

**Registration form**

**PIPE-FITTING CEU 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** \_\_\_\_\_

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

**Address** \_\_\_\_\_

**City** \_\_\_\_\_ **State** \_\_\_\_\_ **Zip** \_\_\_\_\_

**Email** \_\_\_\_\_ **Fax ( )** \_\_\_\_\_

**Phone:**  
**Home ( )** \_\_\_\_\_ **Work ( )** \_\_\_\_\_

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

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

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

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

Collections \_\_\_ Wastewater Treatment \_\_\_\_\_

**Technical Learning College**

PO Box 420, Payson AZ 85547-0420

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Telephone (928) 468-0665 Toll Free (866) 557-1746

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**Visa or MasterCard #** \_\_\_\_\_ **Exp. Date** \_\_\_\_\_

**If you've paid on the Internet, Please write your customer#** \_\_\_\_\_

**Please invoice me, PO#** \_\_\_\_\_

***We will stop mailing the certificate of completion we need your e-mail address.  
We will e-mail the certificate to you, if no e-mail address; we will mail it to you.***

## **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 also understand that this type of study program deals with dangerous conditions and that I will not hold Technical Learning College, Technical Learning Consultants, Inc. (TLC) liable for any errors or omissions or advice contained in this CEU education training course or for any violation or injury caused by this CEU education training course material. I will 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.

**State Approval Listing Link**, check to see if your State accepts or has pre-approved this course. Not all States are listed. Not all courses are listed. If the course is not accepted for CEU credit, we will give you the course free if you ask your State to accept it for credit.

**Professional Engineers;** Most states will accept our courses for credit but we do not officially list the States or Agencies. Please check your State for approval.

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

<http://www.tlch2o.com/PDF/CEU%20State%20Approvals.pdf>

*You can obtain a printed version of the course manual from TLC for an additional \$79.95 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.

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.

# Pipe-fitting Answer Key

Name \_\_\_\_\_

Phone# \_\_\_\_\_

Please Circle, Bold, Underline or X, one answer per question.

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| 153. A B C D E | 178. A B C D E |                |

Please fax the answer key to  
TLC Western Campus Fax (928) 272-0747  
Backup Fax (928) 468-0675

Always call us after faxing the paperwork to ensure that we've received it.

**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. Thank you...

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

**PIPE-FITTING CEU COURSE  
CUSTOMER SERVICE RESPONSE CARD**

NAME : \_\_\_\_\_

E-MAIL \_\_\_\_\_ PHONE \_\_\_\_\_

**PLEASE COMPLETE THIS FORM BY CIRCLING THE NUMBER OF THE APPROPRIATE ANSWER IN THE AREA BELOW.**

1. Please rate the difficulty of your course.  
Very Easy 0 1 2 3 4 5 Very Difficult

2. Please rate the difficulty of the testing process.  
Very Easy 0 1 2 3 4 5 Very Difficult

3. Please rate the subject matter on the exam to your actual field or work.  
Very Similar 0 1 2 3 4 5 Very Different

4. How did you hear about this Course? \_\_\_\_\_

5. What would you do to improve the Course?

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How about the price of the course?

Poor\_\_\_\_ Fair \_\_\_\_ Average \_\_\_\_ Good\_\_\_\_ Great\_\_\_\_

How was your customer service?

Poor\_\_\_\_ Fair \_\_\_\_ Average \_\_\_\_ Good \_\_\_\_ Great\_\_\_\_

Any other concerns or comments.

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## Pipefitting CEU Training Course Assignment

The Pipefitting CEU course assignment is 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 receipt of this manual to complete it in order to receive your Professional Development Hours (**PDHs**) or Continuing Education Unit (**CEU**). A score of 70 % or better is necessary to pass this course. If you should need any assistance, please email or fax all concerns and the completed **ANSWER KEY** to [info@tlch2o.com](mailto:info@tlch2o.com).

Select one answer per question.

### Water Supply System

1. A house's water supply may come from a private well or a \_\_\_\_\_ that connects to a city water main. In most cases, either water source is located in the basement/crawlspace.
  - A. Hot water heater
  - B. City water main
  - C. City-owned lines
  - D. Service pipe
  - E. None of the Above
2. A house with a \_\_\_\_\_ utilizes a pump to push water up into a pressure tank where it is stored for use. When the tank empties, the pump is reactivated to fill the tank,
  - A. Hot water heater
  - B. Private well
  - C. City-owned lines
  - D. Incoming line
  - E. None of the Above
3. A house with city water has a "live" water supply line that's connected to a water main and a water meter. The \_\_\_\_\_ is usually the dividing point between the city-owned lines and the homeowner's lines.
  - A. Meter
  - B. City water main
  - C. City-owned lines
  - D. Incoming line
  - E. None of the Above
4. Both systems usually have a 1/2" or larger copper pipe that enters through the basement floor or wall. The line has a \_\_\_\_\_ located near the beginning of the incoming line so the water supply can be stopped in case of repairs or an emergency.
  - A. Hot water heater
  - B. City water main
  - C. Shut-off valve
  - D. Incoming line
  - E. None of the Above

5. \_\_\_\_\_ are made of copper, CPVC (chlorinated polyvinyl chloride) plastic, or in older homes possibly galvanized steel.
- A. Hot water heater
  - B. City water main
  - C. City-owned lines
  - D. Water supply lines
  - E. None of the Above
6. Cold water lines branch out from the \_\_\_\_\_, while hot water lines originate from the hot water heater.
- A. Hot water heater
  - B. Main pipe
  - C. City-owned lines
  - D. Incoming line
  - E. None of the Above

#### System Elements

The elements of a water distribution system include distribution mains, arterial mains, storage reservoirs, and system accessories. These elements and accessories are described as follows:

7. Distribution mains are the pipelines that make up the \_\_\_\_\_. Their function is to carry water from the water source or treatment works to users.
- A. Increase water pressure
  - B. Open or close
  - C. Complete gridiron system
  - D. Distribution system
  - E. None of the Above
8. Arterial mains are \_\_\_\_\_. They are interconnected with smaller distribution mains to form a complete gridiron system.
- A. Increase water pressure
  - B. Open or close
  - C. Complete gridiron system
  - D. Distribution mains of large size
  - E. None of the Above
9. Storage reservoirs are structures used to store water. They also \_\_\_\_\_ the supply or pressure in the distribution system. A common example of a storage reservoir is an aboveground water storage tank.
- A. Increase water pressure
  - B. Equalize
  - C. Complete gridiron system
  - D. Main line isolation
  - E. None of the Above
10. Booster stations are used to \_\_\_\_\_ from storage tanks for low-pressure mains.
- A. Increase water pressure
  - B. Open or close
  - C. Complete gridiron system
  - D. Main line isolation
  - E. None of the Above

11. Valves control the flow of water in the distribution system by isolating areas for repair or by \_\_\_\_\_

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

12. Gate valves should be used in the \_\_\_\_\_ for main line isolation.

- A. Increase water pressure
- B. Distribution system
- C. Complete gridiron system
- D. Main line isolation
- E. None of the Above

#### Butterfly Valve

13. These are rotary type of valves usually found on large transmission lines. They may also have an additional valve beside it known as a " \_\_\_\_\_ " to prevent water hammer.

- A. Increase water pressure
- B. Bypass
- C. Complete gridiron system
- D. Main line isolation
- E. None of the Above

14. Some of these valves can require 300-600 turns to \_\_\_\_\_.

- A. Increase water pressure
- B. Open or close
- C. Complete gridiron system
- D. Main line isolation
- E. None of the Above

15. Most Valvemen will use a machine to open or close a Butterfly Valve, the machine will count the turns required to \_\_\_\_\_.

- A. Feeders as practical
- B. Turns required
- C. Open or close the valve
- D. Curtailing service
- E. None of the Above

16. Crenothrix bacteria or \_\_\_\_\_ will live in the bioslime in of tuberculation.

- A. Feeders as practical
- B. Turns required
- C. Will live
- D. Curtailing service
- E. None of the Above

#### Water Distribution Valves

17. The 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 maintenance without significantly curtailing service over large areas.

- A. Feeders as practical
- B. Turns required
- C. Taken out of service for repairs
- D. Curtailing service
- E. None of the Above

18. Valves should be installed at intervals not greater than 5,000 feet in long supply lines and 1,500 foot in main distribution \_\_\_\_\_.
- A. Feeders as practical
  - B. Turns required
  - C. Loops or feeders
  - D. Curtailing service
  - E. None of the Above
19. All branch mains connecting to feeder mains or feeder loops should have valves installed as close to the feeders as practical. In this way, branch mains can be taken out of service without \_\_\_\_\_ to other locations.
- A. Feeders as practical
  - B. Interrupting the supply
  - C. Will live
  - D. Curtailing service
  - E. None of the Above
20. In the areas of greatest water demand or when the dependability of the distribution system is particularly important, valve spacing of 500 feet may be \_\_\_\_\_.
- A. Principally
  - B. Dependability
  - C. Necessary
  - D. Appropriate
  - E. None of the Above
21. At intersections of distribution mains, the number of valves required is normally one less than the number of \_\_\_\_\_.
- A. Principally
  - B. Dependability
  - C. Radiating mains
  - D. Throttling purposes
  - E. None of the Above
22. The valve omitted from the line is usually the one that principally \_\_\_\_\_ to the intersection.
- A. Supplies flow
  - B. Dependability
  - C. Necessary
  - D. Throttling purposes
  - E. None of the Above
23. Shutoff valves should be installed in \_\_\_\_\_ locations (that is, the northeast corner of intersections or a certain distance from the center line of streets), so they can be easily found in emergencies. All buried small- and medium-sized valves should be installed in valve boxes.
- A. Principally
  - B. Dependability
  - C. Necessary
  - D. Standardized
  - E. None of the Above

24. For large shutoff valves (about 30 inches in diameter and larger), it may be necessary to surround the valve operator or entire valve within a vault or manhole to allow \_\_\_\_\_.
- A. Principally
  - B. Dependability
  - C. Repair or replacement
  - D. None of the Above

#### Gate Valves

25. Gate valves are used when a straight-line flow of fluid and \_\_\_\_\_ are needed.

- A. Minimum flow restriction
- B. Dependability
- C. Necessary
- D. Throttling purposes
- E. None of the Above

26. Gate valves are so-named because the part that either \_\_\_\_\_ flow through the valve acts somewhat like a gate.

- A. Stops or allows
- B. Dependability
- C. Necessary
- D. Throttling purposes
- E. None of the Above

27. The gate is usually wedge-shaped. When the valve is wide open the gate is \_\_\_\_\_ into the valve bonnet. This leaves an opening for flow through the valve the same size as the pipe in which the valve is installed.

- A. Principally
- B. Dependability
- C. Fully drawn up
- D. Throttling purposes
- E. None of the Above

28. There is little pressure drop or flow restriction through the valve. Gate valves are not suitable for \_\_\_\_\_.

- A. Principally
- B. Dependability
- C. Necessary
- D. Throttling purposes
- E. None of the Above

29. The control of flow is difficult because of the valve's design, and the flow of fluid slapping against a partially open gate can cause extensive damage to the valve. Except as specifically authorized, gate valves should not be used for \_\_\_\_\_.

- A. Throttling
- B. Ball
- C. Gate
- D. Planetary gears
- E. None of the Above

Ball Valves

30. Most ball valves are the \_\_\_\_\_. They require only a 90-degree turn to either completely open or close the valve.

- A. Hydrants
- B. Ball
- C. Gate
- D. Planetary gears
- E. None of the Above

31. Many are operated by planetary gears. This type of gearing allows the use of a relatively small \_\_\_\_\_ and operating force to operate a fairly large valve. The gearing does, however, increase the operating time for the valve.

- A. Handwheels
- B. Valves
- C. And Gate Valves
- D. Planetary gears
- E. None of the Above

32. Some \_\_\_\_\_ also contain a swing check located within the ball to give the valve a check valve feature. Ball valves should be either fully-on or fully-off.

- A. Hydrants
- B. Ball valves
- C. Gate
- D. Planetary gears
- E. None of the Above

Valve Exercising

33. Valve exercising should be done once per year (especially main line valves) to detect \_\_\_\_\_ and to prevent valves from becoming inoperable due to freezing or build-up of rust or corrosion.

- A. Hydrants
- B. Ball
- C. Malfunctioning valves
- D. Planetary gears
- E. None of the Above

34. A valve inspection should include drawing valve location maps to show distances (ties) to the \_\_\_\_\_ from specific reference points (telephone poles, stonelines, etc.).

- A. Valves
- B. Ball
- C. Gate
- D. Planetary gears
- E. None of the Above

35. \_\_\_\_\_ are designed to allow water from the distribution system to be used for fire-fighting purposes.

- A. Hydrants
- B. Ball
- C. Gate
- D. Planetary gears
- E. None of the Above

36. 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. None of the Above

#### Tree System

37. Older water systems frequently were expanded without planning and developed into a tree-like system. This consists of a single main that \_\_\_\_\_ as it leaves the source and progresses through the area originally served.
- A. Be isolated
  - B. Decreases in size
  - C. By laying out
  - D. Limits the expansion
  - E. None of the Above

38. Smaller pipelines \_\_\_\_\_ the main and divide again, much like the trunk and branches of a tree.
- A. Be isolated
  - B. Friction loss
  - C. Branch off
  - D. Limits the expansion
  - E. None of the Above

39. A tree-like system is not desirable because the size of the old main limits the expansion of the system needed to meet \_\_\_\_\_. In addition, there are many dead ends in the system where water remains for long periods, causing undesirable tastes and odors in nearby service lines.
- A. Be isolated
  - B. Friction loss
  - C. Increasing demands
  - D. Limits the expansion
  - E. None of the Above

40. The most reliable means to provide water for fire-fighting is by \_\_\_\_\_ into the system. 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. Be isolated
  - B. Designing redundancy
  - C. By laying out
  - D. Limits the expansion
  - E. None of the Above

#### Friction Loss

41. Water will still be distributed through the system if a single section fails. The damaged section can be isolated and the remainder of the system will still \_\_\_\_\_.
- A. Be isolated
  - B. Carry water
  - C. By laying out
  - D. Limits the expansion
  - E. None of the Above

42. Water supplied to fire hydrants will feed from multiple directions. Thus during periods of peak fire flow demand, there will be \_\_\_\_\_ from "friction loss" in water mains as the velocity within any given section of main will be less since several mains will be sharing the supply.
- A. Be isolated
  - B. Friction loss
  - C. By laying out
  - D. Less impact
  - E. None of the Above

#### Types of Pipes Used in the Water Distribution Field

Several types of pipe are used in water distribution systems, but only the most common types used by plumbers and operators will be discussed. These piping materials include copper, plastic, galvanized steel, and cast iron.

#### Plastic Pipe (PVC)

43. Plastic pipe has seen extensive use in \_\_\_\_\_. Available in different lengths and sizes, it is lighter than steel or copper and requires no special tools to install.
- A. Ease of installation
  - B. Complete resistance to corrosion
  - C. Chemical resistance
  - D. Stamped on the outside
  - E. None of the Above
44. Plastic pipe has several advantages over metal pipe: it is flexible; it has superior resistance to \_\_\_\_\_; it has complete resistance to corrosion; and, in addition, it can be installed aboveground or below ground.
- A. Ease of installation
  - B. Complete resistance to corrosion
  - C. Chemical resistance
  - D. Rupture from freezing
  - E. None of the Above
45. One of the most versatile plastic and polyvinyl resin pipes is the polyvinyl chloride (PVC). PVC pipes are made of tough, strong thermoplastic material that has \_\_\_\_\_ of physical and chemical properties.
- A. Ease of installation
  - B. Complete resistance to corrosion
  - C. Chemical resistance
  - D. An excellent combination
  - E. None of the Above
46. Its chemical resistance and \_\_\_\_\_ make it an excellent material for application in various mechanical systems.
- A. Ease of installation
  - B. Complete resistance to corrosion
  - C. Chemical resistance
  - D. Design strength
  - E. None of the Above
47. Sometimes polyvinyl chloride is further chlorinated to obtain a stiffer design, a higher level of impact resistance, and a \_\_\_\_\_ to extremes of temperature.
- A. Ease of installation
  - B. Complete resistance to corrosion
  - C. Chemical resistance
  - D. Greater resistance
  - E. None of the Above

48. A CPVC pipe (a chlorinated blend of PVC) can be used \_\_\_\_\_, but also in hot-water systems with temperatures up to 210°F.

- A. Ease of installation
- B. Not only in cold-water systems
- C. Chemical resistance
- D. Stamped on the outside
- E. None of the Above

49. Economy and \_\_\_\_\_ make plastic pipe popular for use in either water distribution and supply systems or sewer drainage systems.

- A. Ease of installation
- B. Complete resistance to corrosion
- C. Chemical resistance
- D. Stamped on the outside
- E. None of the Above

50. Various types and sizes of coupons or tap cut-outs. You will want to date and collect these cut-outs to determine the condition of the pipe or \_\_\_\_\_.

- A. Ease of installation
- B. Measure the corrosion
- C. Chemical resistance
- D. Stamped on the outside
- E. None of the Above

#### Plastic Pipe (PVC)

51. This is currently the most common type of pipe used in distribution systems. It is available in diameters of 1/2" and larger, and in lengths of 10', 20', and 40'. A main advantage is its light weight, allowing for \_\_\_\_\_.

- A. Long life
- B. Withstand shock loads
- C. Easy installation
- D. Highest C Factor
- E. None of the Above

52. A disadvantage is its inability to withstand shock loads. Since it is \_\_\_\_\_, a tracer wire must be installed with the PVC water main so that it can be located after burial.

- A. Long life
- B. Non-metallic
- C. Been in use for a long time
- D. Highest C Factor
- E. None of the Above

53. The National Sanitation Foundation (NSF) currently lists most brands of PVC pipe as being acceptable for potable water use. This information should be stamped on the outside of the pipe, along with \_\_\_\_\_ and temperature, diameter and pipe manufacturer.

- A. Long life
- B. Withstand shock loads
- C. Working pressure
- D. Highest C Factor
- E. None of the Above

54. PVC pipe will have the highest C Factor of all the above pipes. The higher the C factor the \_\_\_\_\_.

- A. Long life
- B. Withstand shock loads
- C. Been in use for a long time
- D. Smoother the pipe
- E. None of the Above

Cast Iron (CIP)

55. This is another type of piping material that has been in use for a \_\_\_\_\_. It is found in diameters from 3" to 48".

- A. Long life
- B. Shock loads
- C. Tool
- D. C Factor
- E. None of the Above

56. Advantages of this material are its long life, \_\_\_\_\_ to withstand working pressures up to 350 psi.

- A. Long life
- B. Withstand shock loads
- C. Durability and ability
- D. Highest C Factor
- E. None of the Above

57. Disadvantages include the fact that it is heavy, difficult to install and does not withstand shock loading. Although it is \_\_\_\_\_ the material of choice, there is still a lot of it in the ground.

- A. Long life
- B. Not currently
- C. Been in use for a long time
- D. Highest C Factor
- E. None of the Above

Ductile Iron Pipe (DIP)

58. This was developed to \_\_\_\_\_ associated with cast iron pipe. It can be purchased in 4" to 45" diameters and lengths of 18' to 20'.

- A. Overcome the breakage problems
- B. Withstand shock loads
- C. Been in use for a long time
- D. Highest C Factor
- E. None of the Above

59. Its main advantage is that it is \_\_\_\_\_ by internal or external pressures. It is manufactured by injecting magnesium into molten cast iron.

- A. Nearly indestructible
- B. Withstand shock loads
- C. Been in use for a long time
- D. Highest C Factor
- E. None of the Above

60. It is sometimes protected from highly corrosive soils by wrapping the pipe in plastic sheeting prior to installation. This practice can greatly \_\_\_\_\_ of this type of pipe.

- A. Extend the life
- B. Withstand shock loads
- C. Been in use for a long time
- D. Highest C Factor
- E. None of the Above

#### Steel Pipe

61. This pipe is often used in water treatment plants and pump stations. It is available in various diameters and in 20' or 21' lengths. Its main advantage is the ability to form it into a variety of shapes. It also exhibits good yielding and \_\_\_\_\_.

- A. Factory to resist corrosion
- B. Danger posed
- C. Withstand corrosion
- D. Shock resistance
- E. None of the Above

62. It has a smooth interior surface and can withstand pressures up to 250 psi. A disadvantage is that it is \_\_\_\_\_ by both soil and water.

- A. Factory to resist corrosion
- B. Danger posed
- C. Withstand corrosion
- D. Easily corroded
- E. None of the Above

63. To reduce \_\_\_\_\_, steel pipe is usually galvanized or dipped in coal-tar enamel and wrapped with coal-tar impregnated felt.

- A. Corrosion problems
- B. Danger posed
- C. Withstand corrosion
- D. Good yielding
- E. None of the Above

64. Coal-tar products are undergoing scrutiny from a health standpoint and it is recommended that the appropriate regulatory agencies be \_\_\_\_\_ to use of this material.

- A. Contacted prior
- B. Danger posed
- C. Withstand corrosion
- D. Good yielding
- E. None of the Above

#### Asbestos Cement Pipe (ACP)

65. This pipe is manufactured from Portland cement, \_\_\_\_\_ and silica. It is available in diameters from 3" to 36" and in 13' lengths.

- A. Factory to resist corrosion
- B. Danger posed
- C. Withstand corrosion
- D. Good yielding
- E. None of the Above

66. Its main advantages are its ability to \_\_\_\_\_ and its excellent hydraulic flow characteristics due to its smoothness.

- A. Withstand corrosion
- B. Danger posed
- C. Withstand corrosion
- D. Good yielding
- E. None of the Above

67. A major disadvantage is that it is \_\_\_\_\_ during construction or by shock loading.

- A. Factory to resist corrosion
- B. Brittle and is easily broken
- C. Withstand corrosion
- D. Good yielding
- E. None of the Above

68. There is some concern regarding the possible release of asbestos fibers in corrosive water and there has been \_\_\_\_\_ over the health effects of ingested asbestos.

- A. Factory to resist corrosion
- B. Danger posed
- C. Much debate
- D. Good yielding
- E. None of the Above

69. Of greater concern, however, is the \_\_\_\_\_ by inhalation of asbestos fibers.

- A. Factory to resist corrosion
- B. Danger posed
- C. Withstand corrosion
- D. Good yielding
- E. None of the Above

70. Asbestos is considered a hazardous material, and \_\_\_\_\_ must be taken to protect water utility workers when cutting, tapping or otherwise handling this type of pipe.

- A. Factory to resist corrosion
- B. Danger posed
- C. Precautionary measures
- D. Good yielding
- E. None of the Above

#### Galvanized Pipe

71. Galvanized pipe is commonly used for the water distributing pipes inside a building to supply hot and cold water to \_\_\_\_\_.

- A. The fixtures
- B. Water distributing pipes
- C. Inside and outside
- D. Soldered to copper fittings
- E. None of the Above

72. This type of pipe is manufactured in 21-ft lengths. It is galvanized (coated with zinc) both inside and outside at the \_\_\_\_\_.

- A. Thinnest walls
- B. Water distributing pipes
- C. Inside and outside
- D. Factory to resist corrosion
- E. None of the Above

73. Pipe sizes are based on nominal inside diameters. Inside diameters vary with the thickness of the pipe. Outside diameters remain constant so that pipe can be \_\_\_\_\_.

- A. Thinnest walls
- B. Threaded for standard fittings
- C. Inside and outside
- D. Soldered to copper fittings
- E. None of the Above

#### Copper

74. Copper is one of the most widely used materials for tubing. This is because it does not rust and is highly resistant to any \_\_\_\_\_.

- A. Thinnest walls
- B. Water distributing pipes
- C. Inside and outside
- D. Accumulation of scale particles in the pipe
- E. None of the Above

75. This tubing is available in three different types: \_\_\_\_\_

- A. Thinnest walls
- B. Water distributing pipes
- C. Inside and outside
- D. Soldered to copper fittings
- E. None of the Above

76. K has the thickest walls, and M, the thinnest walls, with L's \_\_\_\_\_.

- A. Thinnest walls
- B. Thickness in between the other two
- C. Inside and outside
- D. Soldered to copper fittings
- E. None of the Above

77. The thin walls of copper tubing are \_\_\_\_\_.

- A. Thinnest walls
- B. Water distributing pipes
- C. Inside and outside
- D. Soldered to copper fittings
- E. None of the Above

78. Soldering allows all the tubing and fittings to be \_\_\_\_\_ before the joints are finished.

- A. Set in place
- B. Widely used
- C. Rigid (hard temper)
- D. Straight lengths
- E. None of the Above

79. Type K copper tubing is available in either rigid (hard temper) or flexible (soft temper) and is primarily used for \_\_\_\_\_ in the water distribution systems.

- A. Exposed lines
- B. Underground service
- C. Rigid (hard temper)
- D. Straight lengths
- E. None of the Above

80. Soft temper tubing is available in 40- or 60-ft coils, while \_\_\_\_\_ tubing comes in 12- and 20-ft straight lengths.
- A. Exposed lines
  - B. Widely used
  - C. Hard temper
  - D. Straight lengths
  - E. None of the Above
81. Type L copper tubing is also available in either \_\_\_\_\_ or soft temper and either in coils or in straight lengths.
- A. Exposed lines
  - B. Widely used
  - C. Hard
  - D. Straight lengths
  - E. None of the Above
82. The soft temper tubing is often used as replacement plumbing because of the tube's flexibility, which allows \_\_\_\_\_.
- A. Exposed lines
  - B. Widely used
  - C. Easier installation
  - D. Straight lengths
  - E. None of the Above
83. Type L copper tubing is widely used in \_\_\_\_\_.
- A. Exposed lines
  - B. Widely used
  - C. Water distribution systems
  - D. Straight lengths
  - E. None of the Above
84. Type M copper tubing is made in hard temper only and is available in straight lengths of 12 and 20 ft. It has a thin wall and is used for \_\_\_\_\_ where water pressure is low, but it is NOT used for mains and risers.
- A. Exposed lines
  - B. Widely used
  - C. Branch supplies
  - D. Straight lengths
  - E. None of the Above
85. It is also used for chilled water systems, for exposed lines in hot-water heating systems, and for \_\_\_\_\_.
- A. Exposed lines
  - B. Drainage piping
  - C. Rigid (hard temper)
  - D. Straight lengths
  - E. None of the Above
86. Booster stations are used to increase water pressure from \_\_\_\_\_ for low-pressure mains.
- A. Gate valves
  - B. Dead ends
  - C. Booster stations
  - D. Storage tanks
  - E. None of the Above

87. Valves control the flow of water in the distribution system by isolating areas for repair or by regulating \_\_\_\_\_.

- A. Gate valves
- B. System flow or pressure
- C. Booster stations
- D. Treelike system
- E. None of the Above

88. Gate valves should be used in the \_\_\_\_\_ for main line isolation.

- A. Gate valves
- B. Distribution system
- C. Booster stations
- D. Treelike system
- E. None of the Above

#### Tree System

89. Older water systems frequently were expanded without planning and developed into a \_\_\_\_\_.

- A. Gate valves
- B. Dead ends
- C. Booster stations
- D. Treelike system
- E. None of the Above

90. This consists of a single \_\_\_\_\_ that decreases in size as it leaves the source and progresses through the area originally served.

- A. Main
- B. Dead ends
- C. Booster stations
- D. Treelike system
- E. None of the Above

91. Smaller pipelines branch off the \_\_\_\_\_ and divide again, much like the trunk and branches of a tree.

- A. Gate valves
- B. Main
- C. Booster stations
- D. Treelike system
- E. None of the Above

92. A \_\_\_\_\_ is not desirable because the size of the old main limits the expansion of the system needed to meet increasing demands.

- A. Gate valves
- B. Dead ends
- C. Booster stations
- D. Treelike system
- E. None of the Above

93. There are many dead ends in the system where water remains for long periods, causing undesirable \_\_\_\_\_ in nearby service lines.

- A. Gate valves
- B. Dead ends
- C. Booster stations
- D. Treelike system
- E. None of the Above

94. The most reliable means to \_\_\_\_\_ for fire fighting is by designing redundancy into the system.

- A. Provide water
- B. Dead ends
- C. Booster stations
- D. Treelike system
- E. None of the Above

95. There are several advantages gained by laying out \_\_\_\_\_ in a loop or grid, with feeder and distributor mains interconnecting at roadway intersections and other regular intervals.

- A. Gate valves
- B. Water mains
- C. Booster stations
- D. Treelike system
- E. None of the Above

#### Distribution Valves

96. The purpose of installing shutoff valves in water mains at various locations within the distribution system is to \_\_\_\_\_ to be taken out of service for repairs or maintenance, without significantly curtailing service over large areas.

- A. Dependability of the distribution system
- B. Allow sections of the system
- C. Certain distance
- D. Principally supplies flow
- E. None of the Above

97. Valves should be installed at intervals not greater than 5,000 feet in long supply lines, and 1,500 foot in \_\_\_\_\_.

- A. Dependability of the distribution system
- B. Branch mains
- C. Certain distance
- D. Main distribution loops or feeders
- E. None of the Above

98. All branch mains connecting to feeder mains or feeder loops should have valves installed as close to the \_\_\_\_\_.

- A. Feeders as practical
- B. Branch mains
- C. Certain distance
- D. Principally supplies flow
- E. None of the Above

99. In this way, branch mains can be taken out of service \_\_\_\_\_ the supply to other locations.

- A. Dependability of the distribution system
- B. Without interrupting
- C. Certain distance
- D. Principally supplies flow
- E. None of the Above

100. In the areas of greatest water demand or when the dependability of the distribution system is \_\_\_\_\_, valve spacing of 500 feet may be appropriate.

- A. Dependability of the distribution system
- B. Branch mains
- C. Particularly important
- D. Principally supplies flow
- E. None of the Above

101. At intersections of distribution mains, the number of valves required is normally one less than the number of \_\_\_\_\_.

- A. Dependability of the distribution system
- B. Branch mains
- C. Radiating mains
- D. Principally supplies flow
- E. None of the Above

102. The valve \_\_\_\_\_ is usually the one that principally supplies flow to the intersection.

- A. Dependability of the distribution system
- B. Omitted from the line
- C. Certain distance
- D. Principally supplies flow
- E. None of the Above

103. Shutoff valves should be \_\_\_\_\_ (that is, the northeast corner of intersections or a certain distance from the center line of streets), so they can be easily found in emergencies.

- A. Dependability of the distribution system
- B. Branch mains
- C. Certain distance
- D. Installed in standardized locations
- E. None of the Above

104. All buried small- and medium-sized valves should be \_\_\_\_\_.

- A. Installed in valve boxes
- B. Branch mains
- C. Certain distance
- D. Principally supplies flow
- E. None of the Above

105. For large shutoff valves (about 30 inches in diameter and larger), it may be necessary to surround the valve operator or entire valve within a vault or manhole to \_\_\_\_\_.

- A. Dependability of the distribution system
- B. Branch mains
- C. Allow repair or replacement
- D. Principally supplies flow
- E. None of the Above

#### Classification of Valves

106. There are \_\_\_\_\_ of water valves: Rotary and Linear. Linear is a fancy word for up and down or blade movement.

- A. Flow restriction
- B. Water valves
- C. Distribution system
- D. Gate valves
- E. None of the Above

107. Gate Valve Linear Valve The most common valve in the distribution system. Primarily used for main line \_\_\_\_\_ . Should be exercised on annual basis.

- A. Flow restriction
- B. Water valves
- C. Shut downs
- D. Gate valves
- E. None of the Above

108. \_\_\_\_\_ are used when a straight-line flow of fluid and minimum flow restriction are needed.

- A. Flow restriction
- B. Water valves
- C. Distribution system
- D. Gate valves
- E. None of the Above

109. \_\_\_\_\_ are so-named because the part that either stops or allows flow through the valve acts somewhat like a gate.

- A. Flow restriction
- B. Water valves
- C. Distribution system
- D. Gate valves
- E. None of the Above

110. The gate is usually wedge-shaped. When the valve is wide open the gate is fully drawn up into the \_\_\_\_\_. This leaves an opening for flow through the valve the same size as the pipe in which the valve is installed.

- A. Flow restriction
- B. Water valves
- C. Valve bonnet
- D. Gate valves
- E. None of the Above

111. There is \_\_\_\_\_ or flow restriction through the valve.

- A. Flow restriction
- B. Water valves
- C. Little pressure drop
- D. Gate valves
- E. None of the Above

112. \_\_\_\_\_ are not suitable for throttling purposes.

- A. Flow restriction
- B. Water valves
- C. Distribution system
- D. Gate valves
- E. None of the Above

113. The control of flow is difficult because of the \_\_\_\_\_, and the flow of fluid slapping against a partially open gate can cause extensive damage to the valve.

- A. Flow restriction
- B. Water valves
- C. Valve's design
- D. Gate valves
- E. None of the Above

114. Except as specifically authorized, \_\_\_\_\_ should not be used for throttling.
- A. Flow restriction
  - B. Water valves
  - C. Distribution system
  - D. Gate valves
  - E. None of the Above

#### Valve Glossary

115. Air and Vacuum relief valve: Both of these functions are in one valve. These valves can combine three functions; they can allow large amounts of air to escape during the filling of a pipeline, permits air to enter a \_\_\_\_\_ that is being drained and allow entrained air to escape while a line is operating under pressure.

- A. Air relief valves
- B. Butterfly valve
- C. Air and Vacuum relief valve
- D. Altitude-Control Valve
- E. None of the Above

116. Distribution system water quality can be adversely affected by improperly constructed or poorly located blowoffs of vacuum/\_\_\_\_\_.

- A. Air relief valves
- B. Butterfly valve
- C. Air and Vacuum relief valve
- D. Altitude-Control Valve
- E. None of the Above

117. \_\_\_\_\_ in the distribution system lines must be placed in locations that cannot be flooded. This is to prevent water contamination.

- A. Air relief valves
- B. Butterfly valve
- C. Air and Vacuum relief valve
- D. Altitude-Control Valve
- E. None of the Above

118. The common customer complaint of Milky Water is sometimes solved by the installation of these \_\_\_\_\_.

- A. Air relief valves
- B. Butterfly valve
- C. Air and Vacuum relief valve
- D. Altitude-Control Valve
- E. None of the Above

119. \_\_\_\_\_: Are often used on supply lines to elevated tanks or standpipes. These close automatically when the tank is full and open when the pressure on the inlet side is less than that on the tank side of the valve. These valves control the high water level and prevent overflow.

- A. Air relief valves
- B. Butterfly valve
- C. Air and Vacuum relief valve
- D. Altitude Valve
- E. None of the Above

120. \_\_\_\_\_ is designed to, 1. Prevent overflows from the storage tank or reservoir, or 2. Maintain a constant water level as long as water pressure in the distribution system is adequate.

- A. Air relief valves
- B. Butterfly valve
- C. Air and Vacuum relief valve
- D. Altitude-Control Valve
- E. None of the Above

121. \_\_\_\_\_: Has a movable disc as large as the full bore opening of the valve.

- A. Air relief valves
- B. Butterfly valve
- C. Air and Vacuum relief valve
- D. Altitude-Control Valve
- E. None of the Above

122. \_\_\_\_\_: Are often used on the discharge side of pumps to prevent backflow.

- A. Pressure relief
- B. Check valve
- C. Gate valve
- D. Pressure sustaining valve
- E. None of the Above

123. \_\_\_\_\_: Is a linear valve used to isolate sections of the water main, to permit emergency repairs without interruption of water service to customers.

- A. Pressure relief
- B. Check valve
- C. Gate valve
- D. Pressure sustaining valve
- E. None of the Above

124. \_\_\_\_\_: Maintains constant downstream pressure regardless of fluctuating demand.

- A. Pressure relief
- B. Check valve
- C. Gate valve
- D. Pressure sustaining valve
- E. None of the Above

125. The valve is usually a globe design controlled by a diaphragm with the diaphragm assembly being the only moving part in the valve. Can also be used as an \_\_\_\_\_.

- A. Pressure relief
- B. Check valve
- C. Automatic flow-control valve
- D. Pressure sustaining valve
- E. None of the Above

126. \_\_\_\_\_: A valve that controls water pressure by restricting flows. The pressure downstream of the valve regulates the amount of flow. Usually these valves are of the globe valve design.

- A. Pressure relief
- B. Check valve
- C. Pressure regulating valve
- D. Pressure sustaining valve
- E. None of the Above

127. \_\_\_\_\_ control water pressure and operate by restricting flows. They are used to deliver water from a high pressure to a low-pressure system.

- A. Pressure relief
- B. Check valve
- C. Gate valve
- D. Pressure Regulation Valves
- E. None of the Above

128. The pressure downstream from the valve regulates the amount of flow. Usually, these valves are of the globe design and have a \_\_\_\_\_ that sets the size of the opening.

- A. Pressure relief
- B. Check valve
- C. Gate valve
- D. Pressure sustaining valve
- E. None of the Above

129. \_\_\_\_\_: The simplest type of surge pressure relief is a pressure relief valve. These valves respond to pressure variations at their inlets.

- A. Pressure relief
- B. Check valve
- C. Gate valve
- D. Pressure sustaining valve
- E. None of the Above

#### The Singing Key

130. Dr. Rusty recommends that you listen to the Valve Key when shutting down a \_\_\_\_\_. You will easily hear it sing as you shut the water off or leak by.

- A. Gate valve
- B. Valve failing to open
- C. Opened valves
- D. Over-pressurization
- E. None of the Above

131. It is very easy to create a \_\_\_\_\_ when opening or closing a Gate valve. Always take your time when operating a Gate valve or any valve.

- A. Valve Key
- B. Water hammer
- C. Opened valves
- D. Over-pressurization
- E. None of the Above

Problems

Valve Jammed Open

132. Dr. Rusty recommends that opened valves should not be \_\_\_\_\_.

- A. Jammed-tight on the backseat
- B. Valve failing to open
- C. Opened valves
- D. Over-pressurization
- E. None of the Above

133. Always back the valve-off a \_\_\_\_\_ from the fully opened position.

- A. Quarter turn
- B. Valve failing to open
- C. Opened valves
- D. Over-pressurization
- E. None of the Above

134. Note that motor operated valves coast inevitably to the backseat by tripping on a limit switch. Valves should not be \_\_\_\_\_.

- A. Back seated on torque
- B. Valve failing to open
- C. Opened valves
- D. Over-pressurization
- E. None of the Above

Valve Jammed Closed

135. Variations in the temperature and/or pressure of the \_\_\_\_\_ are often the cause of a valve failing to open.

- A. Valve Key
- B. Valve failing to open
- C. Opened valves
- D. Over-pressurization
- E. None of the Above

136. Thermal binding can occur in high temperature situations depending on the seat and wedge material, length of \_\_\_\_\_ torque applied.

- A. Exposure and closing
- B. Valve failing to open
- C. Opened valves
- D. Over-pressurization
- E. None of the Above

137. \_\_\_\_\_ can cause galling on the valve sealing surfaces as well as on the guides.

- A. Thermal binding
- B. Valve failing to open
- C. Opened valves
- D. Over-pressurization
- E. None of the Above

138. A valve can lock in the \_\_\_\_\_ when high pressure enters the cavity and has no way to escape. This is known as over-pressurization.

- A. Valve Key
- B. Valve failing to open
- C. Closed position
- D. Over-pressurization
- E. None of the Above

If Excessive Torque is Needed to Work the Valve

139. Variations in the temperature and/or pressure of the \_\_\_\_\_ are often the cause of a valve failing to open.

- A. High pressure side
- B. Working fluid
- C. Closing torque applied
- D. Valve sealing surfaces
- E. None of the Above

140. Thermal binding can occur in high temperature situations depending on the seat and wedge material, \_\_\_\_\_ and closing torque applied.

- A. High pressure side
- B. Failing to open
- C. Closing torque applied
- D. Length of exposure
- E. None of the Above

141. \_\_\_\_\_ can cause galling on the valve sealing surfaces as well as on the guides.

- A. High pressure side
- B. Failing to open
- C. Thermal binding
- D. Valve sealing surfaces
- E. None of the Above

142. A valve can \_\_\_\_\_ when high pressure enters the cavity and has no way to escape. This is known as over-pressurization.

- A. Over-pressurization
- B. Positive pressure differential
- C. Lock in the closed position
- D. Carrying capacity
- E. None of the Above

143. Single direction sealing gate valves have a nameplate on the side of the valve that has a relief hole or pressure equalizer. This should be the \_\_\_\_\_ when the valve is closed.

- A. High pressure side
- B. Positive pressure differential
- C. Chemical changes
- D. Carrying capacity
- E. None of the Above

144. Corrosion is caused by chemical changes produced by \_\_\_\_\_. We call this type of corrosion tuberculation.

- A. Closed position
- B. Positive pressure differential
- C. Chemical changes
- D. Electricity or electrolysis
- E. None of the Above

145. It is a protective crust of corrosion products that have built up over a pit caused by the loss of metal, due to \_\_\_\_\_. This type of corrosion will decrease the C-Factor and the carrying capacity in a pipe.

- A. Closed position
- B. Corrosion or electrolysis
- C. Chemical changes
- D. Carrying capacity
- E. None of the Above

#### Knife Gate Valve

146. Always follow standard safety procedures when working on a valve. Install the valve so that the arrows on both sides of the body are in the direction of \_\_\_\_\_.

- A. Positive pressure differential
- B. Handwheel pointing up
- C. Connect individual buildings
- D. Retrofit the service
- E. None of the Above

147. The preferred orientation is with the stem vertical and the \_\_\_\_\_. The opposite orientation is not recommended, because fiber and dirt can build-up in the bonnet.

- A. Positive pressure differential
- B. Handwheel pointing up
- C. Connect individual buildings
- D. Retrofit the service
- E. None of the Above

148. Service connections are used to \_\_\_\_\_ or other plumbing systems to the distribution system mains.

- A. Positive pressure differential
- B. Handwheel pointing up
- C. Connect individual buildings
- D. Retrofit the service
- E. None of the Above

149. Water Meter Re-setter, Riser, or sometimes referred to as a copper yoke. There is also a cast iron version which is best broken off with two sledge or cocking hammers when it's time to replace or \_\_\_\_\_.

- A. Positive pressure differential
- B. Handwheel pointing up
- C. Connect individual buildings
- D. Retrofit the service
- E. None of the Above

#### Common Rotary Valves

150. Globe Valve Rotary Valve: Primarily used for flow regulation, and works similar to a \_\_\_\_\_. They are rare to find in most distribution systems, but can be found at treatment plants.

- A. Bonnet
- B. Valve seat
- C. Globe valves
- D. Disc
- E. None of the Above

151. Always follow standard safety procedures when working on a \_\_\_\_\_.
- A. Bonnet
  - B. Valve
  - C. Globe valves
  - D. Disc
  - E. None of the Above
152. Most Globes have compact OS & Y type, bolted \_\_\_\_\_, rising stems, with renewable seat rings.
- A. Bonnet
  - B. Valve seat
  - C. Globe valves
  - D. Disc
  - E. None of the Above
153. The \_\_\_\_\_ results with most advanced design features provide the ultimate in dependable, economical flow control.
- A. Bonnet
  - B. Valve seat
  - C. Globe valves
  - D. Disc
  - E. None of the Above
154. Globe valves should usually be installed with the inlet below the \_\_\_\_\_.
- A. Bonnet
  - B. Valve seat
  - C. Globe valves
  - D. Disc
  - E. None of the Above
155. For severe throttling service, the valve may be installed so that the flow enters over the top of the \_\_\_\_\_ and goes down through it.
- A. Bonnet
  - B. Seat
  - C. Globe valves
  - D. Disc
  - E. None of the Above
156. The packings will be constantly pressurized. If the valve is to be installed near throttling service, verify with an outside contractor or a skilled valve technician. \_\_\_\_\_, per se, are not suitable for throttling service.
- A. Bonnet
  - B. Valve seat
  - C. Globe valves
  - D. Disc
  - E. None of the Above
157. The valve should be welded onto the line with the \_\_\_\_\_ in the fully closed position. Leaving it even partially open can cause distortion and leaking.
- A. Bonnet
  - B. Valve seat
  - C. Globe valves
  - D. Disc
  - E. None of the Above

158. Allow time for the \_\_\_\_\_ before operating the valve the first time in the pipeline.

- A. Bonnet
- B. Valve seat
- C. Globe valves
- D. Disc
- E. None of the Above

159. The preferred orientation of a \_\_\_\_\_ is upright. The valve may be installed in other orientations, but any deviation from vertical is a compromise.

- A. Bonnet
- B. Valve seat
- C. Globe valve
- D. Disc
- E. None of the Above

160. Installation upside down is not recommended because it can cause dirt to accumulate in the \_\_\_\_\_.

- A. Bonnet
- B. Valve seat
- C. Globe valves
- D. Disc
- E. None of the Above

#### Globe Valve Problems and Solutions

161. If the \_\_\_\_\_ is improperly lubricated or damaged-- Disassemble the valve and inspect the stem.

- A. Bonnet
- B. Valve seat
- C. Valve stem
- D. Disc
- E. None of the Above

162. Acceptable deviation from theoretical centerline, created by joining center points of the ends of the \_\_\_\_\_ is 0.005"/ft of stem. Inspect the threads for any visible signs of damage.

- A. Bonnet
- B. Valve seat
- C. Stem
- D. Disc
- E. None of the Above

163. Small grooves less than \_\_\_\_\_ can be polished with an Emory cloth.

- A. Bonnet
- B. Valve seat
- C. Valve stem
- D. Disc
- E. None of the Above

164. If the valve \_\_\_\_\_ compression is too tight--Verify the packing bolt torque and adjust if necessary.

- A. Bonnet
- B. Valve seat
- C. Valve stem
- D. Packing
- E. None of the Above

165. Foreign debris is trapped on threads and/or in the \_\_\_\_\_ area--This is a common problem when valves are installed outdoors in sandy areas and areas not cleaned before operating.

- A. Bonnet
- B. Valve seat
- C. Valve stem
- D. Packing
- E. None of the Above

166. Always inspect threads and \_\_\_\_\_ area for particle obstructions; even seemingly small amounts of sand trapped on the drive can completely stop large valves from cycling.

- A. Bonnet
- B. Valve seat
- C. Valve stem
- D. Packing
- E. None of the Above

167. The valve may stop abruptly when a cycle is attempted. With the line pressure removed from the valve, disconnect the actuator, gear operator or handwheel and inspect the drive nut, \_\_\_\_\_, bearings and yoke bushing.

- A. Bonnet
- B. Valve seat
- C. Stem
- D. Packing
- E. None of the Above

168. Contaminated parts should be cleaned with a \_\_\_\_\_, varsol or equivalent. All parts should be re-lubricated before being re-assembled.

- A. Bonnet
- B. Valve seat
- C. Valve stem
- D. Packing
- E. None of the Above

169. If the \_\_\_\_\_ are installed outdoors in a sandy area, it may be desirable to cover the valves with jackets.

- A. Bonnet
- B. Valves
- C. Valve stem
- D. Packing
- E. None of the Above

170. If the valve \_\_\_\_\_ are faulty or damaged--contact specialized services or an outside contractor.

- A. Bonnet
- B. Components
- C. Handwheel
- D. Packing
- E. None of the Above

171. If the valve's \_\_\_\_\_ is too small--Increasing the size of the handwheel will reduce the amount of torque required to operate the valve.

- A. Bonnet
- B. Components
- C. Handwheel
- D. Packing
- E. None of the Above

172. If a larger \_\_\_\_\_ is installed, the person operating the valve must be careful not to over-torque the valve when closing it.

- A. Bonnet
- B. Components
- C. Handwheel
- D. Packing
- E. None of the Above

Bellow Seal Valve

173. Always follow \_\_\_\_\_ when working on a valve.

- A. Hermetic seal
- B. Predetermined maximum level
- C. Standard safety procedures
- D. Bellows-assembly weld
- E. None of the Above

174. \_\_\_\_\_ provide a complete hermetic seal of the working fluid. They are used in applications where zero leakage of the working fluid into the environment is permitted.

- A. Hermetic seal
- B. Bellows seal valves
- C. Self contained control valves
- D. Bellows-assembly weld
- E. None of the Above

175. Bellows seal valves are specially modified versions of the standard valves. The installation information that applies to gate and globe valves will apply to \_\_\_\_\_ .

- A. Hermetic seal
- B. Predetermined maximum level
- C. Self contained control valves
- D. Bellows seal valves
- E. None of the Above

176. A \_\_\_\_\_ signifies that the bellows has ruptured or the bellows-assembly weld has a crack.

- A. Packing leak
- B. Predetermined maximum level
- C. Self contained control valves
- D. Bellows-assembly weld
- E. None of the Above

Pressure Sustaining Valve

177. Pressure sustaining valves are used to \_\_\_\_\_ to a predetermined maximum level.

- A. Sustain the system pressure
- B. Predetermined maximum level
- C. Self contained control valves
- D. Bellows-assembly weld
- E. None of the Above

178. The applications balance the \_\_\_\_\_ throughout the whole system by maintaining the minimum pressure for high altitude users.

- A. Hermetic seal
- B. Predetermined maximum level
- C. Pressure distribution
- D. Bellows-assembly weld
- E. None of the Above

179. \_\_\_\_\_ are also used to prevent discharging of the pipe system when any user starts to operate.

- A. Hermetic seal
- B. Predetermined maximum level
- C. Self contained control valves
- D. Pressure sustaining valves
- E. None of the Above

Pressure Reducing Valve

180. Pressure reducing valves maintain a \_\_\_\_\_ which remains steady and unaffected by either changing of inlet pressure and/or various demands.

- A. Hermetic seal
- B. Predetermined outlet pressure
- C. Self contained control valves
- D. Bellows-assembly weld
- E. None of the Above

181. Pressure Reducing Valves are \_\_\_\_\_ which do not require external power.

- A. Hermetic seal
- B. Predetermined maximum level
- C. Self contained control valves
- D. Bellows-assembly weld
- E. None of the Above

Needle Valves Rotary Valve

182. A needle valve, is used to make relatively fine adjustments in the \_\_\_\_\_ of fluid flow.

- A. Fine adjustments
- B. Regulate the flow
- C. Found widely
- D. Efficiently handle gas
- E. None of the Above

183. The \_\_\_\_\_ of a needle valve is the long, tapered, needle-like point on the end of the valve stem. This "needle" acts as a disk.

- A. Fine adjustments
- B. Regulate the flow
- C. Distinguishing characteristic
- D. Efficiently handle gas
- E. None of the Above

#### Plug Valves Rotary Valve

184. Plug valves are \_\_\_\_\_ valves that are found widely in low-pressure sanitary and industrial applications, especially petroleum pipelines, chemical processing and related fields, and power plants.

- A. Fine adjustments
- B. Regulate the flow
- C. Found widely
- D. Extremely versatile
- E. None of the Above

185. They are high capacity valves that can be used for \_\_\_\_\_, even in moderate vacuum systems.

- A. Directional flow control
- B. Regulate the flow
- C. Found widely
- D. Efficiently handle gas
- E. None of the Above

186. They can safely and \_\_\_\_\_ and liquid fuel, and extreme temperature flow, such as boiler feed water, condensate, and similar elements.

- A. Fine adjustments
- B. Regulate the flow
- C. Found widely
- D. Efficiently handle gas
- E. None of the Above

187. They can also be used to \_\_\_\_\_ of liquids containing suspended solids (slurries).

- A. Fine adjustments
- B. Regulate the flow
- C. Found widely
- D. Efficiently handle gas
- E. None of the Above

#### Angle Stop Rotary Valve

188. When working in tight areas, you sometimes need a \_\_\_\_\_ valve. This is an excellent place for an Angle Stop or Angle valve.

- A. Quick-acting
- B. Tight fitting
- C. Dismantle the bottom
- D. Operating time
- E. None of the Above

189. If you ever have to jump an Angle valve on hot, first dismantle the bottom compression fitting and the rubber and \_\_\_\_\_ on the water line.

- A. Quick-acting
- B. Tight fitting
- C. Dismantle the bottom
- D. Slide it
- E. None of the Above

190. Sometimes the bottom compression fitting will have a \_\_\_\_\_ and some operators like to tighten it to the pipe or service before jumping the stop. Either way, it will work. Always have a helper if jumping any service larger than 1 inch.

- A. Quick-acting
- B. Set-screw
- C. Dismantle the bottom
- D. Operating time
- E. None of the Above

Ball or Corporation Stop Rotary Valve Small Valves 2 inches and smaller

191. Most commonly found on customer or water meters. All small \_\_\_\_\_ will have two Ball valves.

- A. Quick-acting
- B. Backflow assemblies
- C. Dismantle the bottom
- D. Operating time
- E. None of the Above

192. Most ball valves are the quick-acting type. They require only a 90-degree turn to either completely \_\_\_\_\_ the valve.

- A. Quick-acting
- B. Open or close
- C. Dismantle the bottom
- D. Operating time
- E. None of the Above

193. Many are operated by planetary gears. This type of gearing allows the use of a relatively small handwheel and \_\_\_\_\_ to operate a fairly large valve. Always follow standard safety procedures when working on a valve.

- A. Quick-acting
- B. Tight fitting
- C. Operating force
- D. Operating time
- E. None of the Above

194. The \_\_\_\_\_ does, however, increase the operating time for the valve.

- A. Quick-acting
- B. Gearing
- C. Dismantle the bottom
- D. None of the Above

195. Brass or zinc is common for body, brass or iron for stem, brass or iron for ball, aluminum, stainless steel, or iron for \_\_\_\_\_ including a Teflon seal in the ball housing.

- A. Teflon seal
- B. Bypass valve
- C. Handle
- D. Body bore
- E. None of the Above

196. Flush the pipeline before installing the valve. Debris allowed to remain in the pipeline (such as weld spatters, \_\_\_\_\_, bricks, tools, etc.) can damage the valve.

- A. Teflon seal
- B. Bypass valve
- C. Debris
- D. Body bore
- E. None of the Above

197. After installation, cycle the valve a minimum of three times and re-torque bolts as required. Ensure that the valve is in the open position and the inside of the body bore of the valve body/body end is coated with a suitable \_\_\_\_\_.

- A. Teflon seal
- B. Bypass valve
- C. Spatter guard
- D. Body bore
- E. None of the Above

Butterfly Valve Rotary Valve

198. Usually a huge water valve found in both treatment plants and through out the distribution system. If the valve is not broken, it is relatively easy to operate. It is usually accompanied with a Gate valve used as a \_\_\_\_\_ to prevent water hammer.

- A. Teflon seal
- B. Bypass
- C. Debris
- D. Body bore
- E. None of the Above

199. These are rotary type of valves usually found on large transmission lines. They may also have an additional valve beside it known as a "bypass valve" to prevent a \_\_\_\_\_.

- A. Teflon seal
- B. Bypass valve
- C. Water hammer
- D. Body bore
- E. None of the Above

200. Butterfly valves should be installed with the \_\_\_\_\_ horizontal or inclined from vertical. Always follow standard safety procedures when working on a valve.

- A. Teflon seal
- B. Bypass valve
- C. Valve shaft
- D. Body bore
- E. None of the Above

You are finished with the assignment. Please fax or e-mail the answer key and registration form to TLC. Always call and ensure we've received your paperwork. God bless and thank you.