock waves
- C. No foreign material
- D. System integrity
- E. Gravity
- F. None of the Above

48. Pipe ends should be covered at the end of the work day or during?

- A. A turbulence
- B. Shock waves
- C. No foreign material
- D. System integrity
- E. Interruptions of construction
- F. None of the Above

### Water Storage Facilities

49. Which of the following terms and tanks vary in size, shape, and application?

- A. Stand pipes
- B. An elevated tank
- C. Tower
- D. Water storage facilities
- E. Storage and distribution facilities
- F. None of the Above

### Surge Tanks

50. Shock waves are created when hydrants, valves, or pumps are opened and closed quickly, trapping the \_\_\_\_\_ of moving water within the confined space of a piping system.

- A. Turbulence
- B. Shock waves
- C. No foreign material
- D. System integrity
- E. Kinetic energy
- F. None of the Above

51. Which of the following terms can create a turbulence that travels at the speed of sound, seeking a point of release?

- A. Turbulence
- B. Shock waves
- C. No foreign material
- D. System integrity
- E. Gravity
- F. None of the Above

52. The release the surge usually finds is an elevated tank, but the surge doesn't always find this release quickly enough. Something has to give, and oftentimes, it's your pipe fittings. Distribution operators are aware of this phenomenon! It's called?

- A. Turbulence
- B. Shock waves
- C. Foreign shock
- D. Break dance
- E. Vortex
- F. None of the Above

53. A Surge tank should not be used for?

- A. Vortex storage
- B. Shock waves
- C. Water storage
- D. System integrity
- E. Gravity storage
- F. None of the Above

54. The goal of the water tower or \_\_\_\_\_ is to store water high in the air, where it has lots of gravitational potential energy.

- A. Stand pipe
- B. An elevated tank
- C. Tower
- D. Water storage
- E. Storage facility
- F. None of the Above

55. Since height is everything, building \_\_\_\_\_ is inefficient. Most of the water is then near the ground. By making the tower wider near the top, it puts most of its water high up.

- A. Stand pipe
- B. An elevated tank
- C. A cylindrical water tower
- D. Time warp continuum
- E. Storage facility
- F. None of the Above

### Storage Reservoirs

56. It is recommended that the volume of \_\_\_\_\_ be equal to from one to three days of the system's average daily use.

- A. Detention basins
- B. Steel reservoirs or tanks
- C. Storage
- D. Some storage for fire protection
- E. System's average daily use
- F. None of the Above

57. It is also recommended that storage reservoirs be located at a \_\_\_\_\_ to allow the water to flow by gravity to the distribution system.

- A. Detention basin
- B. Steel reservoir or tank
- C. High enough elevation
- D. Some storage for fire protection
- E. System's average daily use
- F. None of the Above

58. This, coupled with restricted usage on the part of the consumers, should provide an uninterrupted water supply in the event of pump failure, loss of power or an acute contamination event or cross-connection. Also, if applicable, \_\_\_\_\_ should be provided.

- A. Detention basins
- B. Steel reservoirs or tanks
- C. Storage
- D. Some storage for fire protection
- E. System's average daily use
- F. None of the Above

59. Reservoirs are also used as \_\_\_\_\_ to provide the required chlorine contact time necessary to ensure the adequacy of disinfection.

- A. Detention basins
- B. Steel reservoirs or tanks
- C. Steel tanks
- D. Some storage for fire protection
- E. System's average daily use
- F. None of the Above

60. Also, \_\_\_\_\_ inside the reservoir (walls, curtains, or spirals) increase the contact time by preventing the water from leaving the reservoir too quickly (known as "short-circuiting").

- A. Detention basins
- B. Steel reservoirs or tanks
- C. Steel tank
- D. Vortex storage
- E. Time warp continuum
- F. None of the Above

### Steel Reservoirs

61. Which of the following terms or tanks generally have lower construction and installation costs than concrete, but require more maintenance?

- A. Detention basins
- B. Steel reservoirs
- C. Steel tank
- D. Some storage for fire protection
- E. System's average daily use
- F. None of the Above

62. To protect against corrosion, the exterior should be kept cleaned and painted. Interiors of \_\_\_\_\_ are commonly coated with an epoxy or enamel-type finish.

- A. Detention basins
- B. Steel reservoirs
- C. Steel tank
- D. Some storage for fire protection
- E. System's average daily use
- F. None of the Above

63. Which of the following terms are usually welded or bolted together and are manufactured in a variety of sizes?

- A. Detention basins
- B. Steel reservoirs
- C. Steel tank
- D. Some storage for fire protection
- E. System's average daily use
- F. None of the Above

64. Which of the following terms should be inspected once a year and repainted every 5-7 years?

- A. Detention basins
- B. Steel reservoirs or tanks
- C. Steel tanks
- D. Storage for fire protection
- E. System's average daily use
- F. None of the Above

65. Which of the following terms should also have cathodic protection and be screened to keep birds and insects out?

- A. Detention basins
- B. Steel reservoirs or tanks
- C. Steel tank
- D. Some storage for fire protection
- E. System's average daily use
- F. None of the Above

66. Cleaning and disinfection prior to placing the \_\_\_\_\_ back in service is necessary.

- A. Detention basin
- B. Reservoir or tank
- C. Steel tank
- D. Storage for fire protection
- E. System's average daily use
- F. None of the Above

### **Hydropneumatic Tank Section**

#### **Effects on the Water Supply**

67. Whenever a tank must be taken out of service for \_\_\_\_\_, the operator should insure that the water pressure is maintained by other back-up tanks in the system.

- A. Maintenance
- B. A problem
- C. Corrective action
- D. Particular area
- E. Troubleshooting of problems
- F. None of the Above

68. If this is not possible, customers should be given as much advance notice as possible, maintenance should be conducted during periods of low water demand, and the \_\_\_\_\_ should be conducted as quickly as possible to reduce the time without water service.

- A. Maintenance
- B. A problem
- C. Corrective action
- D. Particular area
- E. Troubleshooting of problems
- F. None of the Above

#### **Troubleshooting Hydropneumatic Tank Problems**

69. The purpose of a hydropneumatic tank is to provide air for the water system. It is the responsibility of the operator to perform \_\_\_\_\_ in hydropneumatic tank systems.

- A. Maintenance
- B. A problem
- C. Corrective action
- D. Particular area
- E. Troubleshooting of problems
- F. None of the Above

70. The operator has to decide, based on his/her own training and capability when a problem requires \_\_\_\_\_ from another operator or an outside expert.

- A. Maintenance
- B. A problem
- C. Corrective action
- D. Assistance
- E. Troubleshooting of problems
- F. None of the Above

71. Operators should not hesitate to seek \_\_\_\_\_ if they are uncomfortable with a particular problem or situation.

- A. Maintenance
- B. A problem
- C. Corrective action
- D. Assistance
- E. Troubleshooting of problems
- F. None of the Above

72. Which of the following terms should only be performed by individuals who are trained and skilled in that particular area?

- A. Maintenance
- B. A problem
- C. Corrective action
- D. Particular area
- E. Troubleshooting of problems
- F. None of the Above

### **Contaminated Wells**

73. Which of the following terms used for drinking water are especially dangerous?

- A. An artesian aquifer
- B. An artesian well
- C. Contaminated wells
- D. Fractured aquifers
- E. Unsaturated zone
- F. None of the Above

74. Groundwater is withdrawn from \_\_\_\_\_ to provide water for everything from drinking water for the home and business to water to irrigate crops to industrial processing water.

- A. Saturated zone
- B. Water table
- C. Fractured aquifers
- D. Karst
- E. Dynamics of groundwater flow
- F. None of the Above

75. Groundwater flows slowly through \_\_\_\_\_ at different rates.

- A. An artesian aquifer
- B. An artesian well
- C. Groundwater flow
- D. Fractured aquifers
- E. Water-bearing formations (aquifers)
- F. None of the Above

### **Aquifer**

76. Many terms are used to describe the nature and extent of the groundwater resource. The level below which all the spaces are filled with water is called the?

- A. Saturated zone
- B. Water table
- C. Fractured aquifers
- D. Karst
- E. Dynamics of groundwater flow
- F. None of the Above

77. Above the water table lies the unsaturated zone. Here the spaces in the rock and soil contain both air and water. Water in this zone is called?

- A. An artesian aquifer
- B. An artesian well
- C. Soil moisture
- D. Fractured aquifers
- E. Unsaturated zone
- F. None of the Above

78. The entire region below the water table is called the \_\_\_\_\_ and water in this saturated zone is called groundwater.

- A. Saturated zone
- B. Water table
- C. Fractured aquifers
- D. Karst
- E. Dynamics of groundwater flow
- F. None of the Above

79. Which of the following terms are cracks, joints, or fractures in solid rock, through which groundwater moves?

- A. An artesian aquifer
- B. An artesian well
- C. Groundwater flow
- D. Fractured aquifers
- E. Unsaturated zone
- F. None of the Above

80. Limestones are often \_\_\_\_\_, but here the cracks and fractures may be enlarged by solution, forming large channels or even caverns.

- A. Saturated zone
- B. Water table
- C. Fractured aquifers
- D. Karst
- E. Dynamics of groundwater flow
- F. None of the Above

81. Limestone terrain where solution has been very active is termed?

- A. An artesian aquifer
- B. An artesian well
- C. Karst
- D. Fractured aquifers
- E. Unsaturated zone
- F. None of the Above

82. Porous media such as sandstone may become so highly cemented or recrystallized that all of the original space is filled. In this case, the rock is no longer a porous medium. However, if it contains cracks it can still act as a?

- A. Saturated zone
- B. Water table
- C. Fractured aquifer
- D. Karst
- E. Dynamics of groundwater flow
- F. None of the Above

83. Some very porous materials are not permeable. \_\_\_\_\_, for instance, has many spaces between its grains, but the spaces are not large enough to permit free movement of water.

- A. An artesian aquifer
- B. An artesian well
- C. Groundwater flow
- D. Fractured aquifers
- E. Unsaturated zone
- F. None of the Above

84. Which of the following terms usually flows downhill with the slope of the water table. Like surface water, groundwater flows toward, and eventually drains into, streams, rivers, lakes and the oceans?

- A. Saturated zone
- B. Water table
- C. Groundwater
- D. Karst
- E. Dynamics of groundwater flow
- F. None of the Above

85. Groundwater flow in the \_\_\_\_\_ underlying springs or surface drainage basins, however, does not always mirror the flow of water on the surface.

- A. Aquifers
- B. An artesian well
- C. Groundwater flow
- D. Fractured aquifers
- E. Unsaturated zone
- F. None of the Above

86. Which of the following terms may move in different directions below the ground than the water flowing on the surface?

- A. Saturated zone
- B. Water table
- C. Fractured aquifers
- D. Groundwater
- E. Dynamics of groundwater flow
- F. None of the Above

87. Unconfined aquifers are those that are bounded by the water table. Some aquifers, however, lie beneath layers of impermeable materials. These are called \_\_\_\_\_, or sometimes artesian aquifers.

- A. An artesian aquifer
- B. An artesian well
- C. Confined aquifers
- D. Fractured aquifers
- E. Unsaturated zone
- F. None of the Above

88. The water in these wells rises higher than the top of the aquifer because of confining pressure. If the water level rises above the ground surface a \_\_\_\_\_ occurs.

- A. Saturated zone
- B. Water table
- C. Fractured aquifers
- D. Flowing artesian well
- E. Dynamics of groundwater flow
- F. None of the Above

89. The piezometric surface is the level to which the water in \_\_\_\_\_ will rise.

- A. An artesian aquifer
- B. An artesian well
- C. Groundwater flow
- D. Fractured aquifers
- E. Unsaturated zone
- F. None of the Above

### **Cone of Depression**

90. When pumping begins, water begins to flow towards the well in contrast to the natural direction of groundwater movement. The water level in the well falls below the \_\_\_\_\_ in the surrounding aquifer.

- A. Cone of depression
- B. Water table
- C. Aquifer
- D. Groundwater
- E. An unconfined aquifer
- F. None of the Above

91. As a result, water begins to move from the \_\_\_\_\_ into the well.

- A. Cone of depression
- B. Water table
- C. Aquifer
- D. Groundwater
- E. An unconfined aquifer
- F. None of the Above

92. The movement of water from an aquifer into a well results in the formation of a?

- A. Cone of depression
- B. Water table
- C. Vortex time warp
- D. Groundwater
- E. An unconfined aquifer
- F. None of the Above

93. Which of the following terms is the vertical drop in the height between the water level in the well prior to pumping and the water level in the well during pumping?

- A. Cone of depression
- B. Water table
- C. Drawdown
- D. Groundwater
- E. An unconfined aquifer
- F. None of the Above

94. When a well is installed in an unconfined aquifer, water moves from the \_\_\_\_\_ into the well through small holes or slits in the well casing or, in some types of wells, through the open bottom of the well.

- A. Cone of depression
- B. Water table
- C. Aquifer
- D. Groundwater
- E. An unconfined aquifer
- F. None of the Above

95. The level of the water in the well is the same as the water level in the?

- A. Cone of depression
- B. Water table
- C. Aquifer
- D. Groundwater
- E. An unconfined aquifer
- F. None of the Above

### Groundwater Section

96. Ground water also is used for about half of the nation's agricultural irrigation and nearly one-third of the industrial water needs. This makes ground water a vitally important?

- A. Spring
- B. Water table
- C. Hydrologic cycle
- D. Underground sources of water
- E. National resource
- F. None of the Above

### What Is Groundwater and Where Does It Come From?

97. Actually ground water occurs as part of what can be called the oldest recycling program -the?

- A. Unconfined aquifers
- B. Aquifers
- C. Saturated zone
- D. Unsaturated zone
- E. Hydrologic cycle
- F. None of the Above

98. Which of the following terms involves the continual movement of water between the earth and the atmosphere through evaporation and precipitation?

- A. Springs
- B. Water table
- C. The hydrologic cycle
- D. Underground sources of water
- E. Confined aquifer
- F. None of the Above

99. As rain and snow fall to the earth, some of the water runs off the surface into lakes, rivers, streams, and the oceans; some evaporates; and some is absorbed by plant roots. The rest of the water soaks through the ground's surface and moves downward through the unsaturated zone, where the open spaces in rocks and soil are filled with a mixture of air and water, until it reaches the?

- A. Unconfined aquifers
- B. Water table
- C. Saturated zone
- D. Unsaturated zone
- E. Hydrologic cycle
- F. None of the Above

100. The water table is the top of the \_\_\_\_\_, or the area in which all interconnected spaces in rocks and soil are filled with water.

- A. Springs
- B. Water table
- C. Saturated zone
- D. Underground sources of water
- E. Confined aquifer
- F. None of the Above

101. The water in the \_\_\_\_\_ is called ground water. In areas where the water table occurs at the ground's surface, the ground water discharges into marshes, lakes, springs.

- A. Unconfined aquifers
- B. Aquifer(s)
- C. Saturated ground
- D. Unsaturated zone
- E. Saturated zone
- F. None of the Above

### Where Is Ground Water Stored?

102. Ground water is stored under many types of geologic conditions. Areas where ground water exists in sufficient quantities to supply wells or springs are called \_\_\_\_\_, a term that literally means "water bearer."

- A. Springs
- B. Water table
- C. The hydrologic cycle
- D. Underground sources of water
- E. Confined aquifer
- F. None of the Above

103. Which of the following terms store water in the spaces between particles of sand, gravel, soil, and rock as well as cracks, pores, and channels in relatively solid rocks?

- A. Unconfined aquifers
- B. Aquifers
- C. Saturated zone
- D. Unsaturated zone
- E. Hydrologic cycle
- F. None of the Above

104. Which of the following terms is controlled largely by its porosity, or the relative amount of open space present to hold water?

- A. Unconfined aquifers storage capacity
- B. An aquifer's storage capacity
- C. Saturated zone storage capacity
- D. Unsaturated zone storage capacity
- E. Hydrologic cycle storage capacity
- F. None of the Above

105. If the aquifer is between layers of relatively impermeable materials, it's called a?

- A. Springs
- B. Water table
- C. The hydrologic cycle
- D. Underground sources of water
- E. Confined aquifer
- F. None of the Above

106. Which of the following terms are frequently found at greater depths than unconfined aquifers?

- A. Unconfined aquifers
- B. Aquifers
- C. Saturated zone
- D. Unsaturated zone
- E. Confined aquifers
- F. None of the Above

### Does Ground Water Move?

107. Ground water can move sideways as well as up or down. This movement is in response to gravity, differences in elevation, and?

- A. Differences in Unconfined aquifers
- B. Differences in Aquifers
- C. Differences in Saturated zone
- D. Differences in Unsaturated zone
- E. Differences in pressure
- F. None of the Above

108. The movement is usually quite slow, frequently as little as a few feet per year, although it can move as much as several feet per day in?

- A. Unconfined aquifers
- B. Aquifers
- C. Saturated zone
- D. Unsaturated zone
- E. More permeable zones
- F. None of the Above

109. Ground water can move even more rapidly in \_\_\_\_\_, which are areas in water soluble limestone and similar rocks where fractures or cracks have been widened by the action of the ground water to form sinkholes, tunnels, or even caves.

- A. Saturated zone
- B. Water table
- C. Fractured aquifers
- D. Karst aquifers
- E. Dynamics of groundwater flow
- F. None of the Above

## Water Well Reports and Hydrogeology

### Depth to the Aquifer

110. It is necessary to identify which geologic unit is the \_\_\_\_\_; i.e., the porous and permeable rock or sediment that contains ground water.

- A. Aquifer
- B. Hydraulic head
- C. Head
- D. Top of the aquifer
- E. Ground water
- F. None of the Above

### Nature of the Aquifer

111. Which of the following terms can be described as either unconfined or confined?

- A. An aquifer
- B. Hydraulic head
- C. An unconfined aquifer
- D. A confined aquifer
- E. The nature of the aquifer
- F. None of the Above

112. Which of the following terms has the water table as its upper surface; there are no significant low-permeability layers between the water table and the surface?

- A. An aquifer
- B. Hydraulic head
- C. An unconfined aquifer
- D. A confined aquifer
- E. Either unconfined or confined
- F. None of the Above

113. The top of the aquifer, the \_\_\_\_\_, can rise or fall depending on water use and amount of recharge to the aquifer.

- A. Aquifer is under pressure
- B. Hydraulic head
- C. Head
- D. Water table
- E. Ground water
- F. None of the Above

114. A confined aquifer has a low-permeability geologic formation as its upper boundary; the ground water in the aquifer is under pressure; \_\_\_\_\_ is separated from the surface by the confining layer and generally is recharged at some distance from the well.

- A. The aquifer
- B. Hydraulic head
- C. An unconfined aquifer
- D. A confined aquifer
- E. Either unconfined or confined
- F. None of the Above

### Hydraulic Head (h)

115. Which of the following terms is a measure of the energy that the water at a certain depth possesses because of its elevation and the pressure exerted through the weight of the water above it.

- A. Aquifer is under pressure
- B. Hydraulic head
- C. Head
- D. Top of the aquifer
- E. Ground water
- F. None of the Above

116. Which of the following terms has units of feet, and generally corresponds to the elevation of water in the well?

- A. An aquifer
- B. Hydraulic head
- C. An unconfined aquifer
- D. A confined aquifer
- E. Either unconfined or confined
- F. None of the Above

117. Which of the following terms is the driving force for ground water movement either in a horizontal or vertical direction?

- A. Aquifer is under pressure
- B. Hydraulic head
- C. Head
- D. Top of the aquifer
- E. Ground water
- F. None of the Above

118. Ground water moves from where the head is higher to where the head is lower. If we have enough hydraulic head data for \_\_\_\_\_ over a given area, we can contour the head elevation just like the ground elevation is contoured on a topographic map.

- A. An aquifer
- B. Hydraulic head
- C. An unconfined aquifer
- D. A confined aquifer
- E. Either unconfined or confined
- F. None of the Above

119. Ground water will move from \_\_\_\_\_ to low head areas and will generally flow in a direction that crosses the contours at a 90° angle.

- A. Aquifer is under pressure
- B. Hydraulic head
- C. High head areas
- D. Top of the aquifer
- E. Ground water
- F. None of the Above

### How Wells are Drilled

120. In these modern times, wells can be drilled much faster and safer using?

- A. A drill string
- B. A rotating bit
- C. Drilling fluids
- D. The kelly
- E. A sub
- F. None of the Above

121. Some examples of today's more common well drilling methods include rotary, auger, and \_\_\_\_\_ with many variations of each.

- A. Drag bits
- B. A sub
- C. The drill collar
- D. Cable tool
- E. A top drive
- F. None of the Above

122. Which of the following terms stabilize the hole and aid in the removal of cuttings?

- A. A drill string
- B. A rotating bit
- C. Drilling fluids
- D. The kelly
- E. A sub
- F. None of the Above

123. Air rotary with downhole hammer is particularly suited for hard rock drilling, while \_\_\_\_\_ is better suited for drilling in sediment.

- A. Drag bits
- B. A sub
- C. Mud rotary
- D. A kelly
- E. A top drive
- F. None of the Above

### Basic Rotary Drilling Methods

124. Rotary drilling utilizes a drilling rig with a rotating bit and \_\_\_\_\_ to penetrate into the aquifer. It is the most common type of drilling method used today.

- A. A drill string
- B. A rotating bit
- C. Drilling fluids
- D. The kelly
- E. Circulating drilling fluid
- F. None of the Above

125. Common variations of this method include: direct and reverse mud rotary, \_\_\_\_\_, and drill through casing driver methods.

- A. Drag bits
- B. A sub
- C. The drill collar
- D. A kelly
- E. Direct air rotary
- F. None of the Above

### The Rotary Drill String

126. Rotary drilling methods use \_\_\_\_\_, which typically consists of a bit, collar, drill pipe and a kelly (if table driven).

- A. A drill string    D. The kelly
- B. A rotating bit    E. A sub
- C. Drilling fluids    F. None of the Above

127. Which of the following terms is a section of heavy walled pipe that can be hexagonal, square, or rounded with grooves?

- A. Drag bits                      D. A kelly
- B. A sub                              E. A top drive
- C. The drill collar                F. None of the Above

128. The kelly is several feet longer than the drill pipe being used and fits into \_\_\_\_\_ much like the splines on an automobile's drive shaft fit into a transmission.

- A. Drag bits                      D. The table drive
- B. A sub                              E. A top drive
- C. The drill collar                F. None of the Above

129. Which of the following terms turns the kelly and the rest of the drill string connected below as it slips down through the table?

- A. A drill string    D. The table drive
- B. A rotating bit    E. A sub
- C. Drilling fluids    F. None of the Above

130. Which of the following terms is free to move up and down the mast of the rig while rotating the drill string?

- A. A drill string    D. The kelly
- B. A rotating bit    E. A top drive
- C. Drilling fluids    F. None of the Above

131. Drill pipe makes up a majority of the overall length of \_\_\_\_\_ and is used in various diameters and wall thicknesses for added strength.

- A. Drag bits                      D. A kelly
- B. A drill string                E. A top drive
- C. The drill collar                F. None of the Above

132. Which of the following terms can be used in various lengths but are typically 20-foot sections and may be connected to the drive unit with a sub?

- A. A drill string    D. The kelly
- B. A rotating bit    E. Drill pipe
- C. Drilling fluids    F. None of the Above

133. A sub is a length of pipe used to connect pipes and/or act as shock absorber between the drill pipes and?

- A. Drag bits                      D. Drive unit
- B. A sub                              E. A top drive
- C. The drill collar                F. None of the Above

134. At the end of the drill pipe is?

- A. A drill string    D. The kelly
- B. A rotating bit    E. A sub
- C. The drill collar    F. None of the Above

135. Which of the following terms aids in maintaining a consistent borehole diameter and primarily helps to prevent borehole deviation?

- A. Drag bits                      D. A kelly
- B. A sub                            E. A top drive
- C. The drill collar                F. None of the Above

136. At the end of the collar is?

- A. Drag bits                      D. The rotary bit
- B. A sub                            E. A top drive
- C. The drill collar                F. None of the Above

137. Which of the following terms are typically used in unconsolidated to semi-consolidated sand, silt, and clay-rich formations?

- A. Drag bits                      D. A kelly
- B. A sub                            E. A top drive
- C. The drill collar                F. None of the Above

138. Which of the following terms come in many shapes and sizes and cut with a shearing action aided by the jetting of drilling fluids from nozzles or jets in the bit?

- A. Drag bits                      D. A kelly
- B. A sub                            E. A top drive
- C. The drill collar                F. None of the Above

139. \_\_\_\_\_, such as the common tri-cone bit, typically utilize interlocking teeth or buttons on individual rotating cones to cut, crush, or chip through the formation.

- A. Reamer(s)    D. Roller bits
- B. Drill string    E. Projection of cutting blades
- C. Drilling fluid    F. None of the Above

140. Which of the following terms are also aided by the jetting of drilling fluids from nozzles or jets in the bit?

- A. Roller bits    D. Under reamers
- B. Drilling fluid    E. Roller button bits
- C. A rotating bit    F. None of the Above

141. These bits can be used in consolidated formations and even hard rock applications if equipped with carbide buttons. These types of bits are often referred to as?

- A. Mud                      D. Under reamers
- B. Drilling fluid    E. Roller button bits
- C. A rotating bit    F. None of the Above

142. Often an initial borehole needs to be reamed or made larger. \_\_\_\_\_ are bits that can be used to enlarge, straighten, or clean an existing borehole.

- A. Reamer(s)    D. Common tri-cone bit
- B. Drill string    E. Projection of cutting blades
- C. Drilling fluid    F. None of the Above

143. Which of the following terms are used to enlarge deeper sections of an existing borehole without requiring the enlargement of the entire upper well bore?

- A. Reamer(s)
- B. Drill string
- C. Under reamers
- D. Common tri-cone bit
- E. Projection of cutting blades
- F. None of the Above

144. Under reaming involves the projection of \_\_\_\_\_ beneath permanently installed casing in loosely consolidated sediments.

- A. Reamer(s)
- B. Drill string
- C. Cutting blades
- D. Common tri-cone bit
- E. Projection of cutting blades
- F. None of the Above

### Direct Rotary Method

145. Direct rotary drilling methods utilize a rotating bit at the end of a drilling string with \_\_\_\_\_ that is circulated from the rig through the drill pipe and jets in the bit.

- A. Mud
- B. Drilling fluid
- C. A rotating bit
- D. Under reamers
- E. Roller button bits
- F. None of the Above

146. Down-force exerted by the drilling rig and/or the weight of the \_\_\_\_\_ itself is used along with rotating action to force the bit downwards, cutting through the sediment or rock.

- A. Reamer(s)
- B. Drill string
- C. Drilling fluid
- D. Common tri-cone bit
- E. Projection of cutting blades
- F. None of the Above

147. Which of the following terms that is pumped by the rig's mud pump and/or air compressor is jetted out of ports in the bit?

- A. Mud
- B. Drilling fluid
- C. Rotating bit
- D. Under reamers
- E. Roller button bits
- F. None of the Above

148. Which of the following terms carries cuttings up the annular space between the drill pipe and formation and into mud pits or containment recirculating systems on the surface?

- A. Reamer(s)
- B. Drill string
- C. Drilling fluid
- D. Common tri-cone bit
- E. Projection of cutting blades
- F. None of the Above

### Direct Mud Rotary Method

149. Which of the following terms use various types of mud or drilling fluid to drill into the ground?

- A. Direct Mud rotary drilling rigs
- B. Drilling fluid
- C. A rotating bit
- D. Under reamers
- E. Roller button bits
- F. None of the Above

150. The process of building up a film of mud on the borehole walls is important to mud rotary drilling and is called?

- A. Mud caking
- B. Drilling fluid
- C. Mud drilling fluids
- D. Bentonite clay
- E. Drilling polymers or gels
- F. None of the Above

**You are finished with your assignment. Please email or fax your answer key and registration form to us and call later to confirm we received the paperwork.**