

U.S.C.G. Merchant Marine Exam

First Assistant Engineer

Q516 Engineering Safety & Environmental Protection

(Sample Examination)

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

1. In a compartment that has been completely flooded with water, the greatest pressure will be exerted _____.
- A. along the top of the bulkhead
 - B. at a point that is one-third from the bottom of the bulkhead
 - C. along the bottom of any bulkhead
 - D. at the vertical center of the bulkhead

Correct answer: C

2. Wooden shoring, with a cross-sectional dimension of 4" X 4" should not be longer than _____.
- A. 8 feet
 - B. 10 feet
 - C. 16 feet
 - D. 20 feet

Correct answer: B

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

Correct answer: D

4. Following a grounding, you can best determine that a SLACK fuel oil tank has been holed by _____.
- A. checking fuel oil strainers
 - B. sounding the tank
 - C. waiting for the vessel to list
 - D. examining tank boundaries

Correct answer: B

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

Correct answer: A

6. What is a major advantage of using a positive pressure type self-contained breathing apparatus?

- A. Facial hair will not affect the mask performance.
- B. The speed with which it can be put into operation is around 45 seconds.
- C. The equipment is lightweight and the wearer can work without difficulty in confined spaces.
- D. The average operating time is over an hour.

Correct answer: B

7. Life jackets should be stowed in _____.

- A. the forepeaks
- B. the pumproom
- C. readily accessible spaces
- D. locked watertight containers

Correct answer: C

8. Which of the following is required to be included in the fireman's (emergency) outfit?

- A. Chemical protection face shield
- B. Approved work vest
- C. Self-contained breathing apparatus
- D. 5 cell approved flashlight

Correct answer: C

9. Which of the following statements is true concerning an immersion suit and its use?

- A. Only a light layer of clothing may be worn underneath.
- B. They provide sufficient flotation to do away with the necessity of wearing a life jacket.
- C. They should be tight fitting.
- D. A tear in the suit will not appreciably reduce its value.

Correct answer: B

10. In order to retrieve an inflatable life raft and place it on deck, you should heave on the _____.

- A. lifelines
- B. righting strap
- C. sea anchor
- D. towing bridle

Correct answer: D

11. When a rescue vessel approaches a survival craft in heavy seas, the person in charge of the survival craft should _____.

- A. tie up to the rescue vessel
- B. transfer only those personnel who are not seasick
- C. wait for calmer weather before transferring personnel
- D. transfer all personnel immediately

Correct answer: C

12. Each vessel in ocean and coastwise service must have an approved EPIRB. An EPIRB _____.

- A. must be stowed in a manner so that it will float free if the vessel sinks
- B. must be stowed where it is readily accessible for testing and use
- C. is a device that transmits a radio signal
- D. all of the above

Correct answer: D

13. A fire can be extinguished by removing _____.

- A. the heat
- B. the fuel
- C. the oxygen
- D. any of the above

Correct answer: D

14. The spreading of fire as a result of heat being carried through a vessel's ventilation system, is an example of heat transfer by _____.

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

Correct answer: B

15. Hazardous conditions exist which may result in spontaneous combustion when _____.

- A. oil-soaked rags are stowed in the machine shop
- B. powdered aluminum is stowed dry
- C. dry metal turnings accumulate
- D. all of the above

Correct answer: A

16. If the items shown in the illustration are burning, this fire would be a Class _____. Illustration SF-0001

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

Correct answer: A

17. "Dry Powder" fire extinguishers, which contain a mixture of graphite and sodium chloride as the extinguishing agent, are generally used to fight which type of fire?

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

Correct answer: D

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

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

Correct answer: C

19. A simple precaution to reduce the possibility of accidental fires in the paint locker, is to _____.

- A. label the fixed firefighting system
- B. store paint cans on metal shelves only
- C. not allow oily rags to accumulate in the space
- D. place a portable fire extinguisher immediately outside the locker

Correct answer: C

20. You are reviewing emergency procedures with new crew members. How would you direct them to proceed if they hear the fire and emergency signal on the ship's general alarm or whistle?

- A. Report to their stateroom and wait further instructions.
- B. Report to the bridge and wait further instructions.
- C. Report directly to the scene of the emergency to help.
- D. Report to their assigned duty station as posted on the Station Bill, so an accurate muster can be taken.

Correct answer: D

21. How would you ensure that your crew is prepared to combat a shipboard fire using ship's equipment?

- A. Show crew generic fire training videos.
- B. Have them read a firefighting textbook.
- C. Conduct required drills, simulating fire conditions and training with ship's equipment.
- D. Check training records, to see if crew members have attended a firefighting training course.

Correct answer: C

22. The component shown in the illustration would be installed in which of the following types of fire detection systems? Illustration SF-0004

- A. Rate-of-rise
- B. Combined fixed temperature and rate-of-rise
- C. Fixed temperature
- D. Line-type pneumatic

Correct answer: C

23. During repairs it is necessary to replace an existing vessel bulkhead. Drawings indicate the bulkhead is A60. "A" indicates which of the following?

- A. "A" class bulkheads must not allow flame or smoke passage for 15 minutes when subjected to a fire test
- B. "A" class bulkheads must not allow flame or smoke passage for 30 minutes when subjected to a fire test
- C. "A" class bulkheads must not allow flame or smoke passage for 60 minutes when subjected to a fire test
- D. "A" class bulkheads must not allow flame or smoke passage for 120 minutes when subjected to a fire test

Correct answer: C

24. Which extinguishing agent is the best for use on electrical fires?

- A. Dry chemical
- B. CO₂
- C. Foam
- D. Water fog

Correct answer: B

25. The most common cooling agent used for fighting fires on tank vessels is _____.

- A. flue gas
- B. water
- C. carbon dioxide
- D. steam smothering

Correct answer: B

26. 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 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

27. During an inspection of a ships storeroom, you find sealed containers of chemicals labeled "potassium bicarbonate" and "potassium chloride". These chemicals are most commonly used aboard ship for _____.

- A. descaling evaporator tubes
- B. recharging dry chemical fire extinguishers
- C. degreasing machinery parts
- D. engine jacket water treatment

Correct answer: B

28. Which portable fire extinguisher is normally recharged in a shore facility?

- A. Water (pump tank)
- B. Dry chemical (cartridge-operated)
- C. Water (cartridge-operated)
- D. Carbon dioxide

Correct answer: D

29. Which of the listed characteristics applies to a semi-portable CO₂ system?

- A. Each cylinder must weigh less than 50 pounds.
- B. It has distribution piping installed permanently.
- C. The cylinders are mounted horizontally.
- D. It has a portable hose and nozzle.

Correct answer: D

30. Water applied as a "fog" can be more effective than water applied as a "solid stream", because _____.

- A. a given amount of water can absorb more heat when it is in the form of fog
- B. it does not have to hit the seat of fire to be effective
- C. it reduces the total amount of water that must be pumped into the ship to fight a given fire
- D. of all of the above

Correct answer: D

31. A low velocity fog applicator is held in an all-purpose nozzle by a bayonet joint. The applicator is prevented from rotating in the joint by _____.

- A. a keeper screw
- B. a locknut
- C. water pressure
- D. a spring-loaded catch

Correct answer: D

32. Why is it essential to introduce CO₂ from a fixed fire extinguishing system, into a large engine room, as quickly as possible?

- A. The fire may warp the CO₂ piping.
- B. To keep the fire from spreading through the bulkheads.
- C. Carbon dioxide takes a long time to disperse to all portions of a space.
- D. Updraft from the fire tends to carry the CO₂ away.

Correct answer: D

33. Actuating the fixed CO₂ system should cause the automatic shutdown of the _____.

- A. fuel supply only
- B. supply and exhaust ventilation
- C. mechanical and natural ventilation
- D. exhaust ventilation only

Correct answer: B

- 34.** Your ship has a low-pressure carbon dioxide system that covers the engine room. Fire has been reported in the engine room and the decision has been made to dump the carbon dioxide system into the engine room. While following the procedures to release carbon dioxide you find one engine room supply fan damper that will not close. How should you proceed?
- A. Continue the release procedures and dump the carbon dioxide, after the release then try to seal the fan damper opening.
 - B. Cover the fan damper opening with a plastic tarp to stop the flow of air into the engine room and then continue with the release procedures.
 - C. Cover the fan damper opening with burlap bags to slow the flow of air into the engine room and then continue with the release procedures.
 - D. Continue the release procedures and dump the carbon dioxide with the damper still open.

Correct answer: B

- 35.** While in the engine control room you smell smoke and see it coming from the vent in the main switchboard panel. Which of the many different types of extinguishers, if any, are required to be in that space and why would it be best suited to extinguish this class of fire?
- A. A fixed CO₂ system as it will smother the fire while limiting the clean-up and damage to the area around the fire.
 - B. A portable dry chemical extinguisher, as it is the most common type of portable extinguisher found onboard ships.
 - C. A portable CO₂ extinguisher as it will smother the fire while limiting the clean-up and damage to the area around the fire.
 - D. No portable extinguisher is required in the engine control room.

Correct answer: C

- 36.** The most important characteristic of a fire extinguishing agent to be used on electrical fires is for the agent to be _____.
- A. easily removable
 - B. flame resistant
 - C. non-conducting
 - D. wet

Correct answer: C

- 37.** As an engineer on a tanker, how would you direct the fire team to combat a large cargo space fire?
- A. Open the ullage caps and lower the level in tanks adjacent to the tank on fire.
 - B. Use the inert gas system to extinguish the fire.
 - C. Use fixed water and foam systems to extinguish the fire.
 - D. Use the fixed carbon dioxide system to extinguish the fire.

Correct answer: C

38. The longer an oil fire is permitted to burn, the _____.

- A. easier it is to control
- B. easier it is to extinguish
- C. harder it is to extinguish
- D. less chance there is of reignition

Correct answer: C

39. Your vessel is carrying a cargo of Ethyl methacrylate, which has caught fire. Which extinguishing agents should be used?

- A. Water fog, dry chemical, or chemical foam.
- B. Carbon dioxide, dry chemical, or alcohol foam.
- C. Carbon dioxide, dry chemical, or chemical foam.
- D. Water, dry chemical, or chemical foam.

Correct answer: C

40. As chief engineer sailing aboard chemical tankers you frequently review the best practices regarding firefighting during safety meetings. Which of the following would align with industry best practice regarding the use of water in extinguishing chemical fires?

- A. Water is best applied to the chemical fire in a solid stream in order to maximize effectiveness.
- B. Water is best used for cooling of the chemical itself as well as surrounding areas.
- C. Water is best applied in spray form to smother the chemical fire.
- D. Water is best applied from opposing directions to ensure maximum effectiveness.

Correct answer: B

41. One of the main concerns when fighting a galley fire is _____.

- A. contaminating food with extinguishing agent
- B. spreading of fire through the engineering space
- C. the igniting of a grease fire in the range hood ventilation system
- D. the loss of stability

Correct answer: C

42. As first engineer you are the senior engineering officer in Emergency Squad #1. The fire alarm sounds and you report to the muster station where the bridge informs you smoke has been reported coming from the ship's laundry room. What should your first action be?

- A. Start boundary cooling the area.
- B. Help dress out other crew members in fireman's outfit.
- C. Charge the ship's fire main.
- D. Secure power and ventilation to the laundry room and inform the bridge once this is done.

Correct answer: D

43. According to Coast Guard Regulations (46 CFR 30), a flammable liquid with a Reid vapor pressure of 8-1/2 psi or less, and a flash point of 80°F or below, is a grade _____.

- A. A
- B. E
- C. C
- D. D

Correct answer: C

44. By definition, combustible liquids are liquids which _____.

- A. have a flash point of 80°F or higher
- B. give off flammable vapors at or below 80°F
- C. spontaneously ignite
- D. are highly volatile with a flash point of 0°F

Correct answer: A

45. If diesel fuel vapors in a compartment are considered to be within the flammable range _____.

- A. the upper explosive limit has been exceeded
- B. the vapor air mixture is too rich to burn
- C. the vapor air mixture is too lean to burn
- D. an explosion may occur if a source of ignition is present

Correct answer: D

46. Tankers carrying cryogenic cargoes, such as LNG, are fitted with gas detector systems alarmed at 30% of the lower explosive limit. If the gas detector alarm sounds, this means _____.

- A. a flammable vapor concentration exists at the sample point, but it is too lean to burn
- B. an explosion is about to take place
- C. the detector sensor is sampling a space where the cargo vapor concentration is 30 percent by volume
- D. the detector is sampling a space in which 30 percent of the atmosphere is explosive

Correct answer: A

47. Span gas is used aboard liquefied natural gas carriers to _____.

- A. inert the barrier spaces
- B. detect leaks in cargo piping
- C. calibrate the gas leak detectors
- D. odorize the cargo

Correct answer: C

48. Petroleum vapors are dangerous _____.

- A. at all times due to their toxicity
- B. only if the oxygen concentration is below 16 percent
- C. only if the vapor is between the upper and lower explosive limit
- D. only if the source of the vapor is above its flash point

Correct answer: A

- 49.** The atmosphere of an empty fuel tank is tested and designated "gas free". Which of the following statements is correct concerning this tank?
- A. The concentration of flammable gas in the compartment is less than 10% of the lower flammable limit.
 - B. The gas free status is good as long as the initial conditions remain unchanged.
 - C. The tank should be frequently retested.
 - D. All of the above.

Correct answer: D

- 50.** As listed on a Safety Data Sheet (SDS), what is a liquid called that is having a flash point below 199.4°F (93°C)?
- A. combustible liquid
 - B. flammable liquid
 - C. explosive liquid
 - D. viscous liquid

Correct answer: B

- 51.** With regards to a ship's Oil Record Book, an oil tanker of 150 gross tons and above must maintain entries in _____.
- A. Part I only
 - B. Part II only
 - C. Both Part I and Part II
 - D. Part III

Correct answer: C

- 52.** Coast Guard regulations require a shipboard oil pollution emergency plan to be reviewed _____.
- A. once a year
 - B. once every two years
 - C. once every four years
 - D. once every five years

Correct answer: A

- 53.** Which of the following statements is true concerning the overboard discharge of vessel sewage at sea?
- A. The vessel may discharge disinfected and comminuted sewage into the sea, from an approved system, only if the vessel is more than 3 nautical miles from the nearest land.
 - B. The vessel may discharge sewage into the sea, from an approved system which is not comminuted or disinfected, only if the vessel is more than 12 nautical miles from the nearest land.
 - C. The vessel must have an approved sewage plant.
 - D. All of the above.

Correct answer: D

- 54.** You are providing onboard training to your engineers on the factors affecting trim and stability. What instructions do you give your engineers to stabilize the ship should it experience an unstable rolling behavior?
- A. Discharge dirty ballast from a centerline double bottom tank.
 - B. Add ballast to a centerline double bottom tank.
 - C. Discharge water from the forepeak tank.
 - D. Add ballast to wing tank to the side of the ship with an angle of list.

Correct answer: B

- 55.** Your vessel was damaged in a collision and one compartment has partially flooded. The vessel has free communication with the sea with water flowing in and out as the vessel rolls. Which of the following is the most important factor contributing to free communication loss of stability?
- A. Depth from the bottom of the damaged compartment to the waterline.
 - B. Whether or not the damaged compartment on the opposite side of the vessel is full or empty.
 - C. Distance from the vessel centerline to the centerline of the damaged compartment.
 - D. Breadth of the damaged compartment affected.

Correct answer: C

- 56.** As chief engineer you should understand the concept of loll and its cause. An angle of loll is commonly caused by which of the following conditions?
- A. A negative GM.
 - B. An off-center weight.
 - C. Free surface with G remaining below M.
 - D. High external force such as wind and current.

Correct answer: A

- 57.** After transferring a weight forward on a vessel, the draft at the center of flotation will _____.
- A. change, depending on the location of the LCG
 - B. increase
 - C. decrease
 - D. remain constant

Correct answer: D

- 58.** A vessel's center of gravity is lowered when the _____.
- A. freeboard is increased
 - B. reserve buoyancy increases
 - C. tanks are ballasted
 - D. trim is increased

Correct answer: C

59. When a vessel is inclined, the tendency for it to return to its original position is caused by the _____.

- A. movement of the center of gravity
- B. movement of the center of buoyancy toward the low side of the vessel
- C. increased free surface in the buoyant wedge
- D. upward movement of the center of flotation

Correct answer: B

60. While serving as chief engineer on a partially loaded containership the vessel is involved in a collision. An empty starboard side wing tank becomes open to the sea and the ship takes a starboard list. After investigating the damage it is found that no other adjoining tanks are open to the sea. What action should be recommended to ensure the ship maintains an even keel position?

- A. Discharge ballast from a centerline double bottom tank to increase the vessels GM and give her more stability.
- B. Discharge ballast from a port wing while checking the free surface effect.
- C. Ballast a port wing and check the free surface effect for both damaged and intact tanks.
- D. Ballast a starboard wing while checking the free surface effect.

Correct answer: C

61. The difference between the initial trim of a vessel and the trim after a change in load has occurred is known as _____.

- A. trim
- B. change of trim
- C. final trim
- D. change of draft

Correct answer: B

62. Adverse effects due to free surface will result when _____.

- A. the vessel's draft is increased, thus increasing the vessel's wetted surface area
- B. a portion of liquid is removed from a full tank
- C. the vessel is trimmed by the stern
- D. the vessel's draft is decreased exposing more surface area to the wind and current

Correct answer: B

63. You can generally improve the vessel's stability in a hazardous situation by _____.

- A. pumping double bottoms to the forepeak
- B. ballasting appropriate port or starboard deep tanks
- C. deballasting double bottoms
- D. transferring ballast athwartships

Correct answer: B

64. Pitching is the rising and falling motion of the bow of a ship oscillating about which axis?

- A. Longitudinal
- B. Vertical
- C. Transverse
- D. Centerline

Correct answer: C

65. Coast Guard Regulations (46 CFR) require that life jackets shall be _____.

- A. provided for all personnel on watch
- B. readily accessible to persons in the engine room
- C. provided for each person onboard
- D. all of the above

Correct answer: D

66. Pollution Prevention Regulations (33 CFR) specify that the person in charge of bunkering is responsible for the _____.

- A. quantity of fuel received
- B. communications with terminal operator
- C. quality of fuel received
- D. vessels draft

Correct answer: B

67. As chief engineer on a vessel, you and the first engineer are planning a welding job in the cargo-hold. How would you ensure that all safety precautions are reviewed prior to starting this job?

- A. Have the first engineer review the SOLAS manual prior to starting the job.
- B. Have the first engineer verbally review fire safety with crew working on the job.
- C. Have the first engineer complete a hot-work permit after completing the job.
- D. Have the first engineer complete a hot-work permit prior to starting the job.

Correct answer: D

68. As first engineer, you are standing by the #3 deep fuel oil storage tank as a crew member is working inside the tank. Before entering the tank, the atmosphere was checked and determined safe for men to work. While standing by you notice that the crew member is not moving. After attempts to communicate with the downed mariner receives no response, what action would you take?

- A. Have additional crew members don a SCBA to enter the tank, to aid in the removal of the unconscious crew member.
- B. Send another crew member, without a SCBA on, into the tank to retrieve the unconscious crew member.
- C. Call the captain and ask him how you should proceed.
- D. Send two additional crew members, without a SCBA on, into the tank to retrieve the unconscious crew member.

Correct answer: A

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

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

Correct answer: B

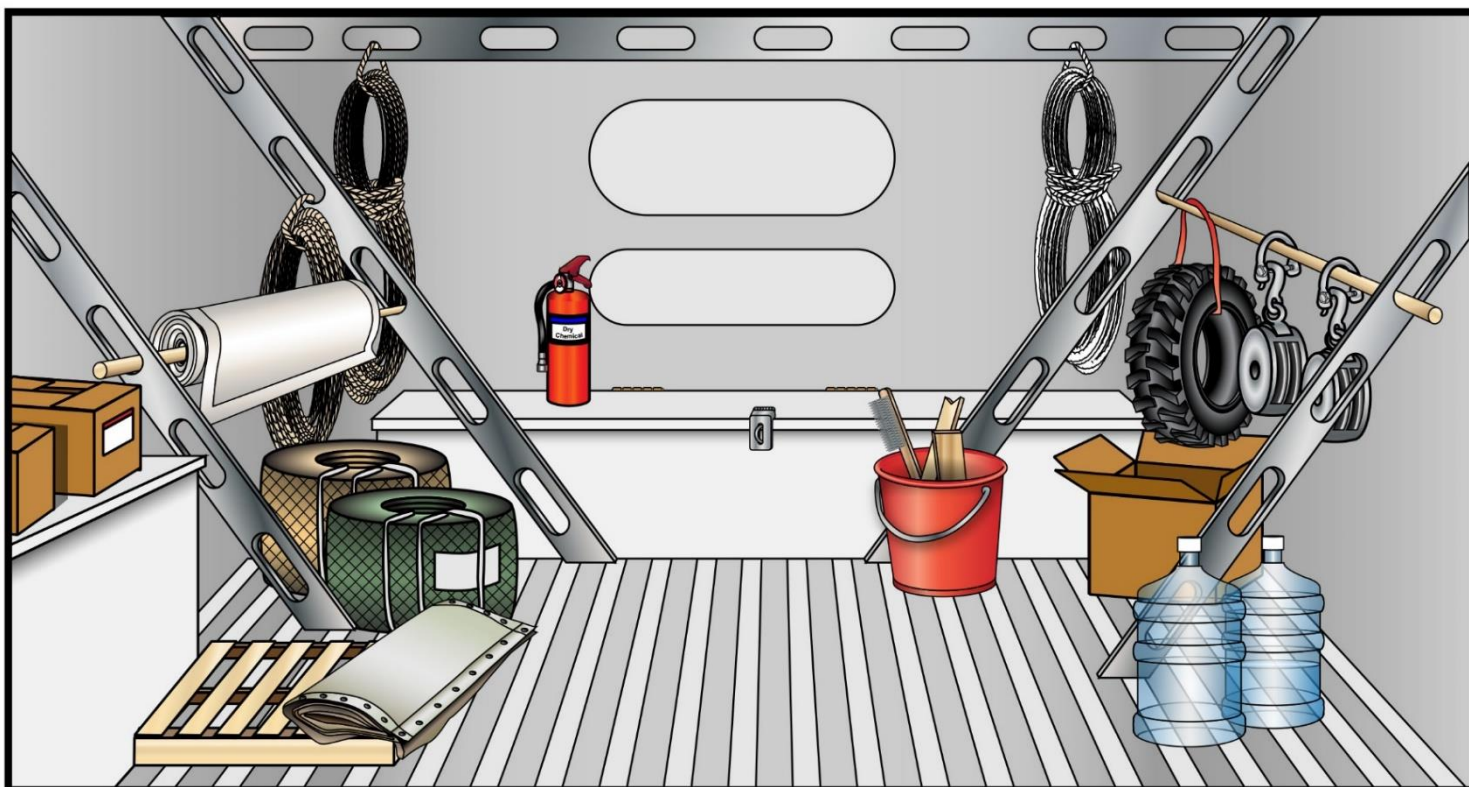
70. When taking samples of a tank atmosphere with an explosimeter, you should _____.

- A. sample as much of the tank as possible, especially at the bottom
- B. avoid sampling in the vicinity of deep webs to prevent false readings
- C. sample only near the ullage openings as all vapors accumulate there
- D. only sample around the deck longitudinals as gases are lighter than air

Correct answer: A



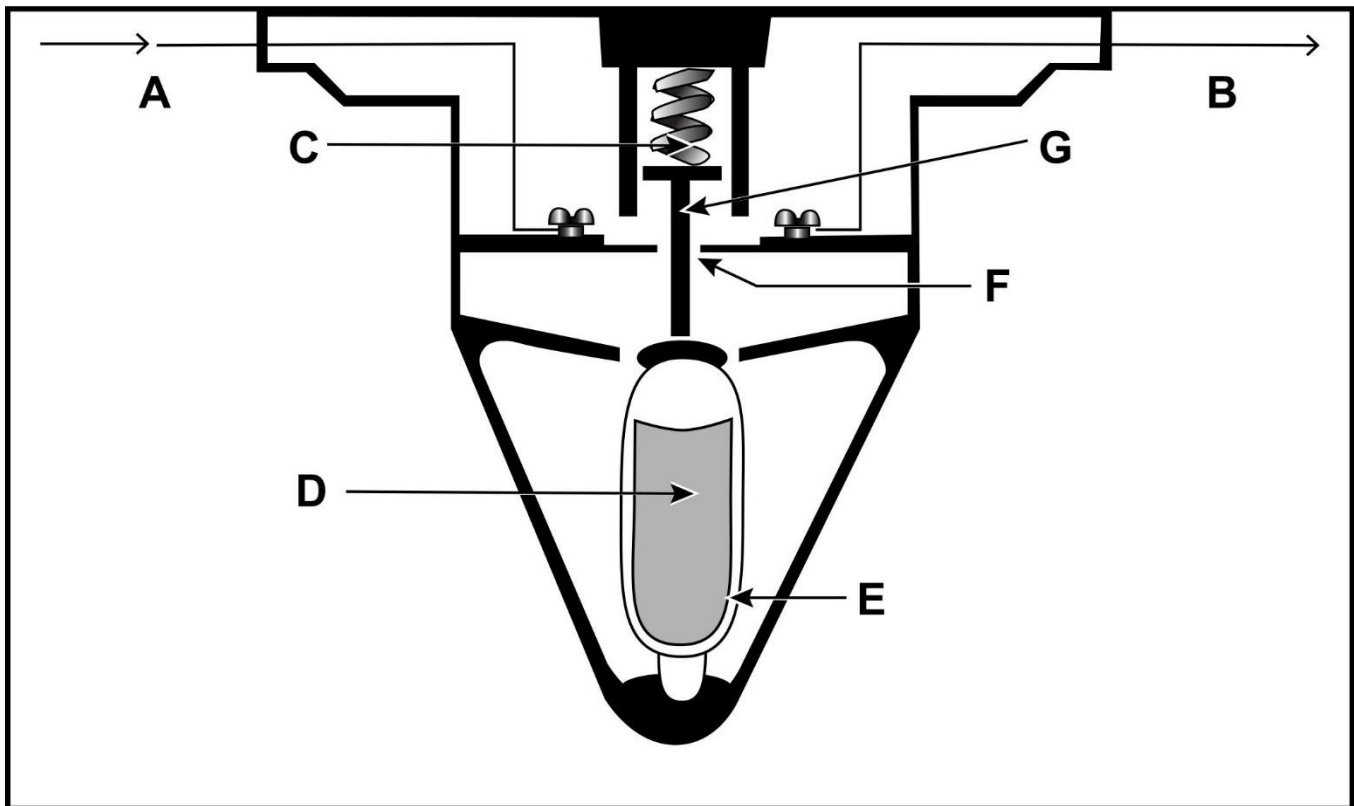
SF-0001



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SF-0004



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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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