

U.S.C.G. Merchant Marine Exam

Chief Engineer – Limited

Q603 Engineering Safety & Environmental Protection

(Sample Examination)

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

1. An acceptable method of temporarily sealing a crack formed in the hull of a vessel is to _____.
- A. apply a patch of sheet packing backed by a strongback or shoring
 - B. shore up the crack with welded braces
 - C. drill holes at each end
 - D. tack weld a doubler plate over the crack

Correct answer: A

2. It is generally not advisable to drive a wedge into a crack occurring in the hull because wedges _____.
- A. tend to open the crack
 - B. will pull through the plating
 - C. will work loose
 - D. will splinter

Correct answer: A

3. 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

4. The safe and efficient use of the facepiece of a self-contained breathing apparatus is directly influenced by _____.
- A. the donning of the facepiece
 - B. the maintenance of the facepiece
 - C. the stowing of the facepiece
 - D. all of the above

Correct answer: D

5. A rigid lifesaving device designed for a group of survivors to hold on to while in the water is defined as a _____.
- A. life raft
 - B. life cushion
 - C. life preserver
 - D. buoyant apparatus

Correct answer: D

6. An immersion suit should be equipped with a/an _____.
- A. air bottle for breathing
 - B. whistle and hand-held flare
 - C. whistle, strobe light, and reflective tape
 - D. whistle, hand-held flare, and sea dye marker

Correct answer: C

7. You have abandoned ship and are in charge of a life raft. How much water per day should you permit each occupant to drink after the first 24 hours?
- A. 1 can
 - B. 1 pint
 - C. 1 quart
 - D. 1 gallon

Correct answer: B

8. Which of the lifeboat parts listed must be painted bright red?
- A. Hatches
 - B. Releasing gear lever
 - C. Boat hooks
 - D. Compass

Correct answer: B

9. With the sprinkler system and air system on, and all hatches shut, the survival craft will be protected from _____.
- A. a nuclear environment
 - B. a fire and toxic environment
 - C. a hurricane
 - D. a drop greater than ten feet

Correct answer: B

10. 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

11. 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

12. 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

13. All of the following are part of the fire triangle EXCEPT _____.

- A. fuel
- B. oxygen
- C. heat
- D. electricity

Correct answer: D

14. A Type A fire has been reported onboard your vessel. What type of materials would your fire teams expect to find at the scene?

- A. Metals
- B. Electrical equipment where the use of a non-conducting extinguishing agent is of first importance
- C. Ordinary combustible materials where the quenching and cooling effects of quantities of water, or solutions containing large percentages of water, are of first importance
- D. Flammable liquids, greases, etc., where a blanketing effect is essential

Correct answer: C

15. A fire, occurring in the windings, of an overloaded electrical motor, is considered a _____.

- A. class "A" fire
- B. class "B" fire
- C. class "C" fire
- D. class "D" fire

Correct answer: C

16. 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

17. The most likely location for a liquid cargo fire to occur on a tanker would be _____.

- A. in the amidships house
- B. at the main deck manifold
- C. at the vent header
- D. in the pumproom

Correct answer: D

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

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

Correct answer: B

19. As chief engineer, you are discussing fire safety with a new unlicensed crew member. What would you expect the crew member to know having been onboard the vessel for two days?

- A. The release procedures for the low-pressure CO₂ system.
- B. The procedures to secure the fire detection system.
- C. Ship's signals for fire and emergency and abandon ship.
- D. The starting procedures for the ship's fire pump.

Correct answer: C

20. Fire detecting systems on merchant vessels may be arranged to sense _____.

- A. rate of temperature rise
- B. ionized particles
- C. smoke
- D. all of the above

Correct answer: D

21. In reviewing ship drawings with a new operational level engineering officer, you note that some divisional bulkheads are labeled A60. In the discussion with the junior officer, what should be noted is indicated by the label A60?

- A. Materials meeting construction yard specification A60.
- B. Fire division boundary, A Class, with insulation that will limit temperature rise below the allowable level for 60 minutes.
- C. Fire division boundary, A Class, with insulation that will limit temperature rise below the allowable level for 60 seconds.
- D. Damage stability bulkhead, A Class, with bulkhead strength that will limit flooding for 60 minutes.

Correct answer: B

22. During onboard training with your engineers, you review the various firefighting agents available for use onboard a ship. Which of the following statements describes carbon dioxide as an extinguishing agent?

- A. Carbon dioxide is a finely divided mist produced by either a high or low velocity fog nozzle. It is used for knocking down flames and cooling hot surfaces.
- B. Carbon dioxide is produced by a special foam nozzle or by a fixed system. It is used to form a blanket over the surface of burning liquids. It is effective only with liquids which are not appreciably soluble in water.
- C. Carbon dioxide may be applied through a fixed or semi-fixed system, or from a portable extinguisher. It is useful for inerting a compartment or for putting out small local fires.
- D. Carbon dioxide is a sodium or potassium bicarbonate or monosodium phosphate solution, usually applied from a semi-fixed or portable extinguisher.

Correct answer: C

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

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

Correct answer: B

24. Which of the listed methods, is the most effective to fight a fire on the open deck of a vessel if using a dry chemical type fire extinguisher?

- A. Approach the fire from the windward side.
- B. Direct the extinguisher discharge at the base of the fire.
- C. Move the discharge stream back and forth in a rapid sweeping motion.
- D. All of the above.

Correct answer: D

25. Servicing of a cartridge-operated dry chemical fire extinguisher aboard ship would include ensuring that the _____.

- A. recharge of weight loss exceeds 10% of the weight of charge
- B. powder is not caked and there is a full charge
- C. pressure gage is within the operating range
- D. cartridge weight is not less than 1/4 ounce of weight stamped on cartridge

Correct answer: B

26. There is always a lower water pressure at the fire hose outlet than is found at the discharge of the pump. Which of the following reasons is the common cause of this loss in pressure?

- A. Leaky pilot valve
- B. Friction in the piping and valves
- C. Wear in the hydrant
- D. Leaky pump suction valve

Correct answer: B

27. Properly stowed fire hose is either faked or rolled into a rack with the _____.

- A. male and female ends connected together to prevent damage
- B. female end available to be quickly connected to the hydrant
- C. nozzle end arranged to be easily run out to the fire
- D. male end attached to the adjacent fire hydrant

Correct answer: C

28. While fighting a fire, in order to utilize two hoses from a single "wye" gate attached to a hydrant outlet, you need only turn the valve handle _____.

- A. at the base of the "Y" in either direction
- B. at the base of the "Y" counter-clockwise 180°
- C. on each leg of the "Y" 90°
- D. on each leg of the "Y" 180°

Correct answer: C

29. The primary function of an automatic sprinkler system is to _____.
- A. instantaneously extinguish the fire which triggered it
 - B. limit the spread of the fire and control the amount of heat produced
 - C. protect people in the areas which have had sprinkler heads installed
 - D. alert the crew to the fire

Correct answer: B

30. 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. Continue the release procedures and dump the carbon dioxide with the damper still open.
 - 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. 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.

Correct answer: D

31. As the senior engineer of a vessel, you have just activated the CO₂ release handle for the engine room to extinguish a fire. How would you direct the emergency team to re-enter the engine room?
- A. Have the team wait two hours, then, with the team dressed in firefighting gear and SCBA, approach the engine room door. Crack the door open and advance, if no fire is detected.
 - B. Wait until there are no signs of smoke or heat, have the team dressed in firefighting gear and approach the engine room door. Crack the door open and advance, if no fire is detected.
 - C. Have the team wait two hours and crack the door open with a charged fire hose at the ready and advance, if no fire is detected.
 - D. Wait until there are no signs of smoke or heat, then, with the team dressed in firefighting gear and SCBA, approach the engine room door. Crack the door open with a charged fire hose at the ready and advance, if no fire is detected.

Correct answer: D

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. cut the cable with an insulated cable cutter
 - B. separate the two ends
 - C. secure power to the cable
 - D. all of the above

Correct answer: D

33. When fighting a liquefied natural gas fire, you should _____.
- A. use only dry chemical
 - B. use only carbon dioxide
 - C. secure the source of gas, then extinguish the fire
 - D. extinguish the fire, then secure the source of gas

Correct answer: C

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

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

Correct answer: C

35. You are the chief engineer of a vessel, while in port working cargo a fire is reported in the engine room. Shoreside firefighting assistance has been requested. How would you proceed?

- A. Use the ship's SOPEP plan and coordinate with shoreside firefighters to extinguish the fire.
- B. Evacuate the ship and leave the fighting of the fire to the shoreside firefighters.
- C. Use the ship's SOLAS manual and coordinate with shoreside firefighters to extinguish the fire.
- D. Use the ship's Fire Control Plan and coordinate with shoreside firefighters to extinguish the fire.

Correct answer: D

36. 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. water fog over the fire
- B. foam directed against the vessel's side
- C. dry chemical around the fire
- D. solid water streams directly into the fire

Correct answer: B

37. The "flammable limits" of an atmosphere are the _____.

- A. upper and lower percentage of vapor concentrations in an atmosphere which will burn if an ignition source is present
- B. two temperatures between which an atmosphere will burn if an ignition source is present
- C. upper and lower pressures between which an atmosphere will not burn
- D. two temperatures between which an atmosphere will self-ignite

Correct answer: A

38. The explosive range of methane is 5% to 15% by volume in air. This means a vapor/air mixture of _____.

- A. 3 percent methane by volume is too rich to burn
- B. 5 percent methane by volume will give a reading of 100 percent L.E.L. on a combustible gas indicator
- C. 10 percent methane by volume is too rich to burn
- D. 20 percent methane by volume is too lean to burn

Correct answer: B

39. The volatility of a liquid is the tendency of a liquid to _____.

- A. ignite
- B. explode
- C. asphyxiate
- D. vaporize

Correct answer: D

40. Which of the petroleum products listed has a flash point below 150°F?

- A. Light fuel oils
- B. Road oils
- C. Lubricating oils
- D. Asphalt

Correct answer: A

41. Which of the following is classified as a grade "E" combustible liquid?

- A. Most commercial gasoline
- B. Benzene
- C. Very light naphtha
- D. Bunker "C"

Correct answer: D

42. High concentrations of hydrogen sulfide gas are most dangerous to personnel because they can _____.

- A. cause involuntary skeletal muscle contractions
- B. paralyze your breathing system
- C. cause eye inflammation
- D. cause dizziness

Correct answer: B

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

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

Correct answer: A

44. A fuel tank is considered to be gas free when the tank is _____.

- A. free of most flammable gas concentrations
- B. free of all dangerous concentrations of flammable or toxic gases
- C. inerted with carbon dioxide for 24 hours
- D. thoroughly ventilated for at least 24 hours

Correct answer: B

45. The physical data term on a Safety Data Sheet (SDS) that indicates if the vapor formed by a material is lighter or heavier than air is called _____.

- A. vapor gravity
- B. vapor level
- C. vapor pressure
- D. vapor density

Correct answer: D

46. 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. viscous liquid
 - C. flammable liquid
 - D. explosive liquid

Correct answer: C

47. Which ship must maintain Part II (Cargo/Ballast Operations) of the Oil Record Book?
- A. An oil tanker of 100 gross tons or above.
 - B. A ship of 150 gross tons or above, other than an oil tanker.
 - C. A non-tanker that carries more than 200 cubic meters of oil in bulk.
 - D. A ship of 200 gross tons or above, other than an oil tanker.

Correct answer: C

48. The Oil Record Book must be maintained onboard the vessel for _____.
- A. 6 months and then submitted to the nearest Marine Safety Office for review
 - B. the duration of the ship's active employment
 - C. not less than 3 years and be readily available for inspection
 - D. an annual inspection

Correct answer: C

49. During fueling operations oil is detected in the water adjacent to your vessel. If however, it is determined to be from some source other than your vessel, you should _____.
- A. notify the Coast Guard
 - B. secure operations until the exact type of oil is determined
 - C. make an entry in the Oil Record Book to that effect
 - D. all of the above

Correct answer: A

50. Where will you find the procedures for the reporting of oil discharge into the water?
- A. The vessel's Certificate of Inspection
 - B. The vessel's International Oil Pollution Prevention Certificate
 - C. The vessel's Oil Transfer Procedures
 - D. The vessel's Oil Record Book

Correct answer: C

51. After fuel tanks have been filled and bunkers completed, which of the listed procedures should be followed next?
- A. The tanks should be made seaworthy to prevent contamination.
 - B. The tanks should be sounded to verify levels.
 - C. The pressure-vacuum relief valve should be reset.
 - D. The tanks should be marked with a bull stamp on the manifold filling valve.

Correct answer: B

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 are true regarding U.S. flag vessel response plans for the carriage of oil?

- A. A shipboard oil pollution emergency response plan which includes, but is not limited to, shipboard spill mitigation procedures that must be submitted to the United States Coast Guard for approval.
- B. Oil is considered regulated cargo and all vessels engaged in the domestic oil trade are issued a Certificate of Inspection by the USCG. The issuance of this document satisfies all USCG requirements for vessel emergency contingency response plans.
- C. All domestic regulations regarding emergency response contingency plans are superseded by MARPOL, the international pollution prevention standard.
- D. The owner of a U.S. Flag vessel engaged in the carriage of oil regardless of size and route does not need to prepare and submit a contingency plan for emergency response in the event of a spill.

Correct answer: A

54. Which of the following statements is true concerning the overboard discharge of vessel sewage at sea?

- A. The vessel must have an approved sewage plant.
- 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 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.
- D. All of the above.

Correct answer: D

55. Victual waste is _____.

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

Correct answer: A

56. 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. Whether or not the damaged compartment on the opposite side of the vessel is full or empty.
- B. Distance from the vessel centerline to the centerline of the damaged compartment.
- C. Depth from the bottom of the damaged compartment to the waterline.
- D. Breadth of the damaged compartment affected.

Correct answer: B

57. By what method is the final light ship weight, longitudinal and vertical centers of gravity of a vessel, and final assignment of the load lines determined?
- A. By relying on resultant calculations from an inclining experiment
 - B. By relying on naval architectural design calculations
 - C. By actually shifting ballast horizontally and longitudinally and relying on resultant calculations
 - D. By relying on calculations based on ballasting a light vessel to full load displacement

Correct answer: A

58. 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. Add ballast to a centerline double bottom tank.
 - B. Discharge dirty ballast from a centerline double bottom tank.
 - C. Add ballast to wing tank to the side of the ship with an angle of list.
 - D. Discharge water from the forepeak tank.

Correct answer: A

59. After refueling your vessel, you notice that the GM of the vessel is less than the required 0.15 meters. What do you do?
- A. Transfer the fuel to raise the ship's KG and ignore the free surface effect.
 - B. Transfer the fuel to lower the ship's KG and minimize the free surface effect.
 - C. Transfer the fuel to increase the free surface effect and raise the ship's KG.
 - D. Do nothing because the minimum GM required is 0.1 meters.

Correct answer: B

60. Many uninspected motor vessels require load lines. For the purpose of the Load Line Regulations, the term "surveyor" means _____.
- A. any person designated by the American Bureau of Shipping who actually examines the vessel
 - B. any person from the Coast Guard who performs duties with respect to the inspection, enforcement, and administration of Title 52 of the revised statute
 - C. an officer of the Coast Guard designated by the commandant to command all Coast Guard activities within his district
 - D. any person from the Coast Guard who is in charge of a marine inspection zone

Correct answer: A

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

Correct answer: B

62. The water in which a vessel floats provides vertical upward support. The point through which this support is assumed to act is known as the center of _____.
- A. gravity
 - B. buoyancy
 - C. flotation
 - D. effort

Correct answer: B

63. Your vessel is loading cargo, and you are monitoring the stability and trim. Currently, the Longitudinal Center of Buoyancy (LCB) is vertically aligned and below the Longitudinal Center of Gravity (LCG). The Longitudinal Center of Flotation (LCF) is aft of both of these. How is the vessel trimming?
- A. Vessel trims level.
 - B. Trim by the bow about the LCF.
 - C. Trim by the bow about the LCB.
 - D. Trim by the stern about the LCF.

Correct answer: A

64. Your vessel has been damaged in a grounding and one compartment has partially flooded. As a result, you have lost buoyancy. If transverse stability in the flooded condition is poor or negative, every effort should be made to reduce the free surface and to lower the center of gravity. Which of the following should you ensure is maintained?
- A. A GM that is at least neutral - G moved down to be at M
 - B. Ballast is maintained in the pre-grounding state
 - C. A no list condition
 - D. As much reserve buoyancy as possible

Correct answer: D

65. The 2nd assistant engineer has just finished fueling operations. After entering the fuel data into the loading computer, you notice a greater than allowable at-sea bending stress. After the chief mate checks the voyage cargo data the vessel still has an excessive at-sea hogging bending stress. As chief engineer and after consulting with the chief mate, what should your instructions be to reduce the bending moment when ballasting the vessel?
- A. Add ballast to the forepeak tank.
 - B. Add ballast to the aftpeak tank.
 - C. Add ballast to an amidships tank.
 - D. Remove ballast from an amidships tank.

Correct answer: C

66. Yawing is the angular motion of the vessel about what axis?
- A. Longitudinal
 - B. Vertical
 - C. Centerline
 - D. Transverse

Correct answer: B

67. Your vessel, of more than 1000 gross tons on an international voyage is crossing the Atlantic Ocean. The second engineer injures his hand while working on a pump. The injury requires more than basic first aid. As the senior officer onboard how would you proceed?
- A. Contact the medical advisory service contracted by your company to speak with a shoreside doctor and address the injury as directed by the doctor.
 - B. Call your company port engineer and ask for help.
 - C. Seek help from fellow crew members who have no medical training.
 - D. Read an outdated copy of the Ships Medicine Chest reference book found onboard to help treat the injury.

Correct answer: A

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

Correct answer: D

69. The carbon dioxide cylinders of a fixed fire extinguishing system may be located inside the protected space if the quantity of CO₂ required to protect that space is not more than _____.
- A. 300 pounds
 - B. 400 pounds
 - C. 500 pounds
 - D. 600 pounds

Correct answer: A

70. Your passenger vessel has departed port with 1,235 passengers on board for a 10-day voyage. In accordance with 46 CFR Part 78, what actions must be taken to verify that your vessel was in compliance with stability requirements?
- A. Ensure that the vessel owners have determined that the vessel complies with all applicable stability requirements in the vessel's trim and stability book, stability letter, Certificate of Inspection, and Load Line Certificate, as the case may be, and then enter an attestation statement of the verification in the logbook. The vessel may not depart until it is in compliance with these requirements.
 - B. The master shall determine that the vessel complies with all applicable stability requirements in the vessel's trim and stability book, stability letter, Certificate of Inspection, and Load Line Certificate, as the case may be, and then enter an attestation statement of the verification in the ship's stability book. The vessel may not depart until it is in compliance with these requirements.
 - C. The master shall determine that the vessel complies with all applicable stability requirements in the vessel's trim and stability book, stability letter, Certificate of Inspection, and Load Line Certificate, as the case may be and send a message verifying the condition of the vessel to the vessel's owners. The vessel may not depart until it is in compliance with these requirements.
 - D. The master shall determine that the vessel complies with all applicable stability requirements in the vessel's trim and stability book, stability letter, Certificate of Inspection, and Load Line Certificate, as the case may be, and then enter an attestation statement of the verification in the log book. The vessel may not depart until it is in compliance with these requirements.

Correct answer: D