

U.S.C.G. Merchant Marine Exam

OSV – Assistant Engineer

Q653 Engineering Safety & Environmental Protection

(Sample Examination)

Choose the best answer to the following Multiple-Choice Questions:

1. After measuring the length to which a section of shoring should be cut, you should cut the shoring _____.
- A. approximately 1/2 inch shorter than the measured length to allow for the use of wedges
 - B. to the same length as the measured length
 - C. approximately 1/2 inch shorter per foot of the measured length to allow for wet expansion
 - D. approximately 1/2 inch longer than the measured length to allow for trimming

Correct answer: A

2. Which of the following limitations is correct regarding gas masks, otherwise called filter masks?
- A. A maximum of only 30 minutes of protection is afforded with a single canister when in atmospheres containing highly toxic gases.
 - B. All canisters must be discarded within 24 hours when the seal becomes broken.
 - C. A canister is reliable for up to 5 years from the date of manufacture, as long as the seal is unbroken.
 - D. All of the above.

Correct answer: C

3. Which type of respiratory protection is preferable for the repair/investigation personnel in a hydrogen sulfide (H₂S) environment?
- A. Self-Contained Demand-Type Breathing Apparatus (SCDBA)
 - B. Positive Self-Contained Breathing Apparatus (SCBA)
 - C. Emergency Escape Breathing Apparatus (EEBA)
 - D. U.S. Navy Oxygen Breathing Apparatus (OBA)

Correct answer: B

4. The wooden plug fitted tightly in the vent of a damaged tank may prevent the tank from _____.
- A. developing free surfaces
 - B. collapsing
 - C. developing free surface moments
 - D. filling completely

Correct answer: D

5. Progressive flooding in the engine room may be minimized by securing watertight boundaries and _____.
- A. transferring reserve feedwater
 - B. dumping fuel oil
 - C. pumping out flooded compartments
 - D. evacuating the engine room

Correct answer: C

6. A three inch overboard discharge line, located six feet below the waterline, has ruptured and separated from the hull. What would be the minimum number of strokes per minute required from a 10" x 8" x 12" duplex double acting steam operated reciprocating bilge pump, operating at 96% efficiency, to keep the bilge water level from continuing to rise? Illustration SF-0034
- A. 45 strokes per minute
 - B. 56 strokes per minute
 - C. 87 strokes per minute
 - D. 98 strokes per minute

Correct answer: C

7. The upper explosive limit (UEL) of a mixture of flammable vapors and air is defined as _____.
- A. that concentration above which there is just enough flammable vapor to produce an explosion
 - B. that concentration above which the mixture is too rich to burn
 - C. the percentage of flammable vapor by volume in air sufficient to create an explosion
 - D. the percentage of oxygen present in the air sufficient to support combustion

Correct answer: B

8. The blocking open or absence of fire dampers can contribute to _____.
- A. the accumulation of explosive gases
 - B. faster cooling of the fire
 - C. the fire spreading by way of the ventilation system
 - D. fixed foam systems to be ineffective

Correct answer: C

9. All of the following are part of the fire triangle EXCEPT _____.
- A. fuel
 - B. oxygen
 - C. heat
 - D. electricity

Correct answer: D

10. When using foam, a "Class B" fire is extinguished by _____.
- A. replacing the fuel
 - B. cooling the surface
 - C. smothering the fire
 - D. all of the above

Correct answer: C

11. Which of the following statements is true concerning the Halon 1301 fire extinguishing agent?
- A. The agent is less effective than carbon dioxide.
 - B. The agent is highly toxic as stored in pressurized cylinders.
 - C. The agent cannot be used on electrical fires because it leaves a residue.
 - D. Halon extinguishes the fire by a chain breaking reaction.

Correct answer: D

12. Which of the following statements is TRUE concerning life jackets?

- A. Buoyant vests may be substituted for life jackets.
- B. Life jackets are designed to turn an unconscious person's face clear of the water.
- C. Life jackets must always be worn with the same side facing outwards to float properly.
- D. Lightly stained or faded life jackets will fail in the water and should not be used.

Correct answer: B

13. The external flotation bladder on an immersion suit should be inflated _____.

- A. before you enter the water
- B. after you enter the water
- C. after one hour in the water
- D. after you notice that your suit is losing buoyancy

Correct answer: B

14. In the illustration shown, the sea painter is identified as item number _____. Illustration SF-0043

- A. 3
- B. 6
- C. 7
- D. 9

Correct answer: C

15. When inspecting a survival craft, you should check to make sure that the _____.

- A. sea anchor is deployed
- B. hydraulic starting system has been drained
- C. hydraulic pressure is within the specified range
- D. steering controls are locked

Correct answer: C

16. Who is responsible for lowering the survival craft?

- A. Roustabout
- B. First man aboard
- C. Last man aboard
- D. Helmsman

Correct answer: D

17. When personnel are lifted by a helicopter from an inflatable life raft, the personnel on the raft should _____.

- A. Deflate the floor of the raft to reduce the danger of capsizing
- B. Inflate the floor of the raft to provide for additional stability
- C. Remove their life jackets to prepare for the transfer
- D. Take in the sea anchor to prevent fouling of the rescue sling

Correct answer: A

18. Annual servicing of a hand portable CO₂ fire extinguisher includes _____.
- A. Weighing the cylinder and recharging if weight loss exceeds 10% of the weight of the charge
 - B. Inspecting the pressure gauge to ensure the needle is within operating range
 - C. Hydrostatic testing of the cylinder
 - D. Discharging, cleaning inside, and recharging

Correct answer: A

19. Which of the following statements is true concerning the fire extinguisher shown in the illustration?
Illustration SF-0006
- A. The illustrated extinguisher must never be used in conjunction with water.
 - B. There is no danger of reflash in using the illustrated extinguisher on a class "B" fire.
 - C. The agent may be applied in short bursts by squeezing and releasing the lever on the nozzle.
 - D. The initial discharge of the extinguisher should be at close range to scatter the burning material.

Correct answer: C

20. Recharging a previously used cartridge-operated dry chemical fire extinguisher is accomplished by _____.
- A. puncturing the cartridge seal after installation
 - B. recharging the cartridge and refilling it with powder
 - C. replacing the propellant cartridge and refilling it with powder
 - D. authorized fire equipment servicing personnel only

Correct answer: C

21. The fire extinguishing equipment shown in the illustration is a large _____. Illustration SF-0009
- A. Halon 1301 hose reel system
 - B. dry chemical hose reel system
 - C. light water hose reel system
 - D. CO₂ hose reel system

Correct answer: B

22. A high velocity fog nozzle will produce the most effective spray pattern when the water pressure is not less than _____.
- A. 35 psi (241.3 kPa)
 - B. 60 psi (413.6 kPa)
 - C. 75 psi (517.0 kPa)
 - D. 100 psi (689.4 kPa)

Correct answer: D

23. When the cotton cover of a fire hose becomes oily or greasy, it should be washed with a solution of mild soapy fresh water and _____.
- A. cornstarch
 - B. a soft-bristled brush
 - C. a wire brush
 - D. paint thinner

Correct answer: B

24. On a cargo ship equipped with a combination fire detection/carbon dioxide extinguishing system, the presence of fire is indicated at the cabinet simultaneously in two spaces: No.3 hold upper between decks, containing bagged coffee beans; and No.4 lower hold containing fertilizer. To combat these fires, you should _____.
- A. activate the pilot CO2 cylinders, directing the discharge to No.3 hold, then to No.4 hold through the three-way valve
 - B. open the three-way valves to each space simultaneously
 - C. open the applicable three-way valve for No.3 hold and fight the fire in No.4 hold with water
 - D. open the applicable three-way valve for No.4 hold. After discharge, secure the valve; then open the applicable valve for No.3 hold

Correct answer: D

25. Which of the following components provides a direct source of sea water for the fire main system?
- A. Cofferdam sluice valve
 - B. Rose box suction
 - C. Sea chest suction
 - D. Fire pump stuffing box

Correct answer: C

26. In the event of an exhaust duct fire, most dry chemical and carbon dioxide galley range fixed extinguishing systems are automatically activated through the action of a stainless-steel cable, spring and a _____.
- A. fusible link
 - B. stack switch
 - C. thermostat
 - D. pyrostat

Correct answer: A

27. In accordance with 33 CFR Subchapter O, shipboard pollution prevention regulations are enforced by the _____.
- A. U.S. Coast Guard
 - B. State Pollution Board
 - C. Corps of Engineers
 - D. Port Authority

Correct answer: A

28. When fighting a shipboard fire, crew members securing doorways, hatches, and applying cooling water to adjacent decks and bulkheads, while monitoring the spread of heat and smoke, are setting a _____.
- A. safety perimeter
 - B. buffer zone
 - C. fire boundary
 - D. cooling zone

Correct answer: C

29. When approaching a fire from windward, you should shield firefighters from the fire by using an applicator and _____.
- A. low-velocity fog
 - B. a straight stream of water
 - C. high-velocity fog
 - D. foam spray

Correct answer: A

30. In firefighting, the term "protecting exposures" means _____.
- A. protecting firefighters from direct exposure to the heat of the fire
 - B. keeping flames from burning at the tank vents
 - C. protecting exposed areas of the superstructure from flames
 - D. taking measures to prevent the spread of fire from the involved compartment to an adjacent compartment

Correct answer: D

31. What is the purpose of opening the doors and portholes in figure 2 of the illustration? Illustration SF-0013
- A. To allow water used to fight the fire to flow out of the superstructure
 - B. To allow venting of combustion products from the fire to the atmosphere
 - C. To keep the hose teams cool
 - D. To provide air flow around the compartment in order to contain the fire

Correct answer: B

32. If a fire occurs in an electric cable, in which the inner layers of insulation, or the insulation covered by armor is burning, you should _____.
- A. Separate the two ends
 - B. Cut the cable with an insulated cable cutter
 - C. Secure power to the cable
 - D. All of the above

Correct answer: D

33. In fighting a fire in a fuel tank, the FIRST action you should attempt is to _____.
- A. station someone at the fixed CO2 release controls
 - B. top off the tank to force out all vapors
 - C. begin transferring the fuel to other tanks
 - D. secure all sources of fresh air to the tank

Correct answer: D

34. The best means of combating an oil fire on the surface of the water surrounding a vessel tied to the pier, is to use _____.
- A. dry chemical around the fire
 - B. water fog over the fire
 - C. solid water streams directly into the fire
 - D. foam directed against the vessel's side

Correct answer: D

35. A tank has been sealed and unventilated for a long period of time. Which of the following statements is true?

- A. The tank is safe to enter.
- B. The tank is especially dangerous to enter.
- C. Carbon monoxide is present.
- D. Water vapor present when the tank was sealed has oxidized.

Correct answer: B

36. Before entering any space that has been sealed, its oxygen level should be tested. What level of oxygen in the space is equal to fresh air?

- A. 10.0%
- B. 15.8%
- C. 20.8%
- D. 25.8%

Correct answer: C

37. An oxygen indicator will detect _____.

- A. concentrations of explosive gas
- B. an oxygen deficiency in a space
- C. the presence of harmful amounts of carbon monoxide
- D. all of the above

Correct answer: B

38. Which of the following statements is true regarding oxygen indicators?

- A. Prolonged exposure to gases such as CO₂ may affect the accuracy of the indicator
- B. A cotton filter placed in the end of the sampling tube prevents damaging the instrument when exposed to strongly acidic gases
- C. The instrument is capable of providing an immediate accurate reading of any space with no delay
- D. All of the above

Correct answer: A

39. If you see an individual fall overboard, what is the FIRST thing you should do?

- A. pass the word to the bridge
- B. hail "Man Overboard"
- C. throw a life ring overboard
- D. sound three prolonged blasts

Correct answer: C

40. The worst atmospheric condition for dispersion of hydrogen sulfide is _____.

- A. heavy rain
- B. full sun with high winds
- C. nearly calm, clear nights or early morning
- D. gusty winds with rain

Correct answer: C

41. Which of the following conditions is true concerning flammable liquid vapors with a concentration above the upper explosive limit?
- A. The vapor is about to explode.
 - B. The mixture is too rich to burn.
 - C. Conditions are perfect for combustion.
 - D. The mixture is too lean to burn.

Correct answer: B

42. Through which of the listed processes is sufficient heat produced to cause spontaneous ignition?
- A. Aeration
 - B. Anaerobic decomposition
 - C. Putrefaction
 - D. Oxidation

Correct answer: D

43. In the event of a fire, the doors to a stair tower must be closed to prevent the spread of fire by _____.

- A. convection
- B. conduction
- C. radiation
- D. ventilation

Correct answer: A

44. Good housekeeping on a vessel prevents fires by _____.

- A. allowing better access in an emergency
- B. eliminating potential fuel sources
- C. eliminating trip hazards
- D. improving personnel qualifications

Correct answer: B

45. Which of the following procedures reduces the possibility of an interior ventilation duct fire from rapidly spreading?

- A. Having a portable CO₂ ready at each duct opening
- B. Keeping the duct interior clean
- C. Having a fire hose charged at each duct opening
- D. Keeping the duct exterior clean

Correct answer: B

46. Paints and solvents used aboard a vessel should be _____.

- A. drained into a common container after each use
- B. covered with a fine mesh screen to protect from ignition sources
- C. stowed safely at the work site until work is completed
- D. returned to the paint locker after each use

Correct answer: D

47. A burning mattress is considered as which of the following classes of fire?

- A. Class "A"
- B. Class "B"
- C. Class "C"
- D. Class "D"

Correct answer: A

48. A class "D" fire would involve the burning of _____.

- A. electrical insulation
- B. diesel oil
- C. magnesium
- D. dunnage

Correct answer: C

49. Which of the listed classes of fire would most likely occur in the engine room of a vessel?

- A. Classes "A" and "B"
- B. Classes "B" and "C"
- C. Classes "C" and "D"
- D. Classes "A" and "D"

Correct answer: B

50. In a typical automatic fire alarm system, all zone circuits are always connected _____.

- A. in series
- B. to the trouble alarm supervising resistor
- C. in parallel
- D. to the detecting cabinet

Correct answer: D

51. When preparing to pump flammable liquids with a centrifugal pump, you should _____.

- A. have a standby pump running with the discharge valve closed
- B. check for gland leakage and any fire hazard
- C. lift the relief valve by hand to check its operation
- D. draw a small quantity of liquid to prime the pump

Correct answer: B

52. Bunker "C" is classified as a grade _____.

- A. "A" liquid
- B. "B" liquid
- C. "E" liquid
- D. "D" liquid

Correct answer: C

53. When checking the level of a volatile liquid in a tank on the weather deck of a tank vessel, you should position yourself _____.
- A. at a right angle to the wind direction
 - B. on the windward side of the opening
 - C. on the leeward side of the opening
 - D. so that the obstruction of your body will protect you from the fumes

Correct answer: A

54. Individuals who have consumed alcohol within 24 hours of exposure to H₂S can tolerate _____.
- A. unusually large concentrations of H₂S
 - B. smaller than normal concentrations of H₂S
 - C. moderate concentrations of H₂S without the usual reactions
 - D. longer exposure to H₂S concentrations

Correct answer: B

55. A tank or compartment is "gas free" when there is an absence of dangerous concentrations of _____.
- A. flammable or toxic gases
 - B. any combustible liquid
 - C. residues from cargo oil
 - D. all flammable liquids

Correct answer: A

56. What information can be obtained from a marine chemist's certificate on a tank barge?
- A. The number of fire extinguishers required onboard
 - B. The quality of the barge's cargo
 - C. The barge's stability information
 - D. The tanks which are safe to enter when the certificate was issued

Correct answer: D

57. A specific document which identifies a chemical, and lists its physical properties, health hazards, required controls, firefighting procedures, cleanup methods, waste disposal, and the safe handling and storage requirements, is commonly called a _____.
- A. Safety Data Sheet
 - B. Hazardous Chemical Information Sheet
 - C. Hazardous Chemical Loading Document
 - D. Physical/Chemical Characteristics Document

Correct answer: A

58. Victual waste is _____.
- A. Any garbage that comes from food or food provisions
 - B. The resultant sludge that is collected after water washing a boiler
 - C. The final waste product of a manufacturing process
 - D. The final discharge of sewage treatment plants

Correct answer: A

59. In cleaning up an oil spill, the use of straw or reclaimed paper fibers would be an example of which type of oil removal?
- A. Chemical agent removal
 - B. Mechanical removal
 - C. Absorbent removal
 - D. None of the above

Correct answer: C

60. In accordance with 33 CFR Subchapter O (Pollution), which of the following is NOT required to be provided as part of the appendixes of the Shipboard Oil Pollution Emergency Plan?
- A. A list of agencies or officials of Coastal State administrations responsible for receiving and processing incident reports
 - B. A list of personnel duty assignments
 - C. A list which specifies who will be responsible for informing the parties listed and the priority in which they must be notified
 - D. A list of agencies or officials in regularly visited ports

Correct answer: B

61. It is necessary to cool the bulkheads and decks surrounding a compartment where there is a fire in order to _____.
- A. cool the metal below its ignition temperature
 - B. form a dense coating of smothering steam
 - C. prevent oxygen from reaching the flames
 - D. prevent the fire from spreading by the conduction of heat

Correct answer: D

62. In accordance with 33 CFR Subchapter O (Pollution), the overall responsibility in maintaining the Oil Record Book is given to the _____.
- A. Chief mate
 - B. Cargo engineer
 - C. Chief engineer
 - D. Master

Correct answer: D

63. Static water pressure on the hull of a ship is greatest at the _____.
- A. bow
 - B. boot topping
 - C. stern
 - D. keel

Correct answer: D

64. If additional weight is placed on the main deck of the vessel shown in the illustration _____.
Illustration SF-0023

- A. KB will go down
- B. K will rise
- C. G will rise
- D. GM will increase

Correct answer: C

65. Stability is determined principally by the relationship of the center of gravity and the _____.

- A. keel
- B. center of flotation
- C. aft perpendicular
- D. center of buoyancy

Correct answer: D

66. In the absence of external forces, the center of gravity of a floating vessel is located directly above the _____.

- A. geometric center of the displaced volume
- B. center of flotation
- C. metacenter
- D. amidships

Correct answer: A

67. The horizontal fore and aft movement of a vessel is called _____.

- A. heave
- B. surge
- C. yaw
- D. sway

Correct answer: B

68. With no environmental forces acting on the vessel, the center of gravity of an inclined vessel is vertically aligned with the _____.

- A. Center of buoyancy
- B. Original vertical centerline
- C. Center of flotation
- D. Longitudinal centerline

Correct answer: A

69. The center of volume of the immersed portion of the vessel is the _____.

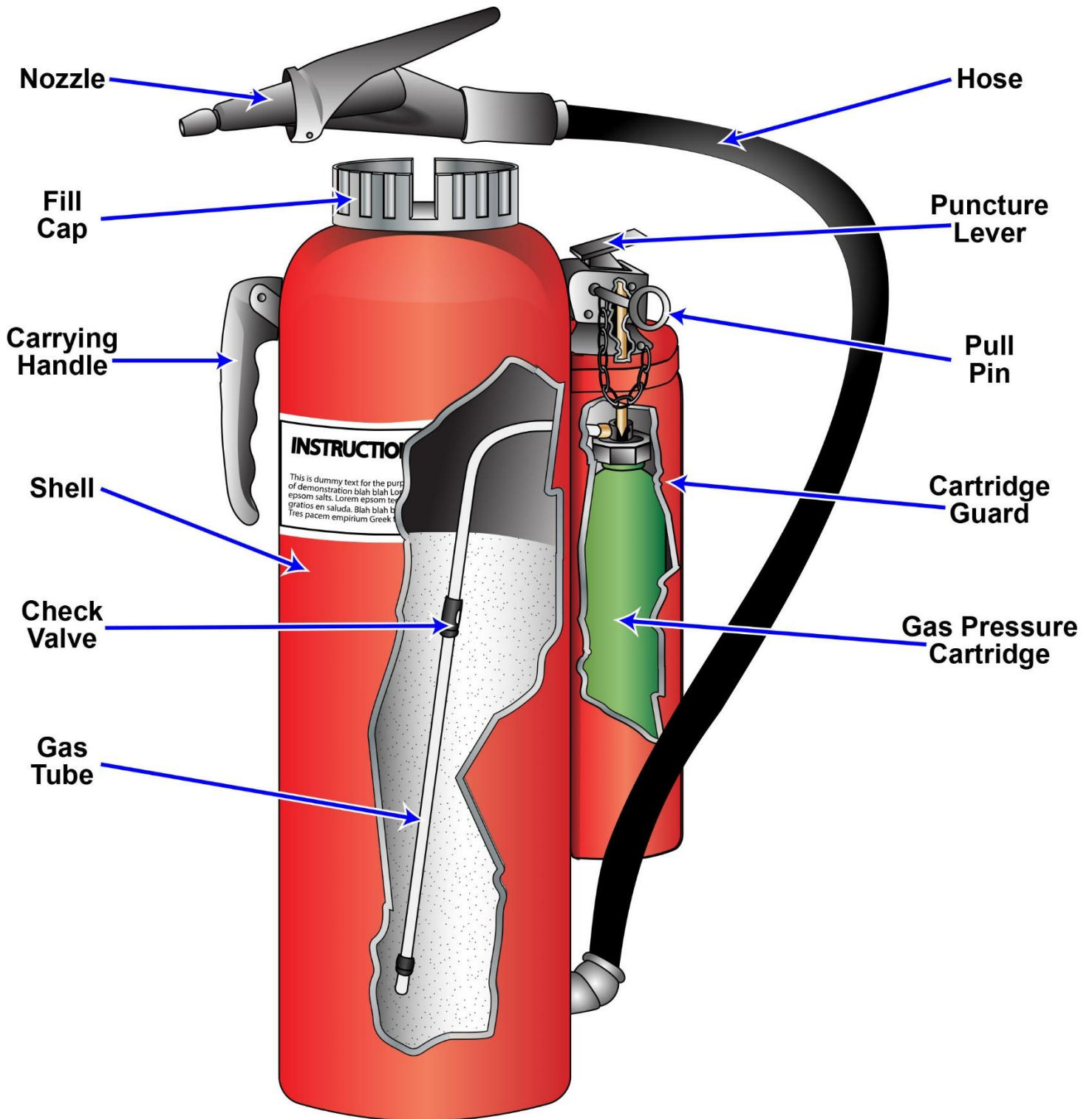
- A. center of flotation
- B. metacentric height
- C. center of buoyancy
- D. center of gravity

Correct answer: C

70. In the absence of external forces, adding weight to one side of a floating vessel, will cause the vessel to _____.
- A. heel until the angle of loll is reached
 - B. list until the center of buoyancy is aligned vertically with the center of gravity
 - C. trim to the side opposite TCG until all moments are equal
 - D. decrease draft at the center of flotation

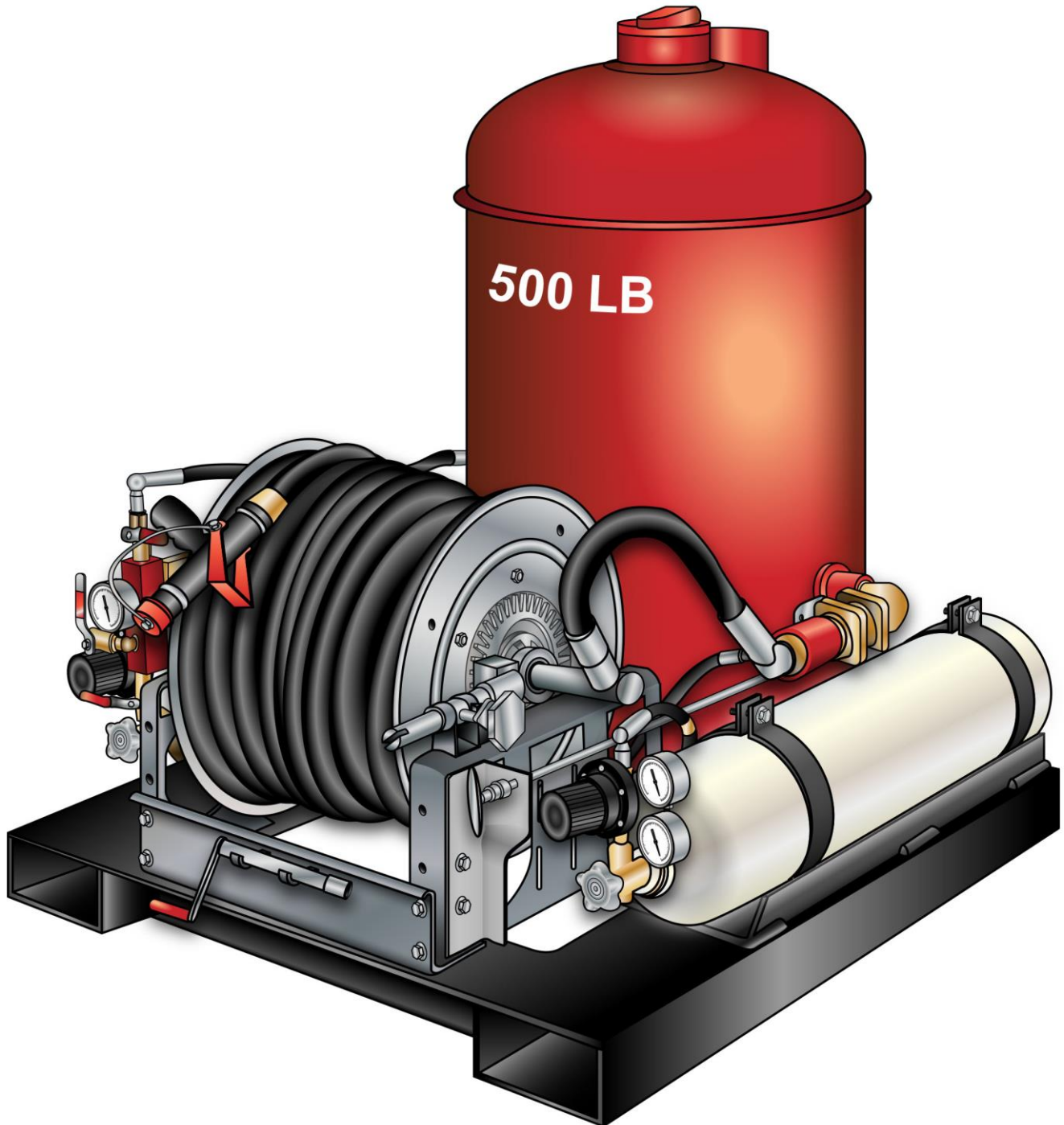
Correct answer: B

SF-0006



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SF-0009



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SF-0013

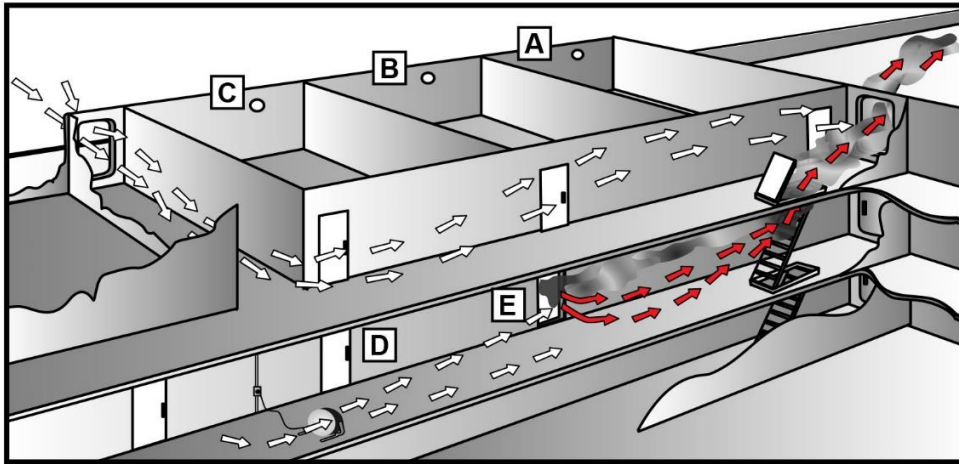


Figure 1

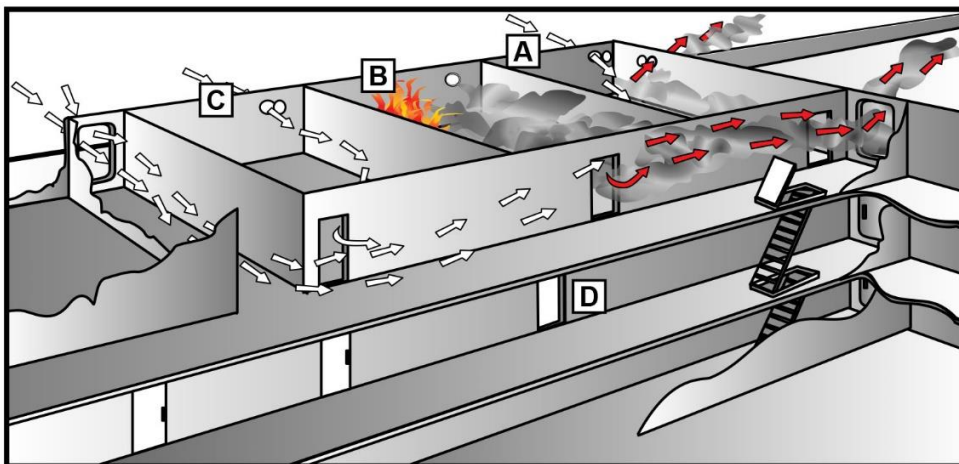


Figure 2

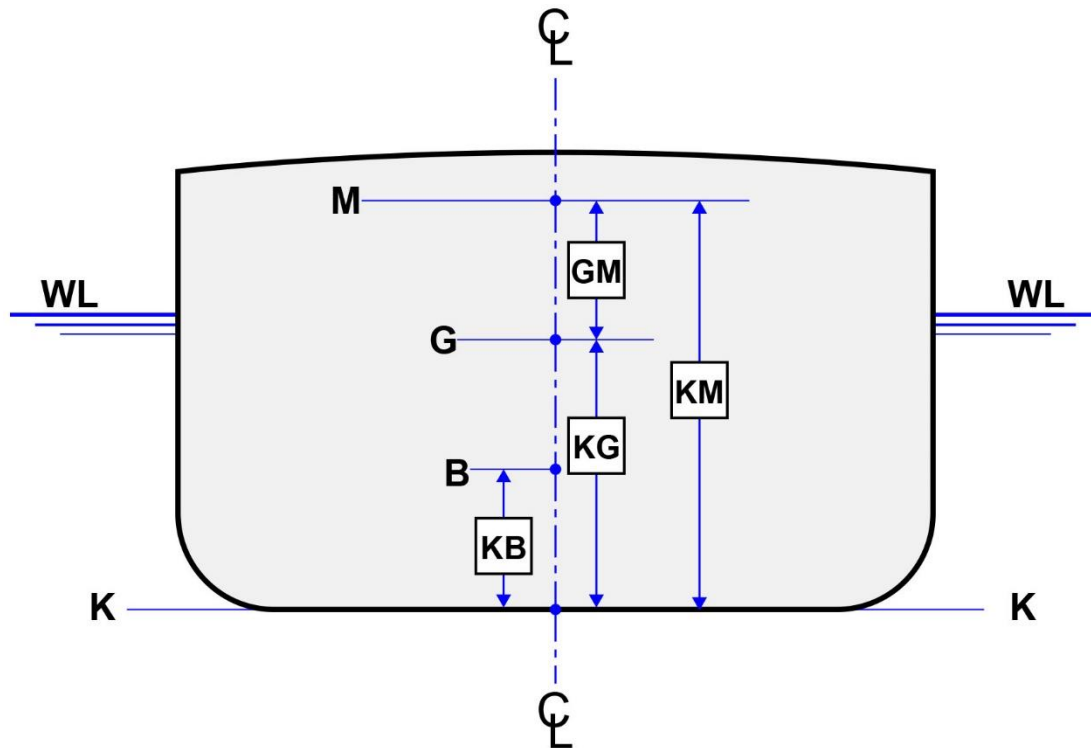


Figure 3

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SF-0023

Stability Calculations



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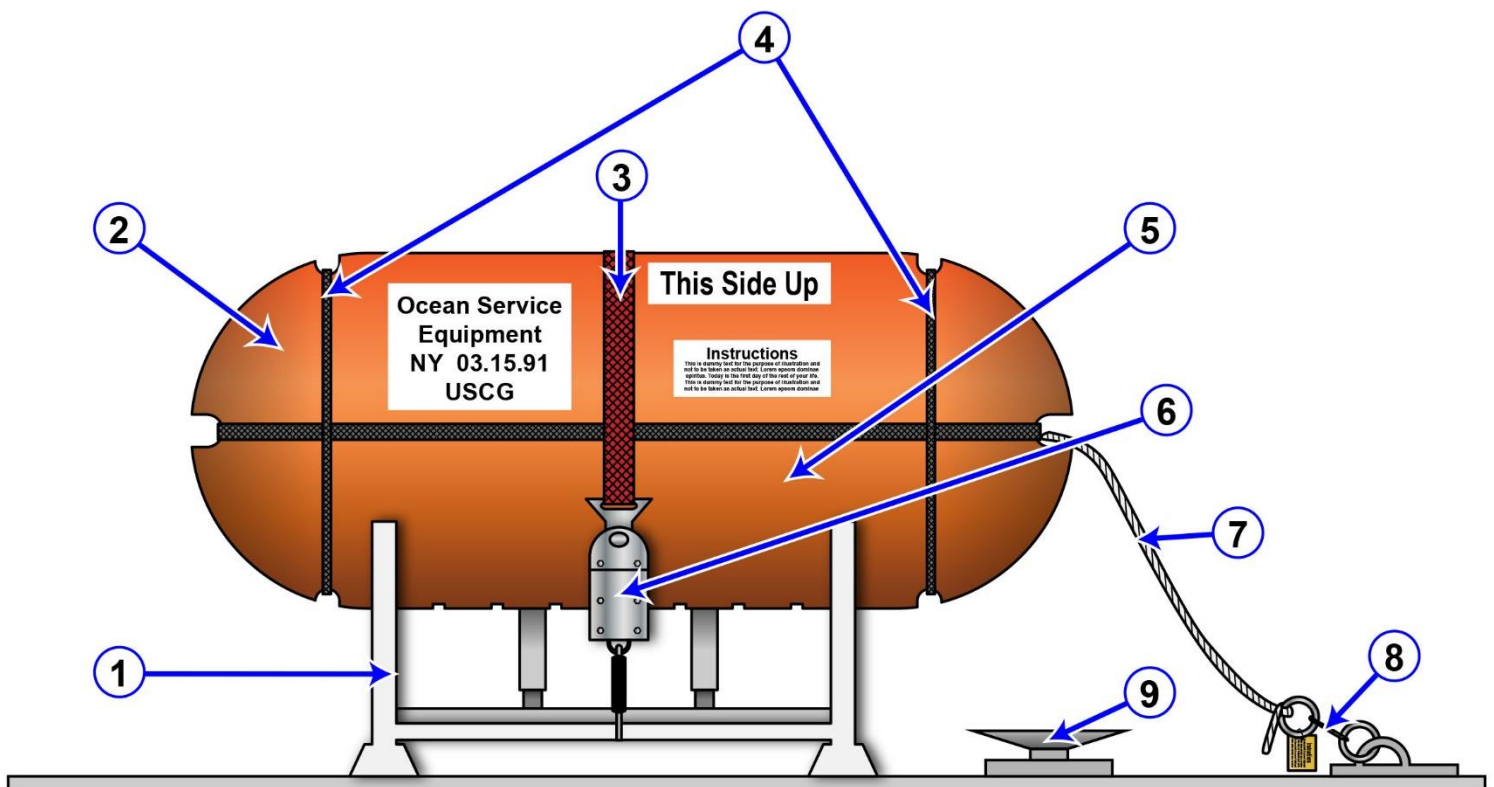
SF-0034

Flow of Gallons of Water Per Minute (gpm) Through Various Hole Diameters (in) at Various Heads (ft) of Water

	2 ft	4 ft	6 ft	8 ft	10 ft	12 ft	14 ft	16 ft
1 in	28 gpm	40 gpm	49 gpm	56 gpm	63 gpm	69 gpm	74 gpm	79 gpm
2 in	111 gpm	157 gpm	192 gpm	222 gpm	248 gpm	272 gpm	294 gpm	314 gpm
3 in	250 gpm	354 gpm	433 gpm	500 gpm	559 gpm	612 gpm	661 gpm	707 gpm
4 in	445 gpm	629 gpm	770 gpm	889 gpm	994 gpm	1089 gpm	1176 gpm	1257 gpm
5 in	695 gpm	982 gpm	1203 gpm	1389 gpm	1553 gpm	1701 gpm	1837 gpm	1964 gpm
6 in	1000 gpm	1414 gpm	1732 gpm	2000 gpm	2236 gpm	2449 gpm	2646 gpm	2828 gpm
7 in	1361 gpm	1925 gpm	2357 gpm	2722 gpm	3043 gpm	3333 gpm	3601 gpm	3849 gpm
8 in	1777 gpm	2514 gpm	3078 gpm	3555 gpm	3974 gpm	4354 gpm	4702 gpm	5027 gpm
9 in	2249 gpm	3181 gpm	3896 gpm	4499 gpm	5030 gpm	5510 gpm	5951 gpm	6362 gpm
10 in	2777 gpm	3927 gpm	4809 gpm	5553 gpm	6209 gpm	6802 gpm	7347 gpm	7854 gpm

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