

**Registration form**

**DISTRIBUTION BASICS \$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*

List number of hours worked on assignment must match State Requirement. \_\_\_\_\_

**Name** \_\_\_\_\_ **Signature** \_\_\_\_\_

*I have read and understood the disclaimer notice on page 2. Digitally sign XXX*

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**Home (\_\_\_\_\_)** \_\_\_\_\_ **Work (\_\_\_\_\_)** \_\_\_\_\_

**Operator ID #** \_\_\_\_\_ **Exp. Date** \_\_\_\_\_

**Class/Grade** \_\_\_\_\_

*Your certificate will be emailed to you in about two weeks.*

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

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

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**Toll Free (866) 557-1746 Fax (928) 272-0747 [info@tlch2o.com](mailto:info@tlch2o.com)**

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## **DISCLAIMER NOTICE**

I understand that it is my responsibility to ensure that this CEU course is either approved or accepted in my State for CEU credit. I understand State laws and rules change on a frequent basis and I believe this course is currently accepted in my State for CEU or contact hour credit, if it is not, I will not hold Technical Learning College responsible. I fully understand that this type of study program deals with dangerous, changing conditions and various laws and that I will not hold Technical Learning College, Technical Learning Consultants, Inc. (TLC) liable in any fashion for any errors, omissions, advice, suggestions or neglect contained in this CEU education training course or for any violation or injury, death, neglect, damage or loss of your license or certification caused in any fashion by this CEU education training or course material suggestion or error or my lack of submitting paperwork. It is my responsibility to call or contact TLC if I need help or assistance and double-check to ensure my registration page and assignment has been received and graded. It is my responsibility to ensure all information is correct and to abide with all rules and regulations.

*You can obtain a printed version of the course manual from TLC for an additional \$69.95 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.

## **Grading Information**

In order to maintain the integrity of our courses we do not distribute test scores, percentages or questions missed. Our exams are based upon pass/fail criteria with the benchmark for successful completion set at 70%. Once you pass the exam, your record will reflect a successful completion and a certificate will be issued to you.

## **Rush Grading Service**

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.

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.

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**Many States and employers require the final exam to be proctored.**

**Some States and many employers require the final exam to be proctored.**

<http://www.abctlc.com/downloads/PDF/PROCTORFORM.pdf>

**Texas Students Only**  
**Acknowledgement of Notice of Potential Ineligibility for License**  
*You are required to sign and return to TLC or your credit will not be reported.*

Name: \_\_\_\_\_

Date of Birth: \_\_\_\_\_

Email Address: \_\_\_\_\_

By signing this form, I acknowledge that Technical Learning College notified me of the following:

- the potential ineligibility of an individual who has been convicted of an offense to be issued an occupational license by the Texas Commission on Environmental Quality (TCEQ) upon completion of the educational program;
- the current TCEQ Criminal Conviction Guidelines for Occupational Licensing, which describes the process by which the TCEQ's Executive Director determines whether a criminal conviction:
  - renders a prospective applicant an unsuitable candidate for an occupational license;
  - warrants the denial of a renewal application for an existing license; or
  - warrants revocation or suspension of a license previously granted.
- the right to request a criminal history evaluation from the TCEQ under Texas Occupations Code Section 53.102; and
- that the TCEQ may consider an individual to have been convicted of an offense for the purpose of denying, suspending or revoking a license under circumstances described in Title 30 Texas Administrative Code Section 30.33.

Enrollee Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Name of Training Provider/Organization: Technical Learning College

Contact Person: Melissa Durbin Role/Title: Dean



## Distribution Basics Answer Key

Name \_\_\_\_\_ Phone \_\_\_\_\_

**You are solely responsible in ensuring that this course is accepted for credit by your State. Did you check with your State agency to ensure this course is accepted for credit?**

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Website \_\_\_ Telephone Call \_\_\_ Email \_\_\_ Spoke to \_\_\_\_\_

Did you receive the approval number, if applicable? \_\_\_\_\_

PA DEP Students are required to complete the original version of the text. \_\_\_\_\_  
Please initial

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You can also fill this assignment out electronically in Adobe Acrobat DC  
Please Circle, Bold, Underline or X, one answer per question.

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| 167. A B C D E F | 184. A B C D E F |                  |

*This course contains general EPA's SDWA federal rule requirements. Please be aware that each state implements water, distribution, sampling procedures, safety and/or environmental regulations that may be more stringent than EPA's regulations.*

*Check with your state environmental/health agency for more information. These rules change frequently and are often difficult to interpret and follow. Be careful to be in compliance and do not follow this course for proper compliance.*

***You are responsible to ensure that TLC receives the Assignment and Registration Key. Please call us to ensure that we received it.***

**Please fax the answer key to TLC Western Campus  
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*Please e-mail or fax this survey along with your final exam*

**DISTRIBUTION BASICS CEU COURSE  
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2. Please rate the difficulty of the testing process.

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## Distribution Basics 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 will 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 answer key 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.**

### Groundwater Production and Treatment System Groundwater and Wells

1. According to the text, toxic material spilled or dumped near a well can leach into which of the following terms and contaminate the groundwater drawn from that well?

- A. Unconfined aquifer(s)
- B. Groundwater
- C. Water table
- D. Well(s)
- E. Aquifer
- F. None of the Above

### Contaminated Wells

2. Which of the following terms can be tested to see what chemicals may be in the well and if they are present in dangerous quantities?

- A. Wells
- B. Drinking water
- C. Water table
- D. Soil moisture
- E. Karst
- F. None of the Above

3. Groundwater is withdrawn from wells to provide water when water is pumped from the ground, which of the following terms change in response to this withdrawal?

- A. Dynamics of groundwater flow
- B. Groundwater
- C. Water table
- D. Well(s)
- E. Aquifer
- F. None of the Above

4. Which of the following terms flows slowly through water-bearing formations at different rates?

- A. Well
- B. Drinking water
- C. Water table
- D. Soil moisture
- E. Groundwater
- F. None of the Above

### Aquifer

5. 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. Unconfined aquifer(s)
- B. Groundwater
- C. Water table
- D. Well(s)
- E. Aquifer
- F. None of the Above

6. Above the water table lies the?

- A. Unsaturated zone
- B. Drinking water
- C. Water table
- D. Soil moisture
- E. Karst
- F. None of the Above

7. The entire region below the water table is called the saturated zone and water in this saturated zone is called?
- A. Unconfined aquifer(s)      D. Well(s)  
 B. Groundwater                      E. Aquifer  
 C. Water table                      F. None of the Above
8. Which of the following terms are cracks, joints, or fractures in solid rock, through which groundwater moves?
- A. Fractured aquifer(s)      D. Soil moisture  
 B. Drinking water              E. Karst  
 C. Water table                  F. None of the Above
9. Limestone is often located in which of the following terms?
- A. Unconfined aquifer(s)      D. Fractured aquifer(s)  
 B. Groundwater                  E. Aquifer  
 C. Water table                  F. None of the Above
10. Which of the following terms 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?
- A. Unconfined aquifer(s)      D. Fractured aquifer(s)  
 B. Groundwater                  E. Aquifer  
 C. Porous media                  F. None of the Above
11. Clay has many spaces between its grains, but the spaces are not large enough to permit free movement of water.
- A. True                      B. False
12. Which of the following terms usually flows downhill with the slope of the water table?
- A. Well                      D. Soil moisture  
 B. Drinking water      E. Groundwater  
 C. Water table              F. None of the Above
13. Which of the following terms flow in the aquifers underlying springs or surface drainage basins, and does not always mirror the flow of water on the surface?
- A. Well                      D. Soil moisture  
 B. Drinking water      E. Groundwater  
 C. Water table              F. None of the Above
14. Which of the following terms may move in different directions below the ground than the water flowing on the surface?
- A. Well                      D. Soil moisture  
 B. Drinking water      E. Groundwater  
 C. Water table              F. None of the Above
15. Unconfined aquifers are those that are bounded by the water table. Some aquifers lie beneath layers of impermeable materials.
- A. True                      B. False
16. A well in such as the above question, an aquifer is called an artesian well.
- A. True                      B. False

17. Which of the following terms is the level to which the water in an artesian aquifer will rise?
- A. Unconfined aquifer(s)
  - B. Piezometric surface
  - C. Water table
  - D. Well(s)
  - E. Aquifer
  - F. None of the Above

### **Cone of Depression**

18. When pumping begins, water begins to flow towards the well in contrast to the natural direction of groundwater movement.

- A. True
- B. False

19. The water level in the well falls below the water table in the?

- A. Water table
- B. Groundwater
- C. Surrounding aquifer
- D. Cone of depression
- E. Well
- F. None of the Above

20. The movement of water from \_\_\_\_\_ into a well results in the formation of a cone of depression.

- A. Confined aquifer
- B. An aquifer
- C. Hydrologic cycle
- D. Water table
- E. Unconfined aquifer
- F. None of the Above

21. Which of the following terms describes a three-dimensional inverted cone surrounding the well that represents the volume of water removed as a result of pumping?

- A. Water table
- B. Groundwater
- C. Gravity
- D. Cone of depression
- E. Well
- F. None of the Above

22. 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. Water table
- B. Groundwater
- C. Drawdown
- D. Cone of depression
- E. Well
- F. None of the Above

23. When a well is installed in this missing term, water moves from the aquifer 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. Confined aquifer
- B. Aquifer(s)
- C. Hydrologic cycle
- D. Water table
- E. An unconfined aquifer
- F. None of the Above

### **Where Is Ground Water Stored?**

24. Areas where ground water exists in sufficient quantities to supply wells or springs are called aquifers, a term that literally means?

- A. Water table
- B. Groundwater
- C. Water bearer
- D. Cone of depression
- E. Well
- F. None of the Above

25. 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. Confined aquifer
- B. Aquifer(s)
- C. Hydrologic cycle
- D. Water table
- E. Unconfined aquifer
- F. None of the Above

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

- A. Water table
- B. Groundwater
- C. An aquifer's storage capacity
- D. Cone of depression
- E. Well
- F. None of the Above

27. There are two kinds of aquifers: confined and unconfined.

- A. True
- B. False

28. If the aquifer is sandwiched between layers of relatively impermeable materials, it is called?

- A. Confined aquifer
- B. Aquifer(s)
- C. Hydrologic cycle
- D. Water table
- E. Unconfined aquifer
- F. None of the Above

29. Confined aquifers are not sandwiched between layers of relatively impermeable materials, and their upper boundaries are generally closer to the surface of the land.

- A. True
- B. False

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

- A. Confined aquifer(s)
- B. Aquifer(s)
- C. Hydrologic cycle
- D. Water table
- E. Unconfined aquifer
- F. None of the Above

### **Does Ground Water Move?**

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

- A. Synthetic organic chemical(s)
- B. Differences in pressure
- C. Permeable zones
- D. Ground-water contamination
- E. Septic tanks, cesspools, and privies
- F. None of the Above

32. Ground water can move even more rapidly in karst aquifers, which are areas in which missing term 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. Contaminant(s)
- B. Saturated zone
- C. Karst aquifer(s)
- D. Water soluble limestone
- E. Serious contamination source(s)
- F. None of the Above

### **Ground-Water Quality**

33. The layers of soil and particles of sand, gravel, crushed rocks, and larger rocks were thought to act as filters, trapping contaminants before they could reach the ground water.

- A. True
- B. False

34. We know that some contaminants can pass through all of these filtering layers into which term to contaminate ground water?

- A. Contaminant(s)
- B. Saturated zone
- C. Karst aquifer(s)
- D. Saturated zone
- E. Water table
- F. None of the Above

### How Does Ground Water Become Contaminated?

35. Groundwater contamination can originate on the surface of the ground, in the ground above the water table, or in the ground below the?
- A. Synthetic organic chemical(s)
  - B. Ground water
  - C. Permeable zones
  - D. Ground-water contamination
  - E. Water table
  - F. None of the Above

### Water Use or Demand

36. Water system demand comes from a number of sources including residential, commercial, industrial and public consumers as well as waste and some?
- A. Pressure
  - B. System integrity
  - C. Unavoidable loss
  - D. Unavoidable loss and waste
  - E. Maximum daily use
  - F. None of the Above

37. The combination of storage reservoirs and distribution lines must be capable of meeting consumers' needs for pressure at all times.
- A. True
  - B. False

38. The quantity of water used in any community varies from 100 to 200 gallons per person per day.
- A. True
  - B. False

39. Which of the following terms is desired, that could also represent a rather significant demand upon the system?
- A. Distribution system
  - B. Water pressure
  - C. Fire protection
  - D. Hydropneumatic tanks and surge tanks
  - E. Cavitation
  - F. None of the Above

40. A common design assumption is to use from 100 to 150 gallons per person per day for average domestic use.
- A. True
  - B. False

41. The maximum daily use is approximately 3 to 5 times the average daily use.
- A. True
  - B. False

42. Which of the following terms is usually encountered during the summer months and can vary widely depending on irrigation practices?
- A. Pressure
  - B. System integrity
  - C. Maximum daily use
  - D. Unavoidable loss and waste
  - E. Minimum daily use
  - F. None of the Above

### Water Pressure

43. 2.31 feet of water is equal to 1 psi, or 1 foot of water is equal to about a half a pound (.433 pounds to be exact).
- A. True
  - B. False
44. For ordinary domestic use, water pressure should be between 25 and 45 psi.
- A. True
  - B. False



45. 20 psi is considered the minimum required at any point in the water system, so that which missing term is prevented?

- A. Distribution system
- B. Water pressure
- C. Backflow and infiltration
- D. Hydropneumatic tanks and surge tanks
- E. Cavitation
- F. None of the Above

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

- A. Pressure
- B. System integrity
- C. Gravity
- D. Unavoidable loss and waste
- E. Maximum daily use
- F. None of the Above

### **Storage and Distribution**

#### **Water Storage Facilities**

47. According to the text, there are different types of storage that are used in the water distribution systems, such as stand pipes, elevated tanks and reservoirs, hydropneumatic tanks and?

- A. Distribution system
- B. Water pressure
- C. Fire protection
- D. Surge tanks
- E. Cavitation
- F. None of the Above

#### **Storage Reservoirs**

48. According to the text, it is also recommended that storage reservoirs be located at a high enough elevation to allow the water to flow by \_\_\_\_\_ to the distribution system.

- A. Pressure
- B. System integrity
- C. Gravity
- D. Cross-connection
- E. Maximum daily use
- F. None of the Above

49. According to the text, some storage for \_\_\_\_\_ should be provided.

- A. Fire protection
- B. Reservoir(s)
- C. Steel tank(s)
- D. Cross-connection
- E. Stored water
- F. None of the Above

50. Which of the following terms are also used as detention basins to provide the required chlorine contact time necessary to ensure the adequacy of disinfection?

- A. Baffle(s)
- B. Reservoir(s)
- C. Steel tank(s)
- D. Cross-connection
- E. Stored water
- F. None of the Above

51. Which of the following terms inside the reservoir increase the contact time by preventing the water from leaving the reservoir too quickly?

- A. Baffle(s)
- B. Reservoir(s)
- C. Steel tank(s)
- D. Cross-connection
- E. Stored water
- F. None of the Above

### **Bacteriological Monitoring Section**

#### **Repeat Sampling**

52. Repeat sampling replaces the old check sampling with a more comprehensive procedure to try to \_\_\_\_\_ areas in the system.

- A. Double check the routine sample
- B. Identify problem
- C. Originate the sampling location
- D. Sample
- E. Calculate MCL compliance
- F. None of the Above

53. According to the text, whenever a Routine Sample is total coliform or fecal coliform present, a set of repeat samples must be collected within how many hours after being notified by the laboratory?

- A. 12
- B. 24
- C. 48
- D. 10
- E. 2
- F. None of the Above

54. Samples should be taken elsewhere in the \_\_\_\_\_ or at the wellhead, if necessary.

- A. Sewage system
- B. Surface system
- C. Sampling location
- D. Distribution system
- E. MCL compliance calculation
- F. None of the Above

55. In a very small system if the system has only \_\_\_\_\_, the repeat samples must be collected from the same sampling location over a four-day period or on the same day.

- A. Routine water
- B. Surface water
- C. One sampling location
- D. One service connection
- E. MCL compliance zone
- F. None of the Above

56. If a repeat sample is necessary, all repeat samples are included in?

- A. Routine sample
- B. Surface water
- C. Original sampling location
- D. Sample
- E. MCL compliance calculation
- F. None of the Above

#### **Positive or Coliform Present Results**

57. According to the text, if you are notified of a positive test result you need to contact either the Drinking Water Program or your local county health department within 24 hours, or by the next business day after?

- A. Results are reported to you
- B. Positive violation
- C. Repeat sampling immediately
- D. Sample violation
- E. MCL compliance violation
- F. None of the Above

58. Ideally speaking, your Drinking Water Program Agency should contract with health departments to provide \_\_\_\_\_ to water systems.

- A. Assistance
- B. Harassment
- C. Hostility
- D. Sample help
- E. Compliance calculation
- F. None of the Above

#### **Spread Plate Method**

59. During this method, colonies are on the \_\_\_\_\_ where they can be distinguished readily from particles and bubbles.

- A. Agar surface
- B. Surface growth area
- C. Top
- D. Bottom
- E. Material
- F. None of the Above

#### **Total Coliforms**

60. This MCL is based on the presence of total coliforms, and compliance is on a daily or weekly basis, depending on your water system type and state rule.

- A. True
- B. False

61. For systems that collect fewer than \_\_\_\_\_ samples per month, no more than one sample per month may be positive. In other words, the second positive result (repeat or routine) in a month or quarter results in a MCL violation.

- A. 5
- B. 10
- C. 100
- D. 200
- E. 40
- F. None of the Above

62. For systems that collect \_\_\_\_\_ or more samples per month, no more than five (5) percent may be Positive, check with your state drinking water section or health department for further instructions.

- A. 5
- B. 10
- C. 100
- D. 200
- E. 40
- F. None of the Above

**The following are acute violations:**

63. Which is violation of nitrate?

- A. Presence
- B. MCL
- C. MCLG
- D. Count
- E. Acute violations
- F. None of the Above

**Backflow/Cross-Connection Section**

**What is backflow? Reverse flow condition**

64. Which of the following terms is any temporary or permanent connection between a public water system or consumer's potable water system and any source or system containing nonpotable water or other substances?

- A. Backflow
- B. Backpressure
- C. Backsiphonage
- D. Cross-connection
- E. Indirect connection
- F. None of the Above

65. Which of the following terms is a form of backflow caused by a negative pressure (i.e., a vacuum or partial vacuum) in a public water system or consumer's potable water system?

- A. Backflow
- B. Backpressure
- C. Backsiphonage
- D. Cross-connection
- E. Indirect connection
- F. None of the Above

66. Backflow is the undesirable reversal of flow of non-potable water or other substances through a \_\_\_\_\_ and into the piping of a public water system or consumer's potable water system.

- A. Backflow
- B. Backpressure
- C. Backsiphonage
- D. Cross-connection
- E. Indirect connection
- F. None of the Above

67. The principal types of mechanical backflow preventers are the reduced-pressure principle assembly, the \_\_\_\_\_, and the double check valve assembly.

- A. High hazard installations
- B. Air gap
- C. Vacuum breaker
- D. Backflow
- E. Device or method
- F. None of the Above

68. Which of the following terms can occur when there is a stoppage of water supply due to nearby firefighting, a break in a water main?

- A. Backflow
- B. Backpressure
- C. Backsiphonage
- D. Cross-connection
- E. Indirect connection
- F. None of the Above

69. Which of the following terms is a form of backflow caused by a downstream pressure that is greater than the upstream or supply pressure in a public water system or consumer's potable water system?

- A. Backflow
- B. Backpressure
- C. Backsiphonage
- D. Cross-connection
- E. Indirect connection
- F. None of the Above

70. Which of the following terms can result from an increase in downstream pressure, a reduction in the potable water supply pressure, or a combination of both?

- A. Backflow
- B. Backpressure
- C. Backsiphonage
- D. Cross-connection
- E. Indirect connection
- F. None of the Above

71. Which of the following terms can have two forms-backpressure and backsiphonage?

- A. Backflow
- B. Backpressure
- C. Backsiphonage
- D. Cross-connection
- E. Indirect connection
- F. None of the Above

72. The basic mechanism for preventing backflow is a mechanical \_\_\_\_\_, which provides a physical barrier to backflow.

- A. High hazard installations
- B. Air gap
- C. Backflow preventer
- D. Backflow
- E. Device or method
- F. None of the Above

73. Which of the following terms is a means or mechanism to prevent backflow?

- A. High hazard installations
- B. Air gap
- C. Backflow preventer
- D. Backflow
- E. Device or method
- F. None of the Above

74. According to the text, basic means of preventing backflow is an \_\_\_\_\_, which either eliminates a cross-connection or provides a barrier to backflow.

- A. High hazard installations
- B. Air gap
- C. Backflow preventer
- D. Backflow
- E. Device or method
- F. None of the Above

### **Types of Backflow Prevention Methods and Assemblies**

75. Which of the following terms must either be physically disconnected or have an approved backflow prevention device installed to protect the public water system?

- A. Backflow
- B. Backpressure
- C. Backsiphonage
- D. Cross-connection
- E. Indirect connection
- F. None of the Above

76. The type of device selected for a particular installation depends on several factors.

- A. True
- B. False

77. When the airflow is restricted, such as the case of an air gap located near a wall, the \_\_\_\_\_ separation must be increased.

- A. Open receiving vessel
- B. Backflow preventer
- C. Barrier to backflow
- D. Air gap
- E. Air break
- F. None of the Above

78. An air gap is a physical disconnection between the free flowing discharge end of a potable water pipeline and the top of an?

- A. Open receiving vessel
- B. Backflow preventer
- C. Barrier to backflow
- D. Air gap
- E. Air break
- F. None of the Above

79. Which of the following terms must be at least two times the diameter of the supply pipe and not less than one inch?

- A. Open receiving vessel
- B. Backflow preventer
- C. Barrier to backflow
- D. Air gap
- E. Air break
- F. None of the Above

80. According to the text, an air break is a physical separation between the free flowing discharge end of a potable water supply pipeline, and the overflow rim of an open or non - pressure receiving vessel.

- A. True
- B. False

81. According to the text, air gap separations must be vertically orientated a distance of at least twice the inside diameter of the supply, but never less than?

- A. 1 inch
- B. 2 inches
- C. 3 inches
- D. Backflow
- E. Depends
- F. None of the Above

82. An obstruction around or near an \_\_\_\_\_ may restrict the flow of air into the outlet pipe and nullify the effectiveness of the air gap to prevent backsiphonage.

- A. High hazard installations
- B. Backflow preventer
- C. Barrier to backflow
- D. Air gap
- E. Air break
- F. None of the Above

83. An air gap is acceptable for \_\_\_\_\_ and is theoretically the most effective protection.

- A. High hazard installations
- B. Backflow preventer
- C. Barrier to backflow
- D. Low pollutional hazards
- E. High pollutional concerns
- F. None of the Above

### **Vacuum Breakers**

84. Which of the following terms can have atmospheric and pressure types?

- A. Downstream piping
- B. Atmospheric vacuum breakers
- C. Vacuum breaker(s)
- D. Hazard application(s)
- E. Backflow preventor(s)
- F. None of the Above

### **Water Distribution System Design and Valves**

#### **System Elements**

85. Booster stations are used to \_\_\_\_\_ from storage tanks for low-pressure mains.

- A. Increase water pressure
- B. Equalize
- C. Complete gridiron system
- D. Boost flow
- E. Provide a reserve pressure
- F. None of the Above

86. Valves control the flow of water in the distribution system by isolating areas for repair or by?

- A. Increase water pressure
- B. Bypasses
- C. Complete gridiron system
- D. Main line isolation
- E. Regulating system flow or pressure.
- F. None of the Above

87. According to the text, Gate valves should be used in the \_\_\_\_\_ for main line isolation.

- A. Increase water pressure
- B. Distribution tree
- C. Complete gridiron system
- D. Distribution system
- E. Arterial system
- F. None of the Above

88. Distribution mains function is to carry water from the water source or treatment works to users, these are the pipelines that make up the?

- A. Increase water pressure
- B. Distribution tree
- C. Complete gridiron system
- D. Distribution system
- E. Arterial system
- F. None of the Above

89. Arterial mains are interconnected with smaller distribution mains to form a complete gridiron system and are for?

- A. Increasing water pressure
- B. Tree system
- C. Complete gridiron system
- D. Distribution mains of large size
- E. Fire protection
- F. None of the Above

### Water Distribution Valves

90. One purpose of installing shutoff valves in water mains at various locations within the distribution system is to allow sections of the system to be \_\_\_\_\_ or provide maintenance without significantly curtailing service over large areas.

- A. Feeders as practical
- B. Adjust the pressure
- C. Open or close the valve
- D. Curtail the service
- E. Taken out of service for repairs
- F. None of the Above

91. According to the text, at intersections of distribution mains, the number of valves required is normally one less than the number of?

- A. Ties
- B. Depends
- C. Radiating mains
- D. Throttling purposes
- E. Standardizes
- F. None of the Above

92. All buried small- and medium-sized valves should be installed in the sidewalk.

- A. True
- B. False

### Ball Valves

93. Most ball valves require only a 180-degree turn to either completely open or close the valve.

- A. True
- B. False

### Valve Exercising

94. Valve exercising should be done to locate inoperable due to freezing or build-up of rust or corrosion and done once per year to detect \_\_\_\_\_ and to prevent valves from becoming

- A. Malfunctioning valves
- B. Dependability
- C. Repair or replacement
- D. Minimum flow restriction
- E. Stops or allows
- F. None of the Above

95. A valve inspection should include drawing valve location maps to show distances to the \_\_\_\_\_ from specific reference.

- A. Valve(s)
- B. Stoneline
- C. Monument
- D. House
- E. Telephone pole
- F. None of the Above

96. Service connections are used to \_\_\_\_\_ or other plumbing systems to the distribution system mains.
- A. Be isolated
  - B. Connect individual buildings
  - C. By laying out
  - D. Limits the expansion
  - E. Decreases in size
  - F. None of the Above

### Common Rotary Valves

97. Globe valve, a rotary valve is rare to find in most distribution systems, but can be found at treatment plants.
- A. True
  - B. False
98. Most Globes have compact OS & Y type, bolted bonnet, rising stems, with renewable seat rings.
- A. True
  - B. False

### System Layouts

#### Tree System

99. Newer water systems are frequently expanded with planning and developed into a tree-like system.
- A. True
  - B. False
100. The Tree system consists of a single main that \_\_\_\_\_ as it leaves the source and progresses through the area originally served.
- A. Be isolated
  - B. Connect individual buildings
  - C. By laying out
  - D. Limits the expansion
  - E. Decreases in size
  - F. None of the Above
101. Smaller pipelines \_\_\_\_\_ the main and divide again, much like the trunk and branches of a tree.
- A. Branch off
  - B. Are manifolded to
  - C. Connect
  - D. Limit the expansion
  - E. Decrease
  - F. None of the Above
102. According to the text, there are several advantages gained by laying out water mains in a loop or grid, with feeder and distributor mains interconnecting at roadway intersections and other regular intervals.
- A. True
  - B. False

### Friction Loss

103. The damaged section can be isolated and the remainder of the system will still carry pressure, water will not be distributed if a single section fails.
- A. True
  - B. False
104. During periods of peak fire flow demand, there will be less impact from \_\_\_\_\_ in water mains as the velocity within any given section of main.
- A. Carrying capacity
  - B. Friction loss
  - C. Pressure
  - D. Static pressure
  - E. Total pressure
  - F. None of the Above

## Stage 2 DBP Rule Federal Register Notices

105. Which of the following rules is part of the Microbial and Disinfection Byproducts Rules, which are a set of interrelated regulations that address risks from microbial pathogens and disinfectants/disinfection byproducts?

- A. Groundwater Rule (GWR)
- B. Compliance
- C. The Stage 2 DBP rule
- D. Long Term 2 Enhanced Surface Water Treatment Rule (LT2)
- E. Interim Enhanced Surface Water Treatment Rule
- F. None of the Above

106. Which of the following rules focuses on public health protection by limiting exposure to DBPs, specifically total trihalomethanes and five haloacetic acids, which can form in water through disinfectants used to control microbial pathogens?

- A. Stage 2 DBPR
- B. DBP exposure
- C. The Stage 2 DBP rule
- D. Long Term 2 Enhanced Surface Water Treatment Rule
- E. Traditional disinfection practices
- F. None of the Above

107. The Stage 1 Disinfectants and Disinfection Byproducts Rule and \_\_\_\_\_, promulgated in December 1998.

- A. Major public health advances
- B. The Stage 2 DBPR
- C. This final rule
- D. Amendments to the SDWA in 1996
- E. Interim Enhanced Surface Water Treatment Rule
- F. None of the Above

### Who must comply with the rule?

108. Entities potentially regulated by this missing term are community and nontransient noncommunity water systems that produce and/or deliver water that is treated with a primary or residual disinfectant other than ultraviolet light.

- A. DBPs from chlorination
- B. Chlorine and chloramine
- C. Stage 2 DBPR
- D. Classes of DBPs
- E. TTHM and HAA5
- F. None of the Above

### Microbial Regulations

109. One of the key regulations developed and implemented by the United States Environmental Protection Agency (USEPA) to counter pathogens in drinking water is the Surface Water Treatment Rule which requires that a public water system, using surface water (or ground water under the direct influence of surface water) as its source, have sufficient treatment to reduce the source water concentration of Giardia and viruses by at least 99.9% and 99.99%, respectively.

- A. True
- B. False

110. Which rule specifies treatment criteria to assure that these performance requirements are met; they include turbidity limits, disinfectant residual, and disinfectant contact time conditions?

- A. Long Term 1 Rule
- B. Maximum Contaminant Level Goal (MCLG)
- C. Stage 1 Byproducts Rule
- D. Surface Water Treatment Rule
- E. Interim Enhanced Surface Water
- F. None of the Above

111. Which rule was established to maintain control of pathogens while systems lower disinfection byproduct levels to comply with the Stage 1 Disinfectants/Disinfection Byproducts Rule and to control Cryptosporidium?

- A. Long Term 1 Enhanced Surface Water Treatment Rule
- B. Maximum Contaminant Level Goal (MCLG)
- C. Stage 1 Disinfectants/Disinfection Byproducts Rule
- D. Surface Water Treatment Rule
- E. Interim Enhanced Surface Water Treatment Rule
- F. None of the Above



**Chlorine Section**  
**Pathophysiology**

112. As far as chlorine safety and respiratory protection, the intermediate \_\_\_\_\_ of chlorine accounts for its effect on the upper airway and the lower respiratory tract.

- A. Generation of free oxygen radicals
- B. Vapor from Chlorine gas
- C. Effects of Hydrochloric acid
- D. Water solubility
- E. The odor threshold for chlorine
- F. None of the Above

113. According to the text, respiratory exposure to \_\_\_\_\_ may be prolonged because its moderate water solubility may not cause upper airway symptoms for several minutes.

- A. Hydrochloric acid
- B. Chlorine gas
- C. The gas
- D. The chemical species produced
- E. Plasma exudation
- F. None of the Above

**Mechanism of Activity**

114. The mechanisms of cellular injury are believed to result from the oxidation of functional groups in cell components, from reactions with tissue water to form \_\_\_\_\_, and from the generation of free oxygen radicals.

- A. Generation of free oxygen radicals
- B. Chlorine acid
- C. Hydrochloric acid
- D. A caustic effect
- E. Hypochlorous and hydrochloric acid
- F. None of the Above

115. Chlorine gas feeds out of the cylinder through a gas regulator. The cylinders are on a scale that operators use to measure the amount used each day. The chains are used to prevent the tanks from falling over.

- A. True
- B. False

**Solubility Effects**

116. Which of the following terms is highly soluble in water?

- A. Hydrochloric acid
- B. H<sub>2</sub>SO<sub>4</sub>
- C. Hypochloric acid
- D. Sodium hypochlorite solution
- E. Sulfuric Acid
- F. None of the Above

117. Because it is highly water soluble, Hypochlorous acid has an injury pattern similar to?

- A. Hydrochloric acid
- B. H<sub>2</sub>SO<sub>4</sub>
- C. Hypochloric acid
- D. Sodium hypochlorite solution
- E. Sulfuric Acid
- F. None of the Above

**Early Response to Chlorine Gas**

118. If you mix ammonia with chlorine gas, this compound reacts to form?

- A. Hypochlorous acid
- B. Chlorine gas
- C. Hydrochloric acid
- D. Sulfuric acid
- E. Chloramine gas
- F. None of the Above

**Chemistry of Chlorination**

119. The hypochlorite ion is a much weaker disinfecting agent than hypochlorous acid, about 100 times less effective.

- A. True
- B. False

120. According to the text, pH and temperature affect the ratio of hypochlorous acid to hypochlorite ions. As the temperature is decreased, the \_\_\_\_\_ increases.  
A. Reduction Ratio                      D. "CT" disinfection concept  
B. CT actual                                E. Ratio of hypochlorous acid  
C. Free chlorine residual                F. None of the Above

121. Under normal water conditions, hypochlorous acid will also chemically react and break down into the hypochlorite ion.  
A. True                      B. False

122. Temperature plays a small part in the acid ratio. Although the ratio of \_\_\_\_\_ is greater at lower temperatures, pathogenic organisms are actually harder to kill.  
A. Hypochlorous acid                      D. Total chlorine  
B. The amount of chlorine                E. pH value and temperature  
C. Chlorine Demand                        F. None of the Above

### Types of Residual

123. \_\_\_\_\_ is all the chlorine that is available for disinfection.  
A. Chlorine residual                      D. Break-point chlorination  
B. Chlorine demand                        E. Total chlorine  
C. Free chlorine                              F. None of the Above

124. Total chlorine residual = free + \_\_\_\_\_.  
A. Chlorine residual                      D. Combined chlorine residual  
B. Chlorine demand                        E. Total chlorine residual  
C. Free chlorine                              F. None of the Above

125. In water, there are always other substances (interfering agents) such as iron, manganese, turbidity, etc., which will combine chemically with the chlorine, these substances are called the?  
A. Chlorine residual                      D. Break-point chlorination  
B. Chlorine demand                        E. Total chlorine residual  
C. Pathogen reduction                      F. None of the Above

126. According to the text, once chlorine molecules are combined with these interfering agents, they are not capable of disinfection. Which term is much more effective as a disinfecting agent?  
A. Chlorine residual                      D. Break-point chlorination  
B. Chlorine demand                        E. Total chlorine residual  
C. Free chlorine                              F. None of the Above

### Residual Concentration/Contact Time (CT) Requirements

127. Since monitoring for very low levels of pathogens in treated water is analytically very difficult, utilizing the \_\_\_\_\_ is recommended to demonstrate satisfactory treatment.  
A. Free chlorine                              D. "CT" disinfection concept  
B. Total residual                              E. T10 of the process unit  
C. Free chlorine residual                      F. None of the Above

128. The CT concept as developed by the United States Environmental Protection Agency (uses the combination of disinfectant residual concentration (mg/L) and the effective disinfection contact time (in minutes) to measure effective pathogen reduction.  
A. True                      B. False

### Calculation and Reporting of CT Data

129. Reduction Ratio should be reported, along with the appropriate pH, temperature, and?

- A. Reduction Ratio
- B. CT actual
- C. Free chlorine residual
- D. Disinfectant residual
- E. T10 of the process unit
- F. None of the Above

### Chlorine (DDBP)

130. These term means that chlorine is present as Cl, HOCl, and  $\text{OCl}^-$  is called \_\_\_\_\_, and that which is bound but still effective is \_\_\_\_\_.

- A. Free available chlorine and Total
- B. Free and Residual
- C. Break point and Free
- D. Free available chlorine and Combined Chlorine
- E. Combined chlorine and Readily available
- F. None of the Above

131. Chloramines are formed by reactions with?

- A. Acid and  $\text{Cl}_2$
- B. Ammonia and  $\text{Cl}_2$
- C. THMS and  $\text{Cl}_2$
- D. Folic Acid and  $\text{Cl}_2$
- E. THMs and Haploidic acid
- F. None of the Above

132. While testing chlorine disinfection process, you will need to understand one especially important feature is the ease of overdosing to create a "\_\_\_\_\_ " concentration.

- A. Free available chlorine and Total
- B. Residual
- C. Break point and Free
- D. Free available chlorine and Combined Chlorine
- E. Combined chlorine and readily available
- F. None of the Above

133. According to the text, this type of chlorine residual concentration residuals from 0.1 to 0.5 ppm.

- A. Free available chlorine and Total
- B. Residual
- C. Break point and Free
- D. Free available
- E. Combined chlorine and readily available
- F. None of the Above

134. A typical chlorine residual is 2 ppm for this type of chlorine residual?

- A. Free available chlorine and Total
- B. Residual
- C. Break point and Free
- D. Combined Chlorine
- E. Combined chlorine and readily available
- F. None of the Above

### Chlorine By-Products

135. The most common chlorination by-products found in U.S. drinking water supplies are?

- A. Chlorate and Chlorite
- B.  $\text{CO}_2$  and  $\text{H}_2\text{SO}_4$
- C. Trihalomethanes (THMs)
- D. Ammonia and THMS
- E. Chloramines
- F. None of the Above

### The Principal Trihalomethanes are:

136. Chloroform, bromodichloromethane, chlorodibromomethane, and bromoform. Other less common chlorination by-products include the haloacetic acids and haloacetonitriles. The amount of THMs formed in drinking water can be influenced by a number of factors, including the season and the source of the water.

- A. True
- B. False

## Alternate Disinfectants Section Summary

### Chloramines

137. Which compound is a very weak disinfectant for Giardia and virus reduction? It is recommended that it be used in conjunction with a stronger disinfectant. It is best utilized as a stable distribution system disinfectant.

- A. Chlorine
- B. Chloramine
- C. Ozone
- D. Oxygen and nascent oxygen
- E. Strongest oxidizing agent
- F. None of the Above

138. In the production of chloramines, the ammonia residuals in the finished water, when fed in excess of stoichiometric amount needed, should be limited to inhibit growth of?

- A. Cryptosporidium
- B. Chlorine-based disinfectants
- C. Giardia lamblia
- D. An emerging parasitic protozoan pathogen
- E. Nitrifying bacteria
- F. None of the Above

### Chlorine Dioxide

139. Chlorine dioxide may be used for either taste and odor control or as?

- A. Post disinfectant
- B.  $\text{ClO}_2$ /chlorite/chlorate
- C. An oxidant
- D. Total residual oxidants
- E. A pre-disinfectant
- F. None of the Above

140. Total residual oxidants (including \_\_\_\_\_, but excluding chlorate) shall not exceed 0.30 mg/L during normal operation or 0.50 mg/L (including chlorine dioxide, chlorite and chlorate) during periods of extreme variations in the raw water supply.

- A. Pre-disinfectant
- B.  $\text{ClO}_2$ /chlorite/chlorate
- C. An oxidant
- D. Chlorine dioxide and chlorite
- E. 25% aqueous solution of sodium chlorite ( $\text{NaClO}_2$ )
- F. None of the Above

## Pump, Motor and Hydraulic Section

### Common Hydraulic Terms

141. Which of the following terms includes the study of liquids in motion, is concerned with such matters as friction and turbulence generated in pipes by flowing liquids?

- A. Pressure
- B. Hydrostatics
- C. Hydrokinetics
- D. Hydraulics
- E. Flow
- F. None of the Above

142. Which of the following terms is about the pressures exerted by a fluid at rest?

- A. Pressure
- B. Hydrostatics
- C. Hydrokinetics
- D. Hydraulics
- E. Flow
- F. None of the Above

143. Which of the following terms is an excellent example of deductive mathematical physics, and in which the predictions agree closely with experiment?

- A. Pressure
- B. Hydrostatics
- C. Hydrokinetics
- D. Hydraulics
- E. Flow
- F. None of the Above

144. Which of the following terms is stated in that, a fluid is a substance that cannot resist a shearing stress, so that pressures are normal to confining surfaces?

- A. Pressure
- B. Hydrostatics
- C. Hydrokinetics
- D. Hydraulics
- E. Flow
- F. None of the Above

145. According to the text, hydraulics may be the physical property that varies over the largest numerical range, competing with electrical resistivity.

- A. True      B. False

### General Pumping Fundamentals

146. Important points to consider about suction piping when the liquid being pumped is below the level of the pump: Sometimes suction lift is also referred to as 'positive suction head'.

- A. True      B. False

147. According to the text, suction lift is when the level of water to be pumped is below the?

- A. Impeller                      D. Centerline of the pump  
B. Suction                        E. Bellows  
C. Lift water                      F. None of the Above

148. According to the text, the ability of the pump to lift water is the result of a partial vacuum created at the?

- A. Partial vacuum                      D. Pressure differential  
B. Suction lift                            E. Negative suction head  
C. Center of the pump                      F. None of the Above

149. The suction side of pipe should be one diameter smaller than the pump inlet.

- A. True      B. False

150. The required eccentric reducer should be turned so that the top is flat and the bottom tapered.

- A. True      B. False

### Pump Definitions

151. Which of the following definitions is a barrier that separates stages of a multi-stage pump?

- A. Gasket                              D. Inter-stage diaphragm  
B. Keyway                              E. Seal  
C. Bearing                              F. None of the Above

152. Which of the following definitions is a flat material that is compressed between two flanges to form a seal?

- A. Gasket                              D. Seal  
B. Keyway                              E. Bond  
C. Packing                              F. None of the Above

153. Which of the following definitions is a line that directs sealing fluid to the stuffing box?

- A. Leak-off                              D. Lantern ring  
B. Gland sealing line                      E. Gland follower  
C. Horizontal line                      F. None of the Above

### Pumps

154. Pumps are excellent examples of?

- A. Hydrostatics                      D. Multi-stage pumps  
B. Quasi-static                      E. Complicated part  
C. Oscillating diaphragm                      F. None of the Above

155. Pumps are of two general types, \_\_\_\_\_ or positive displacement pumps, and pumps depending on dynamic forces, such as centrifugal pumps.
- A. Hydrostatic
  - B. Quasi-static
  - C. Oscillating diaphragm
  - D. Hydrostatic considerations
  - E. Complicated part
  - F. None of the Above

156. Positive displacement pumps have a piston (or equivalent) moving in a closely-fitting cylinder and forces are exerted on the fluid by motion of the piston.
- A. True
  - B. False

157. More complicated pumps have valves check valves that open to allow \_\_\_\_\_, and close automatically to prevent reverse flow.
- A. Pistons
  - B. Diaphragms
  - C. Discharged fluid
  - D. Passage in one direction
  - E. Lift pumps
  - F. None of the Above

### **Pump Categories**

158. The key to understanding a pumps operation is that a pump is to move water and generate the \_\_\_\_\_ we call pressure.
- A. Centrifugal pump(s)
  - B. Impeller blade(s)
  - C. Delivery force
  - D. Diaphragm pump(s)
  - E. Cylindrical pump housing
  - F. None of the Above

159. Pump operation like with a centrifugal pump — pressure is not referred to in pounds per square inch but rather as the equivalent in elevation, called?
- A. Inward force
  - B. Head
  - C. Viscous drag pump
  - D. Center of the impeller
  - E. Incompressible fluid
  - F. None of the Above

160. According to the text, pumps may be classified based on the application they serve.
- A. True
  - B. False

161. According to the text, all pumps may be divided into two major categories: (1) dynamic and (2)?
- A. Centrifugal
  - B. Impeller
  - C. Displacement
  - D. Diaphragm
  - E. Rotary
  - F. None of the Above

### **Basic Water Pump**

162. According to the text, the centrifugal pumps work by spinning water around in a circle inside a?
- A. Vortex
  - B. Cylinder
  - C. Viscous drag pump
  - D. Center of the impeller
  - E. Cylindrical pump housing
  - F. None of the Above

163. The pump makes the water spin by pulling it with an impeller.
- A. True
  - B. False

164. According to the text, without an inward force, an object will travel in a straight line and will not complete the?
- A. Circle
  - B. Pump pushes
  - C. Viscous drag pump
  - D. Center of the impeller
  - E. Incompressible fluid
  - F. None of the Above

165. In a centrifugal pump, the inward force is provided by high-pressure water near the outer edge of the?

- A. Centrifugal pump(s)
- B. Impeller blade(s)
- C. Pump housing
- D. Diaphragm pump(s)
- E. Cylindrical pump housing
- F. None of the Above

166. In the operation of the pump, the water at the edge of the \_\_\_\_\_ inward on the water between the impeller blades and makes it possible for that water to travel in a circle.

- A. Inward force
- B. Pump pushes
- C. Viscous drag pump
- D. Center of the impeller
- E. Incompressible fluid
- F. None of the Above

167. In the operation of the pump, when water is actively flowing through the pump, arriving through a hole near the center of the impeller and leaving through a \_\_\_\_\_ near the outer edge of the pump housing, the pressure rise between center and edge of the pump is not as large.

- A. Centrifugal pump(s)
- B. Impeller blade(s)
- C. Hole
- D. Diaphragm pump(s)
- E. Cylindrical pump housing
- F. None of the Above

**Venturi (Bernoulli's law):**

168. A venturi is a pipe that has a gradual restriction that opens up into a gradual enlargement.

- A. True
- B. False

169. The area of the restriction in a venture will have a \_\_\_\_\_ than the enlarged area ahead of it.

- A. Inward force
- B. Lower pressure
- C. Viscous drag pump
- D. Center of the impeller
- E. Incompressible fluid
- F. None of the Above

170. Which of the following terms best describes a pump whose impeller has no vanes but relies on fluid contact with a flat rotating plate turning at high speed to move the liquid?

- A. Submersible
- B. Blower
- C. Viscous drag pump
- D. Rotary pump
- E. Bicycle pump
- F. None of the Above

**Types of Water Pumps**

171. The water production well industry almost exclusively uses Turbine pumps, which are a type of centrifugal pump.

- A. True
- B. False

172. The most common type of water pumps used for municipal and domestic water supplies are?

- A. Axial flow
- B. Submersible
- C. Rotary pump
- D. Turbine pump(s)
- E. Variable displacement pumps
- F. None of the Above

173. Which of the following terms will produce at different rates relative to the amount of pressure or lift the pump is working against?

- A. Variable displacement pump
- B. Drive shaft
- C. Column pipe
- D. Single or multiple bowls
- E. Pump's lifting capacity
- F. None of the Above

174. Impellers are rotated by the pump motor, which provides the \_\_\_\_\_ needed to overcome the pumping head.

- A. Spider bearing(s)
- B. Horsepower
- C. Impeller(s)
- D. Turbine pump(s)
- E. Desired pumping rate
- F. None of the Above

175. The size and number of stages, horsepower of the motor and \_\_\_\_\_ are the key components relating to the pump's lifting capacity.

- A. Pumping head
- B. Drive shaft
- C. Column pipe
- D. Single or multiple bowls
- E. Pump's lifting capacity
- F. None of the Above

176. Which of the following terms are variable displacement pumps that are by far used the most?

- A. Axial flow
- B. Submersible
- C. Rotary pump
- D. Turbine pump(s)
- E. Centrifugal pumps
- F. None of the Above

177. According to the text, the turbine pump utilizes impellers enclosed in single or multiple bowls or stages to?

- A. Lift water
- B. Drive shaft
- C. Column pipe
- D. Single or multiple bowls
- E. Pump's lifting capacity
- F. None of the Above

178. Vertical turbine pumps are commonly used in groundwater wells. These pumps are driven by a shaft rotated by a motor on the surface.

- A. True
- B. False

179. The shaft turns the impellers within the pump housing while the?

- A. Spider bearing(s)
- B. Horsepower turns the shaft
- C. Impeller(s)
- D. Water moves up the column
- E. Desired pumping rate is obtained
- F. None of the Above

180. The rotating shaft in a line shaft turbine is actually housed within the column pipe that delivers the water to the surface.

- A. True
- B. False

181. The size of the \_\_\_\_\_ are selected based on the desired pumping rate and lift requirements.

- A. Spider bearing(s)
- B. Horsepower
- C. Impeller(s)
- D. Column, impeller, and bowls
- E. Desired pumping rate
- F. None of the Above

182. According to the text, column pipe sections can be threaded or coupled together while the drive shaft is coupled and suspended within the column by?

- A. Oil tube
- B. Spider bearings
- C. Column pipe
- D. Single or multiple bowls
- E. Pump's lifting capacity
- F. None of the Above

183. The water passing through the column pipe serves as the lubricant for the bearings.

- A. True
- B. False



184. Which of the following terms, provide both a seal at the column pipe joints and keep the shaft aligned within the column?

- A. Spider bearing(s)
- B. Keyway
- C. Impeller(s)
- D. Roller bearings
- E. Lantern rings
- F. None of the Above

185. Some vertical turbines are lubricated by oil rather than water. These pumps are essentially the same as \_\_\_\_\_; only the drive shaft is enclosed within an oil tube.

- A. Oil tube
- B. Water lubricated units
- C. Column pipe
- D. Single or multiple bowls
- E. Pump's lifting capacity
- F. None of the Above

### Key Pump Words

186. Which of the following key terms is a measure of a liquid's resistance to flow. i.e.: how thick it is?

- A. NPSH
- B. Specific Speed
- C. Viscosity
- D. S.G.: Specific gravity
- E. Vapor Pressure
- F. None of the Above

187. Which of the following key terms is the weight of liquid in comparison to water at approx. 20 degrees C?

- A. NPSH
- B. Specific Speed
- C. Viscosity
- D. S.G.: Specific gravity
- E. Vapor Pressure
- F. None of the Above

188. Which of the following key terms is a number that is the function of pump flow, head, efficiency?

- A. NPSH
- B. Specific Speed
- C. Viscosity
- D. S.G.: Specific gravity
- E. Vapor Pressure
- F. None of the Above

189. Which of the following key terms determines the type of pump used, the speed it can run at, and with gear pumps, the internal clearances required?

- A. NPSH
- B. Specific Speed
- C. Viscosity
- D. S.G.: Specific gravity
- E. Vapor Pressure
- F. None of the Above

190. Which of the following key terms is the amount of pressure / head required to 'force' liquid through pipe and fittings?

- A. NPSH
- B. Specific Speed
- C. Viscosity
- D. Friction Loss
- E. Vapor Pressure
- F. None of the Above

191. Which of the following key terms is related to how much suction lift a pump can achieve by creating a partial vacuum?

- A. NPSH
- B. Specific Speed
- C. Viscosity
- D. S.G.: Specific gravity
- E. Vapor Pressure
- F. None of the Above

192. Which of the following key terms is related to how a liquid is greater than the surrounding air pressure, the liquid will boil?

- A. NPSH
- B. Specific Speed
- C. Viscosity
- D. S.G.: Specific gravity
- E. Vapor Pressure
- F. None of the Above

### D-C Motors

193. The important characteristic of the D-C motor is that its speed will not vary with the amount of current used.

- A. True
- B. False

194. There are many different kinds of D-C motors, depending on how they are wound and their totally enclosed motors.

- A. True
- B. False

### A-C Motors

195. The synchronous type of A-C motor is used in smaller horsepower sizes, usually above 100 HP.

- A. True
- B. False

196. There are a number of different types of alternating current motors, such as Synchronous, Induction, wound rotor, and?

- A. Bubblers pipe
- B. Manual pump controls
- C. Wound rotor type
- D. Totally enclosed motors
- E. Squirrel cage
- F. None of the Above

197. Which of the following terms of A-C motor requires complex control equipment, since they use a combination of A-C and D-C?

- A. Heat generated
- B. Synchronous type
- C. Motor(s)
- D. Speed/torque characteristics
- E. Full voltage or reduced voltage
- F. None of the Above

### Motor Starters

198. All electric motors, except very large ones are equipped with starters, either full voltage or reduced voltage.

- A. True
- B. False

199. Motors draw a much higher current when they are \_\_\_\_\_.

- A. Heat generated
- B. Synchronous type
- C. Motor(s)
- D. Starting and gaining speed
- E. Full voltage or reduced voltage
- F. None of the Above

200. The purpose of the \_\_\_\_\_ is to prevent the load from coming on until the amperage is low enough.

- A. Bubblers pipe
- B. Manual pump controls
- C. Reduced voltage starter
- D. Totally enclosed motors
- E. Reduced voltage starter
- F. None of the Above