Chapter 5 Quiz

Directions: Write the correct letter on the blank before each question.

________ 1. Which statement about the characteristics of water is MOST accurate? (167)
   A. Water is compressible at all temperatures while its weight varies at different temperatures.
   B. Water is considered to be virtually incompressible and its weight varies at different temperatures.
   C. Water is compressible at very low temperatures while its weight remains constant at all temperatures.
   D. Water is considered virtually incompressible and its weight remains constant at different temperatures.

________ 2. Which statement about the ability of water to extinguish fire is MOST accurate? (168)
   A. Water extinguishes fire by cooling objects it is applied to.
   B. Water can cool or absorb heat from a fire as well as smother fires.
   C. Water breaks the chain reaction of a fire by disrupting the fuel source.
   D. Water must be combined with some other extinguishing agent in order to extinguish fires.

________ 3. Because a large amount of heat is required to change water to steam: (169)
   A. the fire will expand before water puts it out.
   B. this allows less heat to be absorbed from the fire.
   C. this allows more heat to be absorbed from the fire.
   D. the fire will be extinguished before water changes to steam.
4. At 212°F (100°C), water converted to steam occupies approximately:
   (169)
   A. 170 times its original volume.
   B. 700 times its original volume.
   C. 1,700 times its original volume.
   D. 7,000 times its original volume.

5. Which principle of pressure is illustrated when two containers hold two different liquids of different depths, but the pressure at the bottom of each container is approximately the same? (173)
   A. Fluid pressure is perpendicular to any surface on which it acts.
   B. Fluid pressure at a point in fluid at rest is the same intensity in all directions.
   C. The pressure of a liquid in an open vessel is proportional to the density of the liquid.
   D. Pressure applied to a confined fluid from without is transmitted equally in all directions.

6. Atmospheric pressure at sea level is considered to be: (174)
   A. 10 psi (70 kPa).
   B. 12.2 psi (85 kPa).
   C. 14.7 psi (100 kPa).
   D. 16.4 psi (115 kPa).

7. The forward velocity pressure while water is flowing from a discharge opening is considered: (176)
   A. flow pressure.
   B. head pressure.
   C. residual pressure.
   D. normal operating pressure.
8. Which principle of friction loss demonstrates the advantage of a larger size hose? (179)
   A. If all other conditions are the same, friction loss varies directly with length of hose or pipe.
   B. For the same discharge, friction loss varies inversely as the fifth power of diameter of hose.
   C. For a given velocity, friction loss is approximately the same, regardless of pressure on the water.
   D. When hoses are same size, friction loss varies approximately with the square of the increase in velocity of the flow.

9. Which action would reduce friction loss caused by hose length or diameter? (181)
   A. Using older fire hose
   B. Increasing personnel on the hose
   C. Increasing the diameter of the hose
   D. Decreasing the diameter of the hose

10. Which means of moving water uses a primary water source located at a higher elevation than the distribution system? (183)
    A. Gravity system
    B. Direct pumping system
    C. Looped pumping system
    D. Indirect pumping system

11. Which term refers to a fire hydrant that receives water from two or more directions? (184)
    A. Dead-end hydrant
    B. Multiple inlet hydrant
    C. Circulating feed or looped line
    D. Multiple source circular supply

12. Water main valves should be located: (185)
    A. at frequent intervals in a grid system.
    B. at infrequent intervals in a grid system.
    C. so that they correspond with landmarks such as intersections.
    D. so that they correspond with areas most likely to fail in the system.
Directions: Write a brief answer to the questions below.

13. What are the two broad categories of valves for water systems? (186)

14. What are two purposes of private water supply systems? (188)

15. Why must protected properties maintain two completely separate systems when potable and nonpotable water systems are both used? (188)
Chapter 5 Test

Name: ___________________________ Date: ___________________________

Directions: Write the correct letter on the blank before each question.

Objective 1: Describe the characteristics of water.

1. Which statement about the freezing point of water is MOST accurate? (167)
   A. Below 32°F (0°C), water converts to a solid state of matter.
   B. Below 40°F (4°C), water is able to convert to a solid state of matter.
   C. Water will not freeze until ambient temperature and surface water temperature are the same.
   D. Water will not freeze until surface water temperature is lower than ambient temperature.

2. When water converts to a gas, water vapor, or steam, the water: (167)
   A. immediately dissipates so it is rarely visible.
   B. changes to droplets that will fall back to the surface.
   C. only becomes visible if the ambient air temperature is above 40°F (4°C).
   D. only becomes visible as it rises away from the surface of the liquid and begins to condense.

3. Water is: (167)
   A. compressible only in a vacuum.
   B. considered to be virtually incompressible.
   C. compressible only at very low temperatures.
   D. compressible only at very high temperatures.
4. For fire protection purposes, ordinary fresh water is considered to weigh: (167)
   A. 5.5 lb/gal (0.66 kg/L).
   B. 8.3 lb/gal (1 kg/L).
   C. 10.2 lb/gal (1.2 kg/L).
   D. 12 lb/gal (1.5 kg/L).

5. Water may be used to smother fires in a combustible liquid when the: (168)
   A. liquid’s specific gravity is higher than 1.
   B. liquid’s specific gravity is less than 1.
   C. ambient air temperature is below 32°F (0°C).
   D. ambient air temperature is above 32°F (0°C).

6. When water converts to steam within a closed space, the fire: (168)
   A. may react with the steam violently.
   B. may be extinguished by smothering.
   C. will become larger and more difficult to extinguish.
   D. will stay in the incipient stage until it is extinguished.

Objective 2: Identify the advantages and disadvantages of water.

7. Which is a characteristic of water? (169)
   A. Its heat-absorbing capacity is greatest when paired with other extinguishing agents.
   B. Its heat-absorbing capacity is reduced when paired with other extinguishing agents.
   C. It has lower heat-absorbing capacity than other common extinguishing agents.
   D. It has greater heat-absorbing capacity than other common extinguishing agents.
8. At 212°F (100°C), water converted to steam occupies approximately:
   (169)
   A. 20 times its original volume.
   B. 100 times its original volume.
   C. 1,200 times its original volume.
   D. 1,700 times its original volume.

9. As an extinguishing agent, water is generally an:
   (169)
   A. expensive but readily available commodity.
   B. inexpensive and readily available commodity.
   C. expensive and not readily available commodity.
   D. inexpensive but not readily available commodity.

10. A characteristic of water as an extinguishing agent is that it:
    (169)
    A. has a low surface tension that makes it easy to soak into dense materials.
    B. initially has a low surface tension but after being applied has a high surface tension.
    C. initially has a high surface tension but after being applied has a low surface tension.
    D. has a high surface tension that makes it somewhat difficult to soak into dense materials.

11. Which statement about water curtains is MOST accurate? (169)
    A. Radiant heat does not pass through water, so water curtains are very effective.
    B. Radiant heat easily passes through water, rendering water curtains ineffective.
    C. Radiant heat passes through water but with difficulty, so the effectiveness of water curtains is difficult to determine.
    D. Radiant heat passes through cold water but not warm water, so the effectiveness of water curtains depends on temperature.

12. Which statement about water and electricity is accurate? (170)
    A. Water is a poor conductor of electricity.
    B. Water is a good conductor of electricity.
    C. Water conducts electricity only at very high voltages.
    D. Water can conduct electricity, but does not create hazardous situations.
**Objective 3:**
*Summarize facts about water pressure and velocity.*

________ 13. Which is the BEST description of pressure? (170)
   A. Force per unit area
   B. Weight per unit area
   C. Relative measure of weight
   D. Simple measure of movement

________ 14. The first principle of pressure states that fluid pressure is: (172)
   A. greatest at the center of the vessel.
   B. different depending upon the vessel.
   C. congruent to any surface on which it acts.
   D. perpendicular to any surface on which it acts.

________ 15. The second principle of pressure states that fluid pressure at a point in fluid at rest is: (172)
   A. greater near the top.
   B. greater near the bottom.
   C. the same intensity in all directions.
   D. variable and not the same in all directions.

________ 16. The third principle of pressure states that pressure applied to a confined fluid is: (172)
   A. greater near the top.
   B. greater near the bottom.
   C. transmitted equally in all directions.
   D. variable and not the same in all directions.

________ 17. The fourth principle of pressure states that the pressure of a liquid in an open vessel is: (173)
   A. proportional to its depth.
   B. independent of its depth.
   C. dependent upon the length of time in vessel.
   D. variable even when vessels remain the same.
18. The fifth principle of pressure states that the pressure of a liquid in an open vessel is: (173)
   A. variable for similar liquids.
   B. dependent upon the vessel size.
   C. independent of the density of the liquid.
   D. proportional to the density of the liquid.

19. The sixth principle of pressure states that the pressure of a liquid at the bottom of a vessel is: (174)
   A. greater at the center.
   B. independent of the shape of the vessel.
   C. greater toward the outside of the vessel.
   D. dependent upon the shape of the vessel.

20. Which statement describes the relationship between pressure and altitude? (174)
    A. Pressure is independent of the altitude.
    B. Pressure is similar at low and very high altitudes.
    C. Pressure is greatest at low altitudes and least at very high altitudes.
    D. Pressure is greatest at very high altitudes and least at low altitudes.

21. Which term refers to any pressure less than atmospheric pressure? (175)
    A. Vacuum
    B. Head pressure
    C. Static pressure
    D. Perfect vacuum

22. Which term refers to absolute zero pressure? (175)
    A. Vacuum
    B. Head pressure
    C. Static pressure
    D. Perfect vacuum
23. In order to convert head in feet to head pressure in psi, you must divide the number of feet by: (175)
   A. 1.50.
   B. 2.304.
   C. 4.302.
   D. 6.32.

24. Which term refers to stored potential energy available to force water through pipes, fittings, hose and adapters? (175)
   A. Head pressure
   B. Static pressure
   C. Residual pressure
   D. Normal operating pressure

25. Which term refers to the pressure found in a water distribution system during normal consumption demands? (176)
   A. Head pressure
   B. Static pressure
   C. Residual pressure
   D. Normal operating pressure

26. The difference between static pressure and normal operating pressure is: (176)
   A. static pressure is normal operating pressure minus 1.0.
   B. static pressure is normal operating pressure minus 2.30.
   C. normal operating pressure is residual pressure plus static pressure.
   D. the friction caused by water flowing through the pipes, valves and fittings.

27. Which term refers to the portion of total available pressure not used to overcome friction loss or gravity while forcing water through pipes, fittings, hoses, adapters? (176)
   A. Flow pressure
   B. Head pressure
   C. Residual pressure
   D. Normal operating pressure
28. Which term refers to the forward velocity pressure while water is flowing from a discharge opening? (176)
   A. Flow pressure
   B. Head pressure
   C. Residual pressure
   D. Normal operating pressure

29. When a nozzle is above the level of the pump, there is: (176)
   A. pressure loss.
   B. pressure gain.
   C. no change in pressure.
   D. either pressure loss or pressure gain.

30. When a nozzle is below the level of the pump, there is: (176)
   A. pressure loss.
   B. pressure gain.
   C. no change in pressure.
   D. either pressure loss or pressure gain.

31. Why does altitude impact the production of fire streams? (176)
   A. Because atmospheric pressure affects temperature
   B. Because atmospheric pressure affects foam production
   C. Because atmospheric pressure drops as height above sea level increases
   D. Because atmospheric pressure increases as height above sea level increases

32. Friction loss is that part of the total pressure lost: (177)
   A. while water is stationary in pipes.
   B. as water contacts its intended object.
   C. as water moves through the atmosphere.
   D. while forcing water through pipe, fittings, fire hose, and adapters.

33. Which is a cause of friction loss in fire hose? (177)
   A. Sharp bends
   B. Use of newer nozzles
   C. Ambient temperature
   D. Lack of adequate personnel
34. Why is friction loss in newer, modern fire hose much less than in older fire hose? (177)
   A. Modern fire hose has shorter sections.
   B. Modern fire hose has much larger diameters.
   C. Modern fire hose has a smoother inner lining.
   D. Modern fire hose has a smoother outer lining.

Objective 4: Summarize the principles of friction loss.

35. The first principle of friction loss states that if all other conditions are the same, friction loss: (178)
   A. varies directly with length of hose or pipe.
   B. is independent of the length of hose or pipe.
   C. is reduced by half each time the length of hose or pipe doubles.
   D. increases by 25% every time the length of hose or pipe doubles.

36. The second principle of friction loss illustrates that (178)
   A. friction loss and velocity are unrelated.
   B. friction loss develops much faster than change in velocity.
   C. friction loss develops much slower than change in velocity.
   D. friction loss develops at the same rate as change in velocity.

37. Why does the third principle of friction loss demonstrate the advantage of larger size hose? (179)
   A. For the same discharge, friction loss varies inversely as the second power of diameter of hose.
   B. For the same discharge, friction loss varies inversely as the third power of diameter of hose.
   C. For the same discharge, friction loss varies inversely as the fifth power of diameter of hose.
   D. For the same discharge, friction loss varies inversely as the tenth power of diameter of hose.
38. The fourth principle of friction loss states that for a given velocity, friction loss is: (179)
   A. widely variable, regardless of pressure on the water.
   B. inversely proportional to the pressure on the water.
   C. approximately the same, regardless of pressure on the water.
   D. increased by 25% for every 25% increase of pressure on the water.

Objective 5: Identify how friction loss principles can be applied to the fire service.

39. Which statement about fire hose and friction loss is MOST accurate? (179)
   A. Given the same velocity, small and large hose will deliver the same volume.
   B. Hose size has relatively little effect on velocity required to deliver water.
   C. The larger the hose, the greater the velocity needed to deliver the same volume.
   D. The smaller the hose, the greater the velocity needed to deliver the same volume.

40. Which statement about friction loss is MOST accurate? (180)
   A. Flow pressure is greatest at the farthest point in the system.
   B. Flow pressure will always be lowest closest to the source of supply.
   C. Friction loss in a water system decreases as length of hose or piping increases.
   D. Friction loss in a water system increases as length of hose or piping increases.

41. Which would be the BEST option to reduce friction loss caused by hose length? (181)
   A. Reduce the length of the lay
   B. Increase the length of the lay
   C. Use a different type of nozzle
   D. Increase the velocity of the water
42. Which type of friction loss can usually be minimized by employing proper hose handling techniques? (181)
   A. Hose length
   B. Water pressure
   C. Hose diameter
   D. Sharp bends in the hose

43. Which of the following causes water hammer? (181)
   A. Increasing the water pressure
   B. Hoses or pipes that have deformities
   C. Suddenly stopping water moving through a hose or pipe
   D. Suddenly increasing the amount of water moving through a hose or pipe

Objective 6:
Identify the principles of municipal water supply systems.

44. Which action fire departments should take when a large volume of water is needed in an area? (182)
   A. Request that water utility department increase water pressure
   B. Request that nearby homeowners and businesses stop water usage
   C. Completely fill pumpers with water then attempt an offensive fire attack
   D. Ration water used at the incident scene so that exposures are protected first

45. When engineers estimate the amount of water that a large city needs, the: (183)
   A. only needs taken into account are the industrial/domestic needs.
   B. domestic/industrial requirements will far exceed that required for fire protection.
   C. requirements for fire protection will far exceed those for domestic/industrial needs.
   D. needs for fire protection and domestic/industrial needs should be considered to be the same.
46. Which means of moving water uses one or more pumps that take water from a primary source and discharge it through filtration and treatment processes? (183)
   A. Direct pumping system
   B. Linear pumping system
   C. Primary pumping system
   D. Forced distribution system

47. Which statement about a gravity system is MOST accurate? (183)
   A. Uses a primary water source at the same elevation as the distribution system
   B. Uses a primary water source located at a lower elevation than the distribution system
   C. Uses a primary water source located at a higher elevation than the distribution system
   D. Uses two primary water sources, one at a higher elevation and one at a lower elevation

48. For water supply, most communities use a: (183)
   A. gravity system.
   B. direct pumping system.
   C. combination of the direct pumping and gravity systems.
   D. proprietary pumping system that is designed specifically for that community.

49. What is the MAIN concern of fire departments regarding water treatment facilities? (184)
   A. Amount of chemicals put into the water
   B. Cost of the water for the fire department
   C. Possible damage to apparatus tanks caused by treatment
   D. Maintenance failure or other events could disable pumping station(s) or severely hamper the purification process

50. A dead-end fire hydrant is a fire hydrant that: (184)
   A. is located last on a street.
   B. receives water from two directions.
   C. receives water from only one direction.
   D. is located where turn-around in not possible.
51. Which describes a circulating feed or looped line? (184)
A. When a fire hydrant is located in a cul-de-sac
B. When a fire hydrant is located at an intersection
C. When a fire hydrant receives water from only one direction
D. When a fire hydrant receives water from two or more directions

52. In a grid system, large pipes (mains), with relatively widespread spacing, that convey large quantities of water to various points of the system for local distribution to smaller mains are called: (184)
A. distributors.
B. primary feeders.
C. secondary feeders.
D. circulating feeders.

53. In a grid system, a network of intermediate-sized pipes that reinforce the grid and aid the concentration of required fire flow at any point are called: (185)
A. distributors.
B. primary feeders.
C. secondary feeders.
D. circulating feeders.

54. The valves within a water distribution system should be: (186)
A. inspected and operated yearly by the fire department.
B. inspected and operated monthly by the fire department.
C. inspected and operated yearly by the water supply utility.
D. inspected and operated monthly by the water supply utility.

55. Which type of valve is commonly used on private water supply systems and the words open or shut appear in a window as the valve approaches one position or the other? (186)
A. Gate valve
B. Butterfly valve
C. Post indicator (PIV) valve
D. Outside screw and yoke (OS&Y) valve
56. Which type of valve has a yoke on the outside with threaded stem that controls the gate's opening or closing and is most commonly used on sprinkler systems? (186)
   A. Gate valve  
   B. Butterfly valve  
   C. Post indicator (PIV) valve  
   D. Outside screw and yoke (OS&Y) valve

57. Which are the most common type of valves used on most public water distribution systems? (186)
   A. Primary valves  
   B. Indicating valves  
   C. Secondary valves  
   D. Nonindicating valves

58. If a gate valve resists turning after fewer than the indicated number of turns required to close the valve, the: (187)
   A. valve should be considered closed.  
   B. valve should be blown out with water.  
   C. condition should be noted for later repair.  
   D. condition should be reported to the responsible agency.

59. Who should the fire department coordinate with before flushing hydrants in nonemergency situations? (188)
   A. Law enforcement  
   B. Local water authority  
   C. Local transportation authority  
   D. Neighboring housing additions

60. Rates of consumption allow engineers and fire protection personnel to determine: (188)
   A. size of pumper.  
   B. charges for consumers.  
   C. mutual aid agreements.  
   D. adequacy of the water distribution system.
Objective 7: Describe private water supply systems.

61. Most commonly, private water supply systems receive their water from a(an): (188)
   A. cistern.
   B. underground well.
   C. nearby lake or reservoir.
   D. municipal water supply system.

62. If a property is served by both the municipal system and a private source consisting of nonpotable water: (188)
   A. backflow measures are not needed.
   B. the systems can be interconnected.
   C. the private source cannot be considered usable.
   D. measures must be taken to prevent cross contamination.

63. The piping for fire protection and domestic/industrial services for private water supply systems are: (189)
   A. almost always separate.
   B. generally interconnected.
   C. cost prohibitive for businesses.
   D. prone to multiple breakdowns.

64. Which is an advantage to having separate piping arrangements for a private water supply system? (189)
   A. Allows business to not follow codes
   B. More cost effective than just one system
   C. Systems can be used as redundant supply systems
   D. Neither of the systems is affected by service interruptions to the other
Chapter 5 Quiz Answers

1. B
2. B
3. C
4. C
5. C
6. C
7. A
8. B
9. C
10. A
11. C
12. A
13. Indicating and nonindicating
14. *Answers may vary; students should include at least two of the following:*
   - To provide water strictly for fire protection purposes
   - To provide water for sanitary and fire protection purposes
   - To provide water for fire protection and manufacturing processes
15. To prevent cross contamination
Chapter 5 Test Answers

Objective 1
1. A
2. D
3. B
4. B
5. A
6. B

Objective 2
7. D
8. D
9. B
10. D
11. B
12. B

Objective 3
13. A
14. D
15. C
16. C
17. A
18. D
19. B
20. C
21. A
22. D
23. B
24. B
25. B
26. D
27. C
28. A
29. A
30. B
31. C
32. D
33. A
34. C

Objective 4
35. A
36. B
37. C
38. C

Objective 5
39. D
40. D
41. A
42. D
43. C

Objective 6
44. A
45. B
46. A
47. C
48. C
49. D
50. C
51. D
52. B
53. C
54. C
55. C
56. D
57. D
58. D
59. B
60. D
Objective 7
61. D
62. D
63. A
64. D