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1. With reference to the Code of Safe Working Practices for Merchant Seafarers and entering enclosed or confined spaces, state EACH of the following:

   (a) the reasons why the atmosphere of any enclosed space is potentially dangerous; (4)

   (b) the precautions to be taken before a potentially dangerous space is entered. (6)

March 21

2. With reference to the engine log books, explain the reasons for recording EACH of the following:

   (a) running hours; (2)

   (b) lubricating oil consumption; (2)

   (c) fuel consumption; (2)

   (d) salanity or chloride content of the engine jacket cooling water; (2)

   (e) water content of lubricating oil. (2)

March 21

3. (a) State the SIX MARPOL annexes which are currently in force. (6)

   (b) With reference to MARPOL Annex VI and Oxides of Nitrogen (NO_x), state which engines have to comply with the legislation. (2)

   (c) State TWO other pollutants that AnnexVI is designed to limit. (2)

March 21

4. (a) With reference to MARPOL 73/78 Annex IV, explain what is meant by the term *sewage*. (4)

   (b) State the current regulations for the discharge of *sewage*. (6)

March 21

5. With reference to safe storage and handling of refrigerant:

   (a) state where the refrigerant gas bottles should be stored; (2)

   (b) state the weakest part of the storage bottle; (1)

   (c) explain how it can be determined if refrigerant has been leaking from gas bottles; (1)

   (d) state the TWO methods of recharging a refrigeration system, stating where the connection to the system should be made for EACH method; (4)

   (e) state how excessive refrigerant should be removed from the system without infringing MARPOL regulations. (2)

March 21

6. (a) State THREE types of micro-organisms that may exist in water. (3)

   (b) Describe, with the aid of a sketch, the operation of a *Silver Ion Sterilizer.* (7)

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7. Describe, with the aid of a sketch, the construction and operation of an *Active Controlled Tank* roll damping system. (10)

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8. With reference to portable fire extinguishers:

   (a) describe the examination and testing of portable fire extinguishers as specified in the UK and Internatinal legislation. (6)

   (b) state the classes of fire that Dry powder extinguishers may be safely used; (2)

   (c) describe the operation of a portable CO_2 fire extinguisher. (2)

March 21

9. (a) State FIVE monthly checks which should be carried out on fire fighting equipment. (5)

(b) State FIVE yearly checks which should be carried out on fire fighting equipment. (5)

March 21

10. Explain the meaning and purpose of EACH of the following terms:

(a) flare; (2)

(b) bulwark; (2)

(c) coaming; (2)

(d) freeing port; (2)

(e) scupper. (2)

March 21

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(a) the reasons why the atmosphere of any enclosed space is potentially dangerous; (4)

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Enclosed Spaces and Safety for Merchant Seafarers:

(a) Reasons for Potential Danger in Enclosed Spaces:

The Code of Safe Working Practices for Merchant Seafarers emphasizes the inherent risks of entering enclosed or confined spaces. Here's why:

- **Oxygen Deficiency:** Enclosed spaces can have reduced oxygen levels due to various factors. Consumption by rusting, decaying organic matter, or displacement by other gases can lead to oxygen depletion below the safe level (around 19.5%). Oxygen deficiency can cause dizziness, unconsciousness, and even death.

- **Toxic Atmosphere:** Enclosed spaces can accumulate harmful gases or fumes from fuel spills, cleaning chemicals, cargo residues, or engine exhaust. These can be invisible and odorless, making them difficult to detect. Exposure can lead to respiratory problems, poisoning, or even death.

- **Flammable or Explosive Atmospheres:** Enclosed spaces can harbor flammable gasses, vapors, or dust from fuels, paints, or cargo. Ignition sources like sparks from tools or electrical equipment can trigger fires or explosions.

- **Other Hazards:** Limited ventilation, extreme temperatures (hot or cold), and flooding are additional dangers that can arise in enclosed spaces and pose risks to worker safety.

(b) Precautions Before Entering Enclosed Spaces:

The Code outlines strict safety measures before entering an enclosed space:

1. **Permit to Work:** A formal permit system should be established, requiring a risk assessment and outlining specific entry procedures, ventilation requirements, and emergency protocols.

2. **Ventilation:** Adequate ventilation is crucial to ensure a safe atmosphere. This might involve mechanical ventilation systems or natural ventilation by opening hatches for a designated period. Tests should be conducted to confirm oxygen levels and absence of harmful gases before entry.

3. **Atmospheric Monitoring:** Portable gas detectors should be used to monitor oxygen levels, presence of flammable or toxic gases, and ensure a safe atmosphere for entry.

4. **Isolation:** Isolate the space from surrounding machinery or processes that could introduce hazardous substances. Lock out and tag out any equipment that could pose a risk during entry.

5. **Personal Protective Equipment (PPE):** Workers entering the space must wear appropriate PPE based on the identified risks. This could include breathing apparatus, respirators, chemical suits, safety harnesses, and proper footwear.

6. **Communication and Standby:** Clear communication protocols should be established between workers inside the space and a designated standby person outside. The standby person should be trained in rescue procedures and have access to communication equipment to raise the alarm in case of an emergency.

7. **Training:** Workers should receive adequate training on enclosed space entry procedures, risk assessment, use of monitoring equipment, and emergency rescue techniques.

Following these precautions as outlined in the Code of Safe Working Practices is essential to minimize the risks associated with entering enclosed spaces and ensure the safety of merchant seafarers.

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2. With reference to the engine log books, explain the reasons for recording EACH of the following:

(a) running hours; (2)

(b) lubricating oil consumption; (2)

(c) fuel consumption; (2)

(d) salanity or chloride content of the engine jacket cooling water; (2)

(e) water content of lubricating oil. (2)

Engine Log Book Entries: Monitoring Performance and Health

Engine log books record various parameters beyond just temperatures and pressures to provide a comprehensive picture of engine performance and health. Here's why each of these specific entries is important:

(a) Running Hours:

- **Reason for Recording:** Running hours represent the total cumulative time the engine has been operational. This is crucial for:
  - **Scheduled Maintenance:** Many preventive maintenance tasks are based on running hours. Knowing the total operating time allows for timely scheduling of oil changes, filter replacements, and other routine maintenance to prevent excessive wear and tear.
  - **Performance Analysis:** Tracking running hours helps analyze engine performance over time. Increased running hours might be compared with fuel consumption or wear and tear indicators to identify potential efficiency changes or degradation.

(b) Lubricating Oil Consumption:

- **Reason for Recording:** Monitoring lubricating oil consumption helps identify potential problems:
  - **Leaks:** Excessive oil consumption can indicate leaks in the engine lubrication system, such as worn seals or gaskets. Addressing these leaks promptly prevents oil loss and potential environmental damage.
  - **Increased Internal Wear:** In some cases, increased oil consumption might be a sign of increased internal wear within the engine. Tracking oil consumption trends can help identify potential issues early on.

(c) Fuel Consumption:

- **Reason for Recording:** Fuel consumption is a vital indicator of engine efficiency:
  - **Performance Monitoring:** Tracking fuel consumption allows for monitoring engine performance over time. Increased fuel consumption might indicate inefficiency due to factors like improper combustion, dirty air filters, or worn injector nozzles.
  - **Voyage Planning:** Recording fuel consumption data helps with future voyage planning and fuel budgeting. Knowing the average fuel burn rate allows for more accurate fuel calculations for specific routes and operating conditions.

(d) Salinity or Chloride Content of the Engine Jacket Cooling Water:

- **Reason for Recording:** Monitoring salinity or chloride content in the engine jacket cooling water helps detect potential leaks from seawater sources:
    - **Heat Exchanger Leaks:** Sealoil leaks in the heat exchanger can allow saltwater to mix with the engine coolant. This can lead to corrosion damage within the cooling system and engine block. Detecting increased salinity early on allows for prompt repairs and prevents costly damage.

(e) Water Content of Lubricating Oil:

- **Reason for Recording:** Water contamination in lubricating oil can have detrimental effects:
    - **Reduced Lubrication Properties:** Water can dilute the lubricating properties of oil, leading to increased friction and wear on engine components.
    - **Corrosion:** Water can accelerate corrosion within the engine. Monitoring water content allows for early detection and identification of the source of contamination (e.g., condensation, leaks from the cooling system).

By diligently recording and analyzing these log book entries, engineers can gain valuable insights into engine health, performance, and potential problems. This proactive approach allows for preventive maintenance, improved efficiency, and early detection of issues that could lead to costly repairs or breakdowns.

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(b) With reference to MARPOL Annex VI and Oxides of Nitrogen (NO_x), state which engines have to comply with the legislation. (2)

(c) State TWO other pollutants that AnnexVI is designed to limit. (2)

MARPOL Annex VI and Emissions:

(b) Engines Complying with MARPOL Annex VI NOx Regulations:

As mentioned previously, engines with a power output of more than 130 kW must comply with MARPOL Annex VI NOx regulations. This includes:

- **Main propulsion engines:** Regardless of the vessel type or size, if the main engine (or combined power of multiple main engines) exceeds 130 kW, it falls under the regulations.
- **Auxiliary engines:** Any auxiliary engine onboard, including generators, pump drives, or deck machinery engines, exceeding 130 kW in power output needs to meet the NOx emission standards.

(c) Other Pollutants Limited by MARPOL Annex VI:

While NOx is a major focus, MARPOL Annex VI addresses a broader range of air pollutants from ship operations. Two other key pollutants it aims to limit are:

1. **Sulphur Oxides (SOx):**
    - SOx emissions are primarily caused by the sulphur content in marine fuels. MARPOL Annex VI enforces stricter regulations on the sulphur content of fuels used in designated Emission Control Areas (ECAs) and globally. This helps reduce acid rain formation and respiratory issues caused by SOx exposure.
2. **Volatile Organic Compounds (VOCs):**
    - VOCs are a group of organic chemicals that can evaporate at room temperature. They are emitted during fuel transfer operations and contribute to smog formation. MARPOL Annex VI regulates VOC emissions, particularly from tankers, to minimize their environmental impact.

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4. (a) With reference to MARPOL 73/78 Annex IV, explain what is meant by the term *sewage*. (4)

(b) State the current regulations for the discharge of *sewage*. (6)

MARPOL Annex IV and Sewage Regulations:

(a) Definition of Sewage:

According to MARPOL 73/78 Annex IV, **sewage** refers to:

- **All waste streams** originating from sanitary facilities onboard a ship, including:
    - Toilet waste from toilets and urinals
    - Graywater from sinks, showers, laundry, and galley facilities
- **Any other waste** generated onboard that is similar in character to the wastes mentioned above.

This encompasses all human waste products and wastewater streams produced during regular ship operations.

(b) Current Regulations for Sewage Discharge:

MARPOL Annex IV sets strict regulations to minimize pollution from ship-generated sewage. The discharge of sewage is generally prohibited, with exceptions allowed under specific conditions:

- **Comminuted and Disinfected Sewage:** In **waters outside designated special areas**, treated sewage that has been:
    - **Comminuted:** Ground into small particles to aid in dispersal.
    - **Disinfected:** Treated with an approved method (e.g., chemicals) to reduce harmful bacteria and viruses. can be discharged at a distance of **more than 3 nautical miles from the nearest land**.
- **Sewage from Approved Treatment Plants:** Sewage treated onboard using an **approved sewage treatment plant** that meets specific performance standards can be discharged even closer to land, but only when the ship is **en route** and proceeding at a minimum speed. Additionally, the effluent must not produce visible floating solids or cause discoloration of the surrounding water.

- **Special Areas:** In designated **MARPOL special areas**, such as the Baltic Sea or the Mediterranean Sea, even stricter regulations apply. The discharge of any untreated sewage is generally prohibited within these special areas.

These regulations aim to protect the marine environment from the harmful effects of sewage pollution, minimizing the spread of pathogens and ensuring cleaner waters.

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(b) state the weakest part of the storage bottle; (1)

(c) explain how it can be determined if refrigerant has been leaking from gas bottles; (1)

(d) state the TWO methods of recharging a refrigeration system, stating where the connection to the system should be made for EACH method; (4)

(e) state how excessive refrigerant should be removed from the system without infringing MARPOL regulations. (2)

Safe Storage and Handling of Refrigerant

(a) Refrigerant Storage Location:

Refrigerant gas bottles should be stored in a cool, well-ventilated area that is:

- **Dry:** Moisture can cause corrosion of the bottle and valves.
- **Out of direct sunlight:** Exposure to heat can increase pressure inside the bottle and pose a safety risk.
- **Away from heat sources:** Keep them away from boilers, furnaces, or any source of ignition.
- **Secured:** Store them upright and secured with straps or chains to prevent them from falling or tipping over.

(b) Weakest Part of the Storage Bottle:

The weakest part of a refrigerant storage bottle is typically the **valve assembly**. This is where the pressure gauge and charging hose connect. The valve components like the stem and threads are susceptible to damage if mishandled.

(c) Detecting Leaks from Refrigerant Bottles:

Here are some ways to determine if refrigerant has been leaking from a gas bottle:

- **Visual Inspection:** Look for signs of physical damage to the valve assembly, like cracks or loose connections.
- **Hissing Sounds:** A persistent hissing sound coming from the valve area may indicate a leak.

- **Weight Discrepancy:** If a certified weighbridge is available, compare the bottle's weight to the tare weight (empty weight) marked on the bottle. A significant weight difference could indicate refrigerant loss.
- **Electronic Leak Detectors:** Specialized detectors can be used to identify leaks around the valve area.

(d) Refrigeration System Recharging Methods:

There are two main methods for recharging a refrigeration system:

1. **Liquid Line Charging:** This method involves injecting liquid refrigerant directly into the **liquid line** of the system. The connection point is usually located on the **high-pressure side** of the system, after the condenser and before the filter drier. This method requires careful monitoring of system pressures and temperatures to avoid overcharging.

2. **Vapor Line Charging:** This method involves injecting refrigerant in its vapor state into the **suction line** of the system. The connection point is usually located on the **low-pressure side** of the system, just before the compressor inlet. This method is generally slower but reduces the risk of overcharging the system.

(e) Removing Excess Refrigerant (Complying with MARPOL):

Removing excess refrigerant from a refrigeration system must comply with MARPOL regulations to prevent environmental pollution. Here's how to do it safely and legally:

- **Recovery and Recycling:** The most recommended approach is to use a certified technician with specialized equipment to recover and recycle the excess refrigerant. This ensures proper handling and avoids releasing harmful refrigerants into the atmosphere.

- **Recovery for Disposal (as a last resort):** If recycling is not possible, the refrigerant may be recovered for disposal at a licensed facility that adheres to MARPOL regulations. This disposal process ensures safe handling and destruction of the refrigerant according to environmental standards.

Important Note: Never attempt to release refrigerant directly into the atmosphere. This is a violation of MARPOL regulations and can be harmful to the environment.

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6. (a) State THREE types of micro-organisms that may exist in water. (3)

(b) Describe, with the aid of a sketch, the operation of a *Silver Ion Sterilizer.* (7)

Bacteria: These are single-celled organisms, some of which can cause a variety of illnesses like diarrhea, cholera, and E. coli infections if ingested in contaminated water.

1. **Viruses:** Even smaller than bacteria, viruses are not technically living organisms but can replicate inside host cells. They can cause waterborne illnesses like hepatitis A and rotavirus.

2. **Protozoa:** These single-celled organisms are larger than bacteria and can be motile (move on their own). Examples include Giardia lamblia, which can cause giardiasis, a diarrheal illness.

Silver Ion Sterilization

Silver ion sterilization is a method for disinfecting water using positively charged silver ions (Ag+). Here's how it works:

1. **Silver Ion Release:** Silver ions are released into the water through various methods:
    - **Electrolysis:** An electric current is passed through silver electrodes, causing silver atoms to dissolve and release ions into the water.
    - **Silver-impregnated media:** Cartridges containing ceramic or other materials infused with silver slowly release silver ions as water flows through them.
2. **Mechanism of Action:** Silver ions have a strong antimicrobial effect. They disrupt the cell membranes of bacteria, viruses, and other microorganisms. This disrupts essential cellular functions and leads to their death.

- **Disruption of cell membranes:** Silver ions can interact with the cell membrane of microorganisms, causing it to become leaky and lose essential cellular components.
- **Inhibition of enzyme activity:** Silver ions can also bind to and inactivate enzymes within the microorganism, hindering their ability to function and reproduce.
- **DNA and RNA damage:** In some cases, silver ions can damage the DNA or RNA of the microorganism, preventing it from replicating.

3. **Benefits:**

- **Effective against a broad spectrum of bacteria, viruses, and some fungi.**
- **Long-lasting residual effect:** Silver ions remain active in the water for some time, providing ongoing protection.
- **Generally safe for humans at recommended concentrations.**

4. **Limitations:**

- **Ineffective against protozoa (like Giardia) and some parasites.**
- **Not as effective in turbid water:** Silver ions can bind to suspended particles and become less available to target microorganisms.
- **Regular monitoring of silver ion concentration is necessary** to ensure effectiveness and safety. Silver at high concentrations can be harmful to humans.

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7. Describe, with the aid of a sketch, the construction and operation of an *Active Controlled Tank* roll damping system. (10)

An Active Controlled Tank (ACT) roll damping system utilizes onboard tanks filled with water and a sophisticated control system to actively counteract a ship's rolling motion. Unlike passive anti-rolling tanks, which rely on the natural movement of water within the tanks, ACT systems employ pumps, sensors, and advanced control algorithms for a more dynamic and effective stabilization approach.

Construction:

- **Tanks:** The system typically consists of two identical tanks located on either side of the ship, usually positioned low in the bilge area for optimal roll reduction. These tanks can be rectangular, U-shaped, or other suitable designs to maximize water volume and minimize space requirements.

- **Pumps:** Each tank is equipped with a powerful and efficient pump, often an axial flow pump designed for high flow rates and minimal energy consumption.
- **Control System:** This is the brain of the ACT system, comprising:
    - **Roll Sensors:** Gyroscopes or accelerometers are strategically placed to detect the ship's roll motion in real-time, measuring the angle and direction of the roll.
    - **Control Unit:** A powerful computer processes sensor data and calculates the necessary pump operation to counteract the roll. This unit relies on sophisticated control algorithms that consider factors like roll angle, roll rate, ship speed, and wave characteristics.

Operation:

1. **Roll Detection:** The roll sensors continuously monitor the ship's rolling motion, feeding data to the control unit.
2. **Control System Response:** The control unit analyzes the sensor data and predicts the roll development based on the current motion and wave conditions. It then calculates the ideal pump operation to create a counteracting force.
3. **Pump Activation:** Based on the control unit's output, the pumps in the tanks are activated.

- **Starboard Roll:** If the ship rolls to starboard (right), the control unit directs the pump in the port (left) tank to move water rapidly towards the starboard side. This rapid water movement creates a significant weight shift to counteract the roll. The starboard tank pump might also be activated at a slower rate to further optimize water movement.
- **Portside Roll:** Conversely, if the ship rolls to port, the pump in the starboard tank is activated to pump water towards the port side, effectively countering the roll in the opposite direction.

Key Features of ACT Systems:

- **Fast Response:** The control system can react very quickly to changes in roll angle due to real-time sensor data and rapid adjustments in pump operation. This allows for proactive stabilization, anticipating roll development before it becomes significant.
- **High Efficiency:** Modern ACT systems utilize advanced control algorithms and pump designs to optimize water movement and minimize energy consumption.
- **Scalability:** The system can be adapted to vessels of various sizes by adjusting tank size, pump capacity, and control algorithms.

Advantages of ACT Systems:

- **Highly Effective:** ACT systems can achieve significant roll reductions, often exceeding 80% or more depending on sea conditions.
- **Dynamic Response:** They can proactively counter roll motion due to the advanced control system and fast-acting pumps.
- **Lower Energy Consumption:** Compared to some fin stabilizer systems, ACT systems can be more energy-efficient, especially with optimized pump designs and control algorithms.

Disadvantages of ACT Systems:

- **Complexity:** ACT systems are more complex than passive systems due to the additional pumps, sensors, and sophisticated control units. This complexity increases installation and maintenance costs.
- **Space Requirements:** The tanks and pumps require dedicated space within the vessel, which might be a consideration for some designs.
- **Maintenance Needs:** The pumps and control system require regular maintenance to ensure proper operation.

Overall, Active Controlled Tank systems offer a powerful and efficient solution for significantly reducing a ship's rolling motion, enhancing passenger comfort, and improving overall operational efficiency. However, their

complexity, space requirements, and maintenance needs require careful consideration when compared to simpler passive stabilization methods.

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8. With reference to portable fire extinguishers:

(a) describe the examination and testing of portable fire extinguishers as specified in the UK and Internatinal legislation. (6)

(b) state the classes of fire that Dry powder extinguishers may be safely used; (2)

(c) describe the operation of a portable CO_2 fire extinguisher. (2)

Portable Fire Extinguisher Examination and Testing (UK & International)

(a) Examination and Testing:

Both UK and international regulations emphasize the importance of regular examination and testing of portable fire extinguishers to ensure their functionality and safety. Here's a breakdown of the key points:

UK Regulations:

- The **British Standards Institution (BSI)** sets standards for fire extinguisher maintenance in the UK. The most relevant standard is **BS 5306 - Part 8: Servicing and maintenance of portable fire extinguishers**.
- This standard recommends the following schedule for examination and testing:
    - **Monthly Visual Inspections:** These basic checks ensure the extinguisher is readily available and undamaged. (See previous answer for details)
    - **Six-Monthly Service:** A qualified engineer performs a more detailed service, including:
        - Internal and external inspection for damage or corrosion.
        - Functional checks of pressure gauges, discharge levers, and safety pins.
        - Cleaning and lubrication if necessary.
    - **Five-Yearly Internal Inspection:** A more thorough inspection by a qualified engineer, including:
        - Disassembly and internal examination for signs of wear or deterioration.
        - Pressure testing of the extinguisher shell.
        - Replacing any worn or faulty components.

International Regulations:

- The **International Maritime Organization (IMO)** has guidelines for fire safety on ships in the **International Code for Fire Safety Systems (FSS Code)**.
- This code requires fire extinguishers on board vessels to be serviced in accordance with the manufacturer's instructions and relevant national regulations. (Similar to the UK approach)
- The **Solas Convention** (International Convention for the Safety of Life at Sea) also mandates fire extinguisher maintenance on passenger ships.

General Considerations:

- Both UK and international regulations emphasize the importance of using qualified engineers for servicing and testing portable fire extinguishers.
- Records of all examinations and tests should be maintained for future reference.

Dry Powder Fire Extinguishers (Classes of Use)

(b) Classes of Fire:

Dry powder fire extinguishers are versatile and can be used safely on several fire classes:

- **Class A Fires:** Ordinary combustibles like wood, paper, and textiles.
- **Class B Fires:** Flammable liquids like gasoline, oil, and grease.
- **Class C Fires:** Flammable gases like propane and methane. (**Note:** While dry powder can extinguish the flame, it won't stop the gas leak. Shutting off the gas source is crucial)

However, they are **not** suitable for the following fire classes:

- **Class D Fires:** Combustible metals like magnesium or sodium. Dry powder might react with some metals, worsening the fire.
- **Class F Fires:** Cooking oils and fats. Dry powder might not be effective in smothering these types of fires.

Operation of a Portable CO2 Fire Extinguisher

(c) Operation of a CO2 Fire Extinguisher:

Caution: CO2 extinguishers displace oxygen. Never use them in confined spaces without proper ventilation.

Here's how to operate a portable CO2 fire extinguisher:

1. **Pull the safety pin.** This allows you to discharge the extinguisher.
2. **Aim the nozzle** at the base of the flames.
3. **Squeeze the discharge lever** to release the CO2 gas. The CO2 will be expelled as a cold, dense gas that smothers the fire by displacing oxygen.
4. **Keep discharging** the extinguisher in short bursts, sweeping the nozzle back and forth at the base of the flames until the fire is extinguished.
5. **Maintain a safe distance** from the fire while discharging. The CO2 gas can be extremely cold and cause frostbite.
6. **Evacuate the area** once the fire is out and ensure proper ventilation to avoid oxygen depletion.

Remember: Portable fire extinguishers are for small fires only. If the fire is large or spreading rapidly, evacuate the area immediately and call the fire department.

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9. (a) State FIVE monthly checks which should be carried out on fire fighting equipment. (5)

(b) State FIVE yearly checks which should be carried out on fire fighting equipment. (5)

Firefighting Equipment Checks on Marine Vessels

Here's a breakdown of important monthly and yearly checks for firefighting equipment on marine applications:

(a) Monthly Checks (Five Examples):

1. **Visual Inspection:** Perform a thorough visual inspection of all firefighting equipment for any signs of damage, corrosion, leaks, or missing parts. This includes:
    - Fire hoses: Check for cracks, cuts, bulges, or loose couplings.
    - Portable fire extinguishers: Verify tamper seals are intact, pressure gauges are in the green zone, and safety pins are secure.
    - Fire hydrants and valves: Ensure they are accessible, not blocked by debris, and operate smoothly.
    - Breathing apparatus: Inspect masks, hoses, and cylinders for damage or leaks.
    - Firefighting clothing: Check for tears, burns, or any deterioration that might affect protection.
2. **Operational Checks:** Where possible, conduct basic operational checks on some equipment:
    - **Fire hoses:** Unroll and connect hoses to hydrants to ensure proper water flow and pressure.
    - **Portable fire extinguishers: Visually** confirm the lifting handle and discharge lever are functional (**Do not** discharge extinguishers during monthly checks).
3. **Crew Familiarization:** Organize short training sessions or reminders for crew members to ensure familiarity with the location and operation of firefighting equipment in their assigned areas.
4. **Record Keeping:** Document the monthly checks in a designated logbook, recording the date, equipment inspected, any findings, and corrective actions taken (if necessary).
5. **Pressure Gauges:** While a detailed pressure gauge check might be done yearly, a monthly glance at the pressure gauges on fire hydrants and portable extinguishers can provide a quick indication of potential issues.

(b) Yearly Checks (Five Examples):

1. **Detailed Functional Testing:** Perform a more comprehensive functional test on firefighting equipment:
    - **Fire hoses:** Conduct a pressure test to ensure they meet the required pressure rating.
    - **Portable fire extinguishers:** These require a thorough internal and external inspection by a certified technician. This includes a hydrostatic pressure test to ensure the extinguisher can safely handle the pressure of the extinguishing agent. Discharging a small amount of the agent might also be required to verify proper functionality.
    - **Fire hydrants and valves:** Conduct a flow test to verify adequate water pressure and flow rate. Operate the valves to ensure smooth opening and closing.

2. **Breathing Apparatus (BA) Inspection:** A qualified technician should perform a detailed inspection of breathing apparatus sets, including:
    - Checking the integrity of the masks, hoses, and cylinders.
    - Testing alarms and low-air pressure warnings.
    - Verifying the serviceability of breathing gas and refilling cylinders if necessary.
3. **Firefighting Clothing Inspection:** A qualified person should inspect firefighting clothing for any damage, tears, or signs of wear and tear that might compromise their protective capabilities. Replace any unsuitable clothing.
4. **Spare Parts Inventory:** Review the stock of spare parts for firefighting equipment and ensure critical replacement parts are readily available in case of repairs.
5. **Record Keeping:** Document the yearly checks in a designated logbook, recording the date, equipment serviced, any findings or repairs done, and the name of the certified technician (if applicable).

These are just some examples, and the specific requirements for checks and maintenance might vary depending on the type of vessel, national regulations, and classification society guidelines. Always refer to the manufacturer's instructions and relevant regulations for detailed procedures and service intervals.

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10. Explain the meaning and purpose of EACH of the following terms:

(a)	flare;	(2)
(b)	bulwark;	(2)
(c)	coaming;	(2)
(d)	freeing port;	(2)
(e)	scupper.	(2)

Ship's Features and Openings:

Here's a breakdown of the meaning and purpose of each term related to a ship's features and openings:

(a) **Flare:** Flare refers to the outward inclination of a ship's side shell plating above the waterline, particularly towards the bow. This outward angle serves several purposes:

- **Improved Buoyancy:** The flare helps to increase buoyancy at the bow, preventing excessive water ingress during head-on seas.
- **Reduced Wave Impact:** The angle deflects waves outwards, minimizing water washing over the deck and improving weather handling.
- **Stability Enhancement:** The wider beam at the waterline created by the flare improves initial stability, helping the vessel resist rolling motions.

(b) **Bulwark:** A bulwark is a vertical extension above the weather deck along the sides of the vessel. It's essentially a wall that provides safety and security for personnel onboard by preventing falls overboard. Bulwarks can be solid structures made of steel plates or railings with vertical supports.

(c) **Coaming:** A coaming is a raised edge around an opening on a deck, such as a hatchway, skylight, or ventilation opening. The purpose of the coaming is to:

- **Prevent Water Ingress:** The raised edge helps to channel water away from the opening, minimizing the risk of water ingress during rain or rough seas.
- **Provide Structural Support:** Coamings can add strength and rigidity to the deck around the opening.

(d) **Freeing Port:** A freeing port is an opening in the bulwark or side shell plating located below the level of the weather deck. These openings allow water that accumulates on deck to drain overboard and prevent the deck from becoming flooded. Freeing ports are particularly important on working decks exposed to weather conditions.

(e) **Scupper:** A scupper is a small drainage channel located on a deck that leads to a freeing port or drainage pipe. Scuppers help to drain water that accumulates on decks, particularly from rain or washing down operations. Proper scupper placement is crucial to ensure efficient water drainage and prevent water pooling on decks.