CERTIFICATE OF COMPETENCY EXAMINATION

EXAMINATIONS ADMINISTERED BY THE
SCOTTISH QUALIFICATIONS AUTHORITY
ON BEHALF OF
MARITIME AND COASTGUARD AGENCY

SMALL VESSEL EOOW

060-02 - OPERATIONAL PROCEDURES, BASIC HOTEL SERVICES AND SHIP CONSTRUCTION

FRIDAY, 09 May 2025

1400-1600 hrs

Examination paper inserts:

Notes for the guidance of candidates:

1. Candidates should note that 100 marks are allocated to this paper. To pass candidates must achieve 50 marks.
2. Non-programmable calculators may be used
3. All formulae used must be stated and the method of working and ALL intermediate steps must be made clear in the answer.

Materials to be supplied by examination centres:

Candidate's examination workbook

OPERATIONAL PROCEDURES, BASIC HOTEL SERVICES AND SHIP CONSTRUCTION

Attempt ALL questions
Marks for each part question are shown in brackets

1. With reference to the SOLAS requirements for conducting regular emergency musters and drills:

   (a) state the accepted emergency signal for calling crew and passengers to lifeboat muster stations; (2)

   (b) state when emergency drills must be carried out; (4)

   (c) list FOUR types of emergency drill that must be conducted on a regular basis. (4)

2. With reference to watchkeeping duties:

   (a) list the documentation to be referred to for details of watchkeeping duties and responsibilities; (3)

   (b) state TWO cases in which a watch should not be handed over to a relieving engineer; (2)

   (c) list FIVE alarms which should be tested on a regular basis. (5)

3. With reference to the international agreement governing the discharge of oil from ships:

   (a) state the name of the International Authority responsible for overseeing the legislation; (1)

   (b) state the name of the appropriate regulation; (1)

   (c) state what the abbreviation SOPEP stands for; (2)

   (d) explain the purpose of a SOPEP; (2)

   (e) list FOUR items of information a SOPEP should contain. (4)

4. With reference to bunkering procedures:

   (a) explain how the quantity of fuel delivered is checked allowing for temperature and density; (6)

   (b) state the procedure to be followed, in the case of dispute about the quantity of fuel delivered. (4)

5. (a) State the MARPOL Annex number which deals with the disposal of sewage. (1)

(b) With reference to the Annex stated in part (a), state the rules for EACH of the following:

(i) when the sewage is untreated; (2)

(ii) when the sewage is comminuted and disinfected. (2)

(c) Explain why the final discharge from an approved sewage treatment plant is chlorinated before discharge. (2)

(d) Explain how chlorination is carried out and monitored. (2)

(e) State the correct chlorine content of the final discharge. (1)

6. With reference to contamination of ships air conditioning systems by *Legionella Bacteria*:

(a) state the FIVE main danger areas; (5)

(b) outline FIVE counter measures which should be taken to reduce the risk of contamination. (5)

7. With reference to fresh water distilling plants, outline EACH of the following sterilisation methods:

(a) chlorine sterilisation; (5)

(b) silver-ion method of sterilisation. (5)

8. Describe, with the aid of a sketch, an active tank stabilisation system. (10)

9. With reference to a machinery space carbon dioxide smothering system:

(a) state the regulation regarding the rate of flooding with respect to time; (4)

(b) state the precautions to be taken before activating the system. (6)

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)

4. With reference to the SOLAS requirements for conducting regular emergency musters and drills:

(a) state the accepted emergency signal for calling crew and passengers to lifeboat muster stations; (2)

(b) state when emergency drills must be carried out; (4)

(c) list FOUR types of emergency drill that must be conducted on a regular basis. (4)

(a) Accepted emergency signal (2 marks)

- The emergency signal is **seven or more short blasts followed by one long blast** on the ship's whistle and internal alarm systems.

(b) When emergency drills must be carried out (4 marks)

- **Within 24 hours** of a passenger vessel leaving port, if passengers have not previously participated in a muster.
- **Weekly**: crew emergency drills on passenger ships.
- **Monthly**: at least one abandon ship drill and one fire drill for all ships.
- After a **significant change of crew**, so every crew member participates in a drill within 24 hours.

(c) Four types of emergency drill required regularly (4 marks)

1. **Fire drill**
2. **Abandon ship drill / lifeboat drill**
3. **Man overboard drill**
4. **Oil pollution response drill (SOPEP)**

(Other acceptable answers under SOLAS include: security drill, damage control/flooding drill, enclosed space entry/rescue drill, depending on the vessel type.)

2. With reference to watchkeeping duties:

(a) list the documentation to be referred to for details of watchkeeping duties and responsibilities; (3)

(b) state TWO cases in which a watch should not be handed over to a relieving engineer; (2)

(c) list FIVE alarms which should be tested on a regular basis. (5)

(a)

Documentation to refer to for watchkeeping duties and responsibilities (3 marks)

1. **STCW Code (Section A-VIII/2)** – standards for watchkeeping.
2. **Company Safety Management System (SMS) / Standing Orders**.
3. **Code of Safe Working Practices for Merchant Seafarers (COSWP)**.

(Other acceptable: Chief Engineer's Night Orders, Engine Room Standing Orders, ISM Code documentation.)

(b) Cases where a watch should not be handed over (2 marks)

1. When there is an **emergency** in progress (fire, flooding, machinery breakdown).
2. When machinery is in a **critical condition** or undergoing operations (e.g. manoeuvring, bunkering, starting/stopping main engine).

(c) Five alarms to be tested regularly (5 marks)

1. **High-temperature jacket water alarm** (main engine).
2. **Lubricating oil low-pressure alarm**.
3. **Bilge high-level alarm**.
4. **Engine room fire/smoke alarm**.
5. **Oil mist detector alarm** (crankcase).

(Other valid answers: emergency generator start alarm, fuel oil low-level, boiler low-water level, CO_2 release alarm, emergency stop alarms, etc.)

3. With reference to the international agreement governing the discharge of oil from ships:

(a) state the name of the International Authority responsible for overseeing the legislation; (1)

(b) state the name of the appropriate regulation; (1)

(c) state what the abbreviation SOPEP stands for; (2)

(d) explain the purpose of a SOPEP; (2)

(e) list FOUR items of information a SOPEP should contain. (4)

(a) International Authority (1 mark)

- The **International Maritime Organization (IMO)**.

(b) Appropriate Regulation (1 mark)

- **MARPOL 73/78 Annex I** – Regulations for the Prevention of Pollution by Oil.

(c) SOPEP abbreviation (1 mark)

- **Shipboard Oil Pollution Emergency Plan**.

(d) Purpose of SOPEP (3 marks)

- To provide **clear, step-by-step guidance** for the Master and crew in the event of an oil pollution incident.
- To ensure **prompt and effective response** to prevent, control, and minimise pollution.
- To comply with **MARPOL Annex I Regulation 37** (mandatory carriage of SOPEP).

(e) Four items of information SOPEP should contain (4 marks)

1. **Procedure for reporting an oil pollution incident** (who to notify, format of report).
2. **List of authorities/contacts** (flag State, coastal State, port authorities, response organisations).

3. **Action to be taken by crew** to control discharge/spillage (containment, transfer, clean-up measures).

4. **Description of shipboard equipment** and arrangements for pollution prevention (e.g. SOPEP locker contents).

(Other acceptable: ship's plan showing fuel/oil tanks and pipelines; procedures for coordinating with national/local authorities; communication equipment details.)

4. With reference to bunkering procedures:

(a) explain how the quantity of fuel delivered is checked allowing for temperature and density; (6)

(b) state the procedure to be followed, in the case of dispute about the quantity of fuel delivered. (4)

(a) Checking the quantity of fuel delivered allowing for temperature and density (6 marks)

1. **Before delivery**:
    - Dip, ullage, or use automatic gauging on supplier's and receiving ship's tanks.
    - Record temperature and density of fuel at measured tanks.
2. **Volume correction for temperature**:
    - Volume measured is corrected to **standard temperature (15 °C)** using the **Volume Correction Factor (VCF)** tables (API/ASTM tables).
    - Formula:

$$V_{15} = V_{observed} \times VCF$$

Convert to mass:

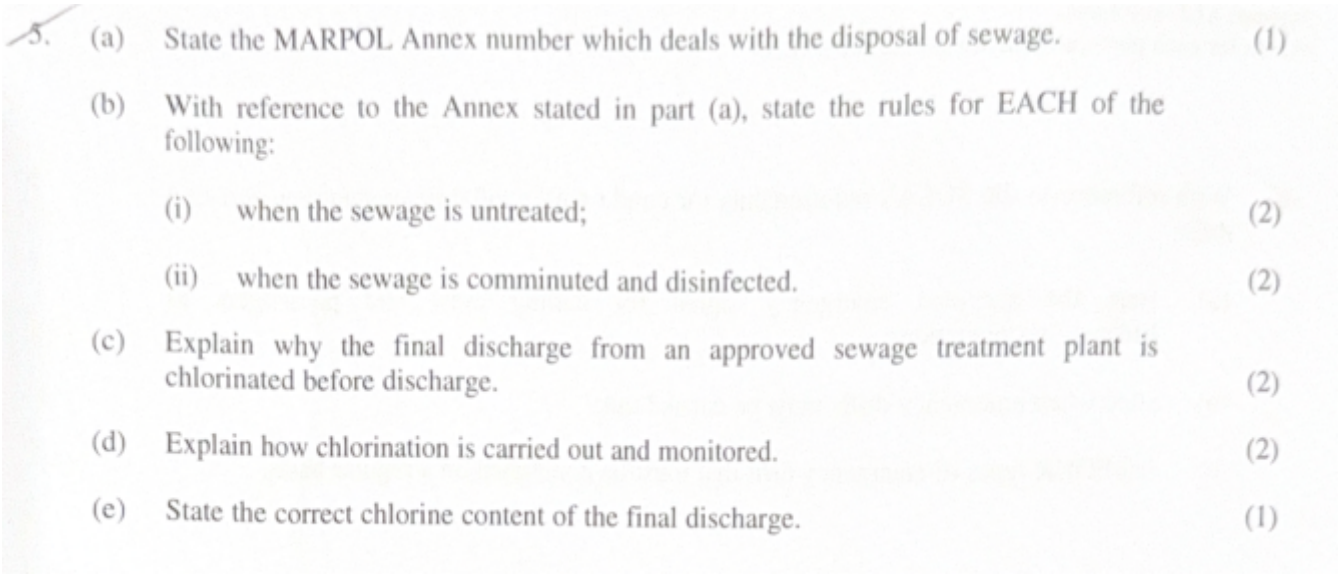
- Corrected volume is multiplied by density at 15 °C to obtain mass:

$$Mass = V_{15} \times \rho_{15}$$

1. **After delivery**:
    - Re-dip and calculate ship's receiving tanks.
    - Compare bunker receipt figures with ship's figures.

(b) Procedure in case of dispute about fuel quantity (4 marks)

1. **Record the details** of the dispute on the **Bunker Delivery Note (BDN)** and ship's log.
2. **Issue a Letter of Protest** to the supplier, signed by Master or Chief Engineer.
3. **Retain all evidence** — soundings, density/temperature records, calibration tables.
4. **Report to company/charterer and flag/port State if necessary**, pending resolution.



5. (a) State the MARPOL Annex number which deals with the disposal of sewage. (1)

(b) With reference to the Annex stated in part (a), state the rules for EACH of the following:

(i) when the sewage is untreated; (2)

(ii) when the sewage is comminuted and disinfected. (2)

(c) Explain why the final discharge from an approved sewage treatment plant is chlorinated before discharge. (2)

(d) Explain how chlorination is carried out and monitored. (2)

(e) State the correct chlorine content of the final discharge. (1)

Perfect 👍 — this is a **MARPOL Annex IV (Sewage)** exam-style question. Here's the structured answer you'd give in the exam:

(a) MARPOL Annex number (1 mark)

- **MARPOL Annex IV** – Regulations for the Prevention of Pollution by Sewage from Ships.

(b) Rules for sewage discharge under Annex IV (4 marks)

(i) Untreated sewage:

- Must **not** be discharged within **12 nautical miles** of the nearest land.
- When outside 12 nm, discharge must be at a **moderate rate**, while ship is proceeding en route at ≥ 4 knots.

(ii) Comminuted and disinfected sewage:

- May be discharged **beyond 3 nautical miles** from the nearest land.
- Must pass through an **approved sewage comminuting and disinfecting system** before discharge.

(c) Why chlorination is used before final discharge (2 marks)

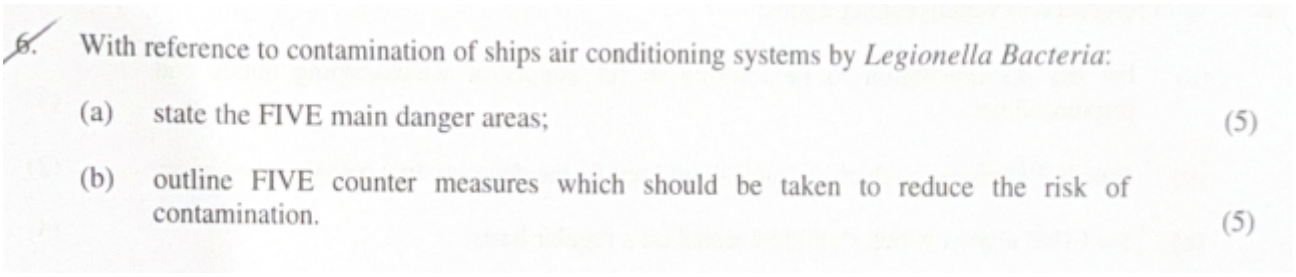
- To **kill harmful bacteria and pathogens** in the effluent.
- To ensure the discharge meets **public health and environmental safety standards**.
- Prevents contamination of **coastal waters, beaches, and shellfish beds**.

(d) How chlorination is carried out and monitored (3 marks)

- **Calcium hypochlorite (solid) or chlorine solution** is dosed into the sewage effluent before discharge.
- Dosing is controlled by a **chlorinator unit** (automatic or manual).
- Chlorine residual levels are checked regularly using a **test kit** (orthotolidine or DPD method) to ensure correct dosage and avoid overdosing.

(e) Correct chlorine content of final discharge (1 mark)

- The free residual chlorine in the discharge should be about **0.5 ppm (mg/L)**.
- (Some examiners accept 0.5–1.0 ppm as correct range.)



6. With reference to contamination of ships air conditioning systems by *Legionella Bacteria*:

(a) state the FIVE main danger areas; (5)

(b) outline FIVE counter measures which should be taken to reduce the risk of contamination. (5)

(a) Five main danger areas for Legionella contamination (5 marks)

1. **Cooling towers and evaporative condensers** (warm water, spray, aerosol formation).
2. **Evaporator drain pans / condensate trays** (stagnant water, sludge build-up).
3. **Humidifiers in the air handling system**.

4. **Domestic hot and cold water systems** (storage tanks, calorifiers, pipe dead-legs).

5. **Shower heads and spray outlets** (fine water droplets, ideal transmission route).

(b) Five countermeasures to reduce risk of contamination (5 marks)

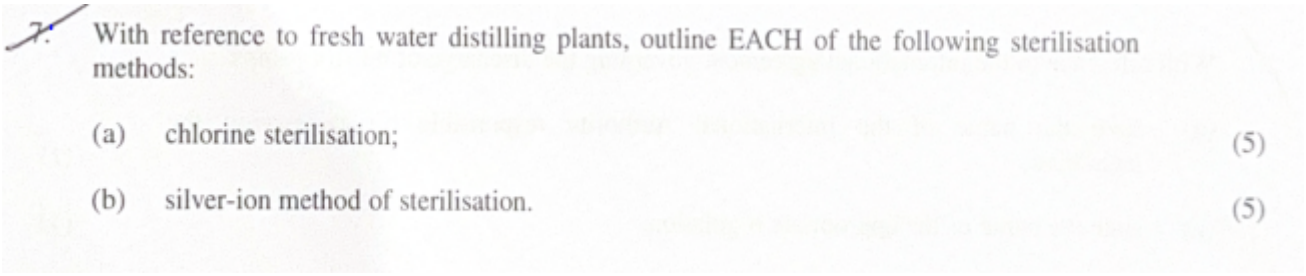
1. Maintain **correct water temperatures** (hot water ≥ 60 °C, cold water ≤ 20 °C).

2. Ensure **regular cleaning and disinfection** of cooling towers, evaporator trays, and pipework.

3. Avoid **stagnation** — remove "dead legs", ensure continuous water circulation.

4. Use **biocides/chlorination or UV sterilisation** for water treatment.

5. Carry out **routine inspection and sampling/testing** of systems for bacterial contamination.



7. With reference to fresh water distilling plants, outline EACH of the following sterilisation methods:

(a) chlorine sterilisation; (5)

(b) silver-ion method of sterilisation. (5)

(a)

Chlorine sterilisation (5 marks)

- **Process**: A controlled dose of chlorine (commonly as sodium hypochlorite solution or calcium hypochlorite powder) is added to the fresh water.

- **Action**: Chlorine is a strong oxidising agent → destroys bacteria, viruses, and organic contaminants.

- **Dosing**: Added in small, measured quantities to achieve the required residual free chlorine level (about **0.2–0.5 ppm** at point of use).

- **Monitoring**: Regular testing with chlorine residual test kits (e.g. DPD method).

- **Advantages**: Cheap, effective, provides residual protection in tanks and pipelines.

- **Disadvantage**: Can impart taste/odour, and overdosing is harmful.

(b) Silver-ion sterilisation (5 marks)

- **Process**: Fresh water is passed through a **silver-ion cartridge unit** which releases controlled amounts of silver ions.

- **Action**: Silver ions have strong **bactericidal properties** — they disrupt microbial cell membranes and DNA, preventing growth.
- **Application**: Commonly used in potable water storage and distribution systems onboard.
- **Monitoring**: Ion concentration levels checked periodically to ensure effectiveness (typically **0.05–0.08 mg/L**).
- **Advantages**: Provides long-lasting bacteriostatic effect, no taste/odour issues.
- **Disadvantage**: Higher cost than chlorine, less effective against high organic contamination.

✅ **Model Answer Recap**

- **Chlorine**: chemical sterilisation by oxidation; effective, cheap, residual; must be carefully dosed and monitored.
- **Silver-ion**: physical/chemical sterilisation using silver cartridges; bactericidal, tasteless, long-lasting; higher cost, needs monitoring.

8. Describe, with the aid of a sketch, an active tank stabilisation system. (10)

Active Tank Stabilisation System

Description

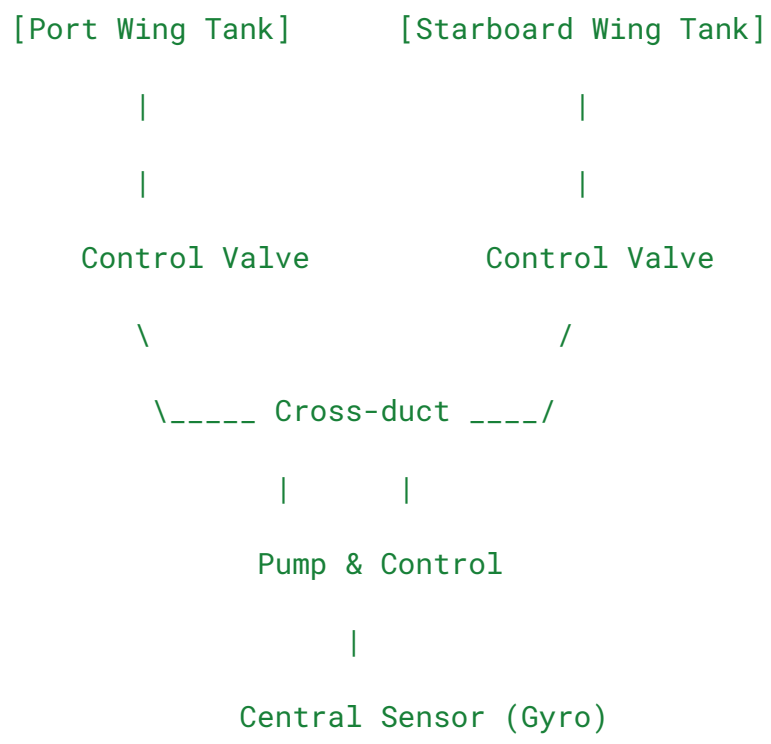
- An *active tank stabilisation system* reduces rolling of the vessel by transferring water between tanks located port and starboard.
- The system typically consists of:
  - **Two wing tanks** (port and starboard) high in the vessel.
  - A **cross-connecting duct** between the tanks.
  - A **centrally located air trunk or vent**.
  - **Pumps and control valves** operated by a stabiliser control system.
  - **Sensors/gyros** that detect roll angle and roll rate.
- **Operation:**
  - When the vessel rolls to one side, water is actively pumped or allowed to flow into the high-side tank.

  - This creates a **counter-heeling moment** opposing the roll.
  - Automatic control valves regulate flow according to signals from the gyro sensors.
  - The system is “active” because it uses **powered pumps and automatic feedback control** (unlike a passive U-tube or free-surface tank).

- **Advantages:**
  - More effective than passive systems, especially at low roll frequencies.
  - Can be controlled and adjusted for different sea states.
- **Disadvantages:**
  - Complex, requires pumps, controls, maintenance, and power.
  - Takes up space and weight high in the ship.

Sketch (exam-style)

(In the exam you’d draw a simple labelled block diagram – here’s how you’d set it out)



- Label: **Port/Starboard tanks**, **cross-duct**, **pump**, **valves**, **gyro sensor**, **control unit**.
- Show **water transfer** from one tank to the other depending on roll.

9. With reference to a machinery space carbon dioxide smothering system:

(a) state the regulation regarding the rate of flooding with respect to time; (4)

(b) state the precautions to be taken before activating the system. (6)

(a) Regulation regarding rate of flooding with respect to time (4 marks)

- According to **SOLAS Ch. II-2**, a fixed CO_2 fire-extinguishing system must be capable of:
    - Discharging **85% of the required volume of CO_2 gas within 2 minutes** into the protected machinery space.
    - The total quantity released must achieve a **minimum concentration of 30% by volume** of the space.
- This ensures that the fire is rapidly smothered before spreading.

(b) Precautions before activating the system (6 marks)

1. **Raise the alarm** – notify crew and bridge/master of intention to release CO_2.
2. **Ensure all personnel evacuated** from machinery space (CO_2 is lethal).
3. **Stop all machinery** in the space – main engine, auxiliaries, and generators if safe to do so.
4. **Shut down fuel oil supply** using quick-closing valves.
5. **Stop and close ventilation** (fans, dampers, skylights, funnel flaps) to make the space airtight.
6. **Close all access points and openings** to prevent CO_2 leakage.

(Other valid points: confirm escape routes are clear, maintain communications, check that release levers are operated in correct sequence – alarm, time delay, CO_2 release.)

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)

(a)

Flare (2 marks)

- ***Meaning**: The outward curvature of a ship's side above the waterline, particularly at the bow.*
- ***Purpose**: Deflects waves and spray away from the deck to improve seaworthiness and keep the forecastle dry.*

(b) Bulwark (2 marks)

- ***Meaning**: The vertical plating or solid rail fitted around the edge of the weather deck.*
- ***Purpose**: Provides protection for crew and equipment from seas washing overboard; acts as a safety barrier.*

(c) Coaming (2 marks)

- ***Meaning**: The raised vertical edge around hatchways, doors, and ventilators.*
- ***Purpose**: Prevents ingress of water into the compartments below when water is on deck.*

(d) Freeing port (2 marks)

- ***Meaning**: Openings in the bulwark fitted with hinged or flap shutters.*
- ***Purpose**: Allow water shipped on deck to drain back to sea quickly, improving ship's safety and stability.*

(e) Scupper (2 marks)

- ***Meaning**: Openings or pipes fitted at deck level that lead overboard.*
- ***Purpose**: Drain rainwater or wash water from decks into the sea, preventing accumulation.*

✅ Model Answer Recap:

- *Flare → curved bow sides → deflect waves.*
- *Bulwark → raised plating at deck edge → crew/cargo protection.*
- *Coaming → raised edge around openings → keeps water out.*

- *Freeing port → deck openings in bulwark → drains shipped water.*

- *Scupper → deck drains → remove rain/wash water.*