Chapter 14 Quiz

Name: ___________________________ Date: ___________________________

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

_______ 1. The device that injects the correct amount of foam concentrate into the water stream to make the foam solution is called a foam: (480)
   A. aerator.
   B. eductor.
   C. solutioner.
   D. proportioner.

_______ 2. During proportioning, foam concentrates are generally intended to be mixed with: (482)
   A. polar solvents.
   B. distilled water.
   C. fresh or salt water.
   D. biodegradable gelling agents.

_______ 3. Which kind of container can foam solution can be stored in? (484-485)
   A. Totes
   B. Pickup tubes
   C. Venturi devices
   D. Unlined metal barrels

_______ 4. Which statement about Class A foam is MOST accurate? (487)
   A. It can only be used with aerating nozzles.
   B. It is not economical because it has such a short shelf life.
   C. Because the product is used in small amounts, it is typically not a major environmental concern.
   D. Using it in conjunction with compressed air foam systems (CAFS) decreases its insulation qualities.
5. Which statement about Class B foam is MOST accurate? (489)

A. Class B concentrates should be stored in a warm area to maximize shelf life.
B. Concentrates that are manufactured to U.S. Military specifications may be mixed at any time.
C. This foam is most commonly used to extinguish ordinary combustibles such as wood and paper.
D. The differences in type of concentrate, method of aeration, and proportioning of the foam will not affect its expansion.

6. Which is a common type of portable foam proportioner? (494)

A. Venturi eductor
B. Jet ration eductor
C. Draft foam eductor
D. In-line foam eductor

7. Which statement about installed in-line eductor systems and portable in-line eductors is MOST accurate? (497)

A. Precautions regarding hose lengths do not apply to installed in-line eductors.
B. Installed systems can use foam supplied by a tank mounted on the apparatus.
C. Portable systems can use foam supplied by a tank mounted on the apparatus.
D. Installed systems do not need to match the nozzle and eductor flow capability.

8. When using low energy portable foam application systems, the aeration and discharge functions are completed by: (503)

A. foam nozzle eductors.
B. the CAFS compressor.
C. an aerating foam nozzle.
D. the master stream appliances.
9. When large-scale flammable and combustible liquid fires require the delivery of an amount of foam that is beyond the capability of the handlines, which nozzles should be used? (504)
   A. Fog nozzles
   B. Smooth bore nozzles
   C. Air-aspirating foam nozzles
   D. Master stream foam nozzles

10. Which method for Class B foam application involves directing a foam fire stream on the ground near the front edge of a burning liquid spill? (506)
    A. Roll-on method
    B. Rain-down method
    C. Bank-down method
    D. Direct application method

11. Which is the most common method of foam application for aboveground storage tank fires? (506)
    A. Roll-on method
    B. Rain-down method
    C. Bank-down method
    D. Direct application method

12. Studies by the U.S. Forest Service have shown that release of Class A foam into a natural water source can be lethal to: (508)
    A. fish.
    B. humans.
    C. livestock.
    D. aquatic birds.

13. Other additives currently available for use as extinguishing agents, as well as pre-treatment of structures threatened by fire spread, are generally known as: (508)
    A. surfactants.
    B. polar solvents.
    C. protein concentrates.
    D. durable or gelling agents.
Directions: Write a brief answer to the questions below.

14. Explain two of the three methods by which foam extinguishes and/or suppresses vapors. (481)

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15. List two of the five tactical advantages that compressed air foam offers. (502)

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16. Briefly explain how a mechanical blower operates. (505)

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17. List three of the nine common causes for the production of poor quality foam or the lack of foam production. (505)

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Chapter 14 Test

Name: _________________________ Date: _________________________

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

Objective 1: Summarize facts about principles of foam.

1. In order to produce fire fighting foam, what three items must be educted or injected in correct ratios? (480)
   A. Foam concentrate, water, and air
   B. Hydrocarbons, foam solution, and air
   C. Foam solutions, gelling agent, and water
   D. Polar solvents, foam concentrate, and water

2. Which piece of equipment injects the correct amount of foam concentrate into the water stream to make the foam solution? (480)
   A. Venturi device
   B. Aerating nozzle
   C. Mechanical blower
   D. Foam proportioner

3. Which are examples of polar solvent fuels requiring the use of special polymeric fire fighting foam? (480)
   A. Water and acetone
   B. Alcohol and ketones
   C. Esters and cooking oils
   D. Kerosene and crude oils

4. What is released as fire fighting foam breaks down, providing a cooling effect on the fuel and suppressing the process of heat-producing oxidation? (481)
   A. Gel
   B. Water
   C. Proteins
   D. Polar solvents
5. The act of mixing water with foam concentrate to form a foam solution is called: (482)
   A. aeration.
   B. eduction.
   C. hydrolization.
   D. proportioning.

6. Which are designed to work in conjunction with proportioners to produce the best possible foam? (482)
   A. Pickup tubes
   B. Foam nozzles
   C. In-line eductors
   D. Jet ratio controllers

7. Which proportioning method uses an external pump to force foam concentrate into the fire stream at the proper ratio in comparison to the flow? (483)
   A. Injection
   B. Induction
   C. Premixing
   D. Batch mixing

8. Which statement about batch mixing is accurate? (483)
   A. It is very complex.
   B. It is potentially inaccurate.
   C. It is most effective during large incidents.
   D. It uses the pressure of a water stream to draft foam.

9. Which proportioning method uses premeasured portions of water and foam concentrate that are mixed in a container? (484)
   A. Injection
   B. Induction
   C. Premixing
   D. Batch mixing

10. What is the smallest type of foam storage container? (485)
    A. Pails
    B. Totes
    C. Barrels
    D. Apparatus tanks
11. In order to eliminate using pails or barrels to supply a foam eductor, fire apparatus equipped with onboard foam proportioning systems usually have ___ piped directly to the delivery system. (485)
   A. in-line eductors
   B. jet ratio controllers
   C. in-line proportioners
   D. foam concentrate tanks

12. Regardless of the type of tank, what is one characteristic that all foam storage containers share? (486)
   A. Oxygenation
   B. Refrigeration
   C. Airtight storage
   D. Room for expansion

Objective 2:
**Distinguish among types of foam concentrates used in fire fighting.**

13. The formula of Class A foam includes _____ that reduce the surface tension of water in the foam solution. (487)
   A. gelling agents
   B. polar solvents
   C. hydrocarbon surfactants
   D. protein foam concentrates

14. What is the commonly used guideline for proportioning Class A foam for exposure protection with standard fog nozzles? (488)
   A. 0.2 to 0.5 percent concentrate
   B. 0.5 to 1.0 percent concentrate
   C. 0.3 to 0.7 percent concentrate
   D. 0.1 to 0.2 percent concentrate

15. The minimum amount of foam solution that must be used on a fire per minute per square foot (square meter) of fire is called the: (488)
   A. eduction rate.
   B. injection rate.
   C. application rate.
   D. proportioning rate.
16. Because it forms a rigid coating that adheres well and is slow to drain, the best consistency of Class A foam for vertical surfaces is:

A. dry foam.  
B. wet foam.  
C. hard foam.  
D. medium foam.

17. What affects the breakdown process of Class A foam?  
A. Surface elevation  
B. Atmospheric pressure  
C. Age of the burning fuel  
D. Ambient air temperature

18. Class B synthetic foam concentrate is made from:  
A. animal proteins.  
B. film forming fluoroprotein.  
C. a mixture of gelling agents.  
D. a mixture of fluorosurfactants.

19. What are Mil-Spec concentrates?  
A. Experimental foams still in the development phase  
B. Foam concentrates used only in U.S. Military operations  
C. Foam concentrates manufactured to U.S. Military specifications  
D. Foam concentrates manufactured by the Milhouse Specialty Company

20. Which factor is MOST likely to affect the degree of expansion in a foam solution?  
A. Biodegradability  
B. Rate of application  
C. Method of aeration  
D. Decomposition rate

21. Which variable affects a foam’s rate of application?  
A. Environmental considerations  
B. The type of foam proportioner used  
C. Whether the fuel is contained or uncontained  
D. The ambient temperature at the incident site
22. Driver/operators calculate the application rate available from a specific nozzle by: (491)
   A. dividing the area of the fire by the flow rate.
   B. dividing the flow rate by the area of the fire.
   C. multiplying the flow rate by the area of the fire.
   D. multiplying nozzle pressure by the area of the fire.

23. Why might fuel and fire consume a portion or the entire foam blanket? (491)
   A. Presence of polar solvents
   B. Presence of thermal drafts
   C. Inconsistent application time
   D. Incorrect type or concentration used

24. Which statement about regular protein foams is MOST accurate? (492)
   A. They are more fluid than most other low expansion foams.
   B. They degrade more quickly and are becoming increasingly rare.
   C. They are a combination of protein-based foam and synthetic foam.
   D. They are derived from animal protein and contain no additives or chemicals.

25. Which foam consists of fluorochemical and hydrocarbon surfactants combined with solvents to create a high boiling point? (492)
   A. Fluoroprotein foam
   B. High-expansion foam
   C. Aqueous film forming foam (AFFF)
   D. Film forming fluoroprotein foam (FFFP)

26. Which foam is MOST likely to be used to combat concealed space fires in cellars or other subterranean spaces? (494)
   A. Fluoroprotein foam
   B. High-expansion foam
   C. Aqueous film forming foam (AFFF)
   D. Film forming fluoroprotein foam (FFFP)
Objective 3:
Explain the operation of low energy foam proportioning systems.

27. Low energy foam systems impart pressure on the foam solution with the use of the: (494)
   A. main fire pump.
   B. mechanical blower.
   C. self-educting pickup tube.
   D. variable-flow variable-rate direct-injection system.

28. Which is a basic foam proportioner that is designed to be attached directly to the pump panel discharge or connected at some point in the hose lay? (494)
   A. In-line foam eductors
   B. Foam nozzle eductors
   C. Jet ratio controller (JRC)
   D. Self-educting master stream nozzle

29. When operating an in-line foam eductor, which of the following operating guidelines must be followed to achieve properly proportioned finished foam? (495)
   A. The inlet pressure should be decreased as much as possible in order to create the Venturi effect.
   B. Back pressure should be increased as much as possible in order to create the best foam induction.
   C. The flow in gallons per minute (L/min) through the eductor must not exceed its rated capacity.
   D. The pressure at the discharge side of the eductor must not be less than 70 percent of the eductor inlet pressure.

30. Viscosity, or the thickness and ability of a liquid to flow freely, is MOST likely to be affected by: (495)
   A. humidity.
   B. elevation.
   C. temperature.
   D. nozzle pressure.
31. Which of the following has a pickup tube that is located in the center bore of the nozzle and uses a modified Venturi design to draw concentrate into its water stream? (496)
   A. Jet ratio controller
   B. Foam nozzle eductors
   C. In-line foam eductors
   D. Self-educting master stream foam nozzle

32. A type of in-line eductor that may be used to supply foam concentrate to a self-educting master stream foam nozzle is called a: (497)
   A. handline eductor.
   B. jet ratio controller.
   C. mechanical blower.
   D. fog nozzle eductor.

33. In some installed in-line eductor systems, a(an) ___ proportioner is installed to reduce the friction loss across the eductor. (497)
   A. bypass
   B. injection
   C. expansion
   D. around-the-pump

34. Installed in-line eductors are most commonly used to proportion which class of foam? (497)
   A. Class A
   B. Class B
   C. Class C
   D. Class K

35. Which is the most common apparatus-mounted foam proportioner and consists of a small return (bypass) water line connected from the discharge side of the pump back to the intake side of the pump? (498)
   A. Around-the-pump proportioner
   B. Bypass-type balanced pressure proportioner
   C. Variable-flow variable-rate direct injection proportioner
   D. Variable-flow demand-type balanced pressure proportioner
36. Which is a proportioner used on large mobile apparatus installations, such as ARFF vehicles, and is one of the most accurate methods of foam proportioning? (499)
   A. Around-the-pump proportioner
   B. Bypass-type balanced pressure proportioner
   C. Variable-flow variable-rate direct injection proportioner
   D. Variable-flow demand-type balanced pressure proportioner

37. Which statement about variable-flow demand-type balanced pressure proportioners is MOST accurate? (500)
   A. It is the simplest method of proportioning foam.
   B. It is a method compatible only with high energy foam systems.
   C. It consists of a variable speed mechanism driven electrically or hydraulically that operates a foam concentrate pump.
   D. It features the ability to monitor the demand for foam concentrate and adjust the amount of concentrate supplied.

38. Batch mixing is generally only used with which types of foam concentrates? (501)
   A. Class A and regular AFFF concentrates
   B. Class B and regular AFFF concentrates
   C. Class A and alcohol resistant AFFF concentrates
   D. Class B and alcohol resistant AFFF concentrates

39. Class A foam solutions do not retain their foaming properties when mixed in water for more than: (501)
   A. 2 hours.
   B. 24 hours.
   C. one week.
   D. one month.

40. When using the batch mixing proportioning method, frothing can be avoided by: (501)
   A. using a lower proportion of foam.
   B. slowly circulating water in the tank.
   C. draining and refilling the water tank.
   D. removing lubricants from pump seals.
Objective 4:
Describe high energy foam generating systems.

41. High-energy foam generating systems/CAFS differ from other methods because: (502)
   A. the flow of concentrate matches the pressure demand better.
   B. the concentrate is supplied from atmospheric pressure foam tanks on the apparatus.
   C. they introduce compressed air into the foam solution prior to discharge into the hoseline.
   D. they introduce compressed air into the foam solution after discharge into the hoseline.

42. Which is a limitation of CAFS? (503)
   A. CAFS requires closer proximity to the fire.
   B. In event of a hose burst, compressed air will intensify the reaction of hoseline.
   C. Foam produced by a CAFS does not adhere to a fuel surface as well as low energy foam.
   D. Hoselines containing high energy foam solution weigh more than those containing plain water.

43. Due to the low eduction rates on a CAFS apparatus, what is required to supply the fire stream at the rate of 0.1 to 1.0 percent? (503)
   A. A handline nozzle
   B. Gelling agents in the foam solution
   C. Film forming fluoroprotein foam (FFFP)
   D. A variable flow rate sensing proportioner

Objective 5:
Distinguish among portable foam application devices.

44. For a portable foam application device, once foam concentrate and water have mixed to form a foam solution, the solution must be: (503)
   A. aerated.
   B. pre-mixed.
   C. hydrolyzed.
   D. proportioned.
45. Which is a common handline nozzle used for foam application? (503)
   A. Fog nozzle
   B. Jet ratio nozzle
   C. Mechanical nozzle
   D. Balanced pressure nozzle

46. A smooth bore nozzle is limited to application of which classification of foam? (504)
   A. Any Class A foam
   B. Any Class B foam
   C. Class A foam from a CAFS
   D. Class B foam from a CAFS

47. Which kind of nozzle allows firefighters the option of operating fixed flow, selective flow, or automatic flow when applying a low expansion, short duration foam blanket? (504)
   A. Fog nozzles
   B. Smooth bore nozzles
   C. Air-aspirating foam nozzles
   D. Master stream foam nozzles

48. Which kind of nozzle inducts air into foam solution by a Venturi action and is the only nozzle that should be used with protein and fluoroprotein concentrates? (504)
   A. Fog nozzles
   B. Smooth bore nozzles
   C. Air-aspirating foam nozzles
   D. Master stream foam nozzles

49. What are the two basic types of medium- and high-expansion foam generators? (505)
   A. Water aspirating and hydrolyzed
   B. Hydrolyzed and burnback resistant
   C. Water aspirating and mechanical blower
   D. Burnback resistant and mechanical blower
50. Both of the basic types of medium- and high-expansion foam generators produce foam containing: (505)
   A. low air content.
   B. high air content.
   C. low water content.
   D. high water content.

Objective 6:  
Identify reasons for the production of poor quality foam or the lack of foam production when using an in-line proportioner.

51. Which statement is true about the adequate and/or inadequate production of foam when an in-line proportioner is used? (505)
   A. A nozzle placed too far above the eductor will result in excessive foaming.
   B. Too long an attack line on the discharge side of the eductor will diminish the Venturi effect.
   C. A partially closed nozzle will result in a flow rate that will not allow the creation of a Venturi effect.
   D. It is acceptable to mix foam concentrates from different manufacturers as long as they are the same class.

52. In which situation is it acceptable to mix together different manufacturers’ foam concentrates? (505)
   A. If they are Class A CAFS foams
   B. If they are mil-spec concentrates
   C. If they are not mil-spec concentrates
   D. If they are Class B polar solvent foams

Objective 7: 
Identify foam application techniques.

53. Direct application is a method of attack that is BEST used with: (506)
   A. Class A foam.
   B. Class B foam.
   C. aqueous film forming foam.
   D. film forming fluoroprotein foam.
54. Which method for Class B foam application involves directing the foam onto a vertical surface and allowing it to run down and spread across pooled fuel product? (506)
   A. Roll-on method
   B. Rain-down method
   C. Bank-down method
   D. Direct application method

Objective 8:
Explain the environmental impact of foam.

55. What is determined by the rate at which natural bacteria can degrade foam? (508)
   A. Hydrolization
   B. Decomposition
   C. Biodegradability
   D. Burnback resistance

56. The process of foam decomposition results in the consumption of: (508)
   A. oxygen.
   B. aquatic life.
   C. fresh water.
   D. carbon dioxide.

57. Why is it important to avoid direct application of Class A foam to natural bodies of water? (508)
   A. It can harm aquatic life.
   B. It will lose its effectiveness.
   C. It is oil-based and will not mix with water.
   D. Water increases the ambient temperature of the foam.

Objective 9:
Identify durable agents.

58. In what way are durable agents similar to Class A foam? (509)
   A. Both products are used in a similar fashion.
   B. Both products are water absorbent polymers.
   C. Both products are inexpensive and easily stored.
   D. Both products form small bubbles filled with water.
59. What is a disadvantage of durable agents? (509)

A. The products are not biodegradable and can be toxic to the environment.
B. These products do not retain their fire retarding properties as long as Class A foam.
C. These products can only be batch mixed and may result in discarding expensive product.
D. Once applied, surfaces coated with these products become very slippery for walking or driving.
Chapter 14 Quiz Answers

1. D
2. C
3. A
4. C
5. B
6. D
7. B
8. C
9. D
10. A
11. B
12. A
13. D
14. Answers may vary; students should include at least two of the following:
   • Separating — Creates a barrier between the fuel and the fire
   • Cooling — Lowers the temperature of the fuel and adjacent surfaces
   • Suppressing or smothering — Prevents the release of flammable vapors, reducing the possibility of ignition or reignition

15. Answers may vary; students should include at least two of the following:
   • The reach of the fire stream is considerably longer than those of low energy systems.
   • A CAFS system produces small uniform air bubbles that are very durable.
   • Foam produced by a CAFS adheres to a fuel surface and resists heat longer than low energy foam.
   • Hoselines containing high energy foam solution weigh less than those containing plain water, or low energy foam solution.
   • CAFS may provide a safer fire attack that allows effective reach from a greater distance.

16. Answer may vary slightly, but students should include the following:
   • They operate on the same principle as the water aspirating nozzle, except that air is forced through the foam solution by the fan instead of being pulled by water movement.

17. Answers may vary; students should include at least four of the following:
   • Incorrect match between eductor and nozzle flow, resulting in no pickup of foam concentrate
   • Air leaks at fittings may cause a loss of suction
   • Clogged proportioning equipment
- Partially closed nozzle will result in a flow rate that will not allow the creation of a Venturi effect capable of picking up foam concentrate
- Too long of an attack line on the discharge side of the eductor
- Kinked hose
- Nozzle placed too far above the eductor, resulting in excessive elevation pressure
- Different manufacturers' foam concentrates should not be mixed together (except for mil-spec concentrates) as they may be chemically incompatible
- Different classes of foam should not be mixed as they may produce an ineffective foam product or prevent any foam delivery
Chapter 14 Test Answers

Objective 1
1. A
2. D
3. B
4. B
5. D
6. B
7. A
8. B
9. C
10. A
11. D
12. C

Objective 2
13. C
14. B
15. C
16. A
17. D
18. D
19. C
20. C
21. C
22. B
23. C
24. B
25. C
26. B

Objective 3
27. A
28. A
29. C
30. C
31. D
32. B
33. A
34. B
35. A
36. B
37. C
38. A
39. B
40. B

Objective 4
41. C
42. B
43. D

Objective 5
44. A
45. A
46. C
47. A
48. C
49. C
50. B

Objective 6
51. C
52. B

Objective 7
53. A
54. C

Objective 8
55. C
56. A
57. A

Objective 9
58. A
59. D