



High Voltage Safety Officer & Switchgear Operations (HV)

30 Practice Questions and Answers for STCW Exams

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Practice Set 1

Q1. What voltage level is defined as High Voltage (HV) under marine SOLAS and STCW regulations?

- A) AC voltage exceeding 1,000 Volts (1 kV) between conductors, or >600V to earth
- B) > 24V
- C) > 100,000V
- D) > 110V

Correct Answer: A (AC voltage exceeding 1,000 Volts (1 kV) between conductors, or >600V to earth)

Explanation: In marine electrical engineering, voltages exceeding 1,000V AC (e.g. 3.3 kV, 6.6 kV, 11 kV) are classified as High Voltage.

Q2. What is the primary hazard of working on High Voltage marine equipment compared to Low Voltage?

- A) Magnetic tool attraction
- B) Low sound
- C) Severe electric arc flash explosion, high-energy blast, and arcing across air gaps
- D) Slightly warm wires

Correct Answer: C (Severe electric arc flash explosion, high-energy blast, and arcing across air gaps)

Explanation: High Voltage can ionize air and jump across gaps, creating explosive arc flashes with temperatures exceeding 10,000 degreesC.

Q3. What safety document MUST be issued before performing maintenance on High Voltage switchgear?

- A) Verbal approval
- B) Deck log entry
- C) High Voltage Permit to Work (PTW) and Sanction to Test
- D) Hot Work Permit only

Correct Answer: C (High Voltage Permit to Work (PTW) and Sanction to Test)

Explanation: HV PTWs enforce formal isolation, proving dead, earthing, key interlocking, and authorized signatures.

Q4. What mandatory step must be taken immediately after opening an HV circuit breaker and isolator?

- A) Touch with bare hand
- B) Spray water
- C) Prove equipment dead using approved calibrated HV voltage detector, then apply safety earths
- D) Turn on generator

Correct Answer: C (Prove equipment dead using approved calibrated HV voltage detector, then apply safety earths)

Explanation: Testing with a certified HV voltage indicator ("prove dead") is mandatory before touching conductors or earthing.



- A) Water bath
- B) Compressed oxygen
- C) Vacuum (VCB) or Sulfur Hexafluoride gas (SF6)
- D) Mineral oil

Correct Answer: C (Vacuum (VCB) or Sulfur Hexafluoride gas (SF6))

Explanation: Vacuum Circuit Breakers (VCB) and SF6 gas breakers rapidly extinguish high-energy electrical arcs.

Q6. What safety equipment must be worn when racking in or out an HV circuit breaker truck?

- A) Leather apron
- B) T-shirt and glasses
- C) Cotton coveralls
- D) Arc flash protection suit (rated cal/cm2), arc flash visor/hood, HV insulating gloves, and ear protection

Correct Answer: D (Arc flash protection suit (rated cal/cm2), arc flash visor/hood, HV insulating gloves, and ear protection)

Explanation: Racking operations carry high risk of arc flash; full arc flash PPE suite is mandatory.

Q7. What is the purpose of earthing switches or portable earthing leads on isolated HV equipment?

- A) Discharge residual capacitive charge and short-circuit conductors to ground for safety
- B) Charge batteries
- C) Increase voltage
- D) Improve power factor

Correct Answer: A (Discharge residual capacitive charge and short-circuit conductors to ground for safety)

Explanation: Earthing guarantees that conductors remain at ground potential even if accidentally re-energized.

Q8. What key interlock system is used to enforce strict mechanical sequence during HV switching operations?

- A) Combination lock
- B) Card swipe
- C) Master padlock
- D) Castell Key Interlock System

Correct Answer: D (Castell Key Interlock System)

Explanation: Castell key interlocks physically prevent incorrect switching operations (e.g. earthing a live busbar).

Q9. What instrument is used to measure insulation resistance of High Voltage cables and machinery?

- A) Hydrometer
- B) High Voltage Megohmmeter (Megger - 2.5 kV or 5 kV DC test voltage)
- C) Oscilloscope
- D) Low voltage multimeter

Correct Answer: B (High Voltage Megohmmeter (Megger - 2.5 kV or 5 kV DC test voltage))

Explanation: HV insulation testing requires 2500V or 5000V DC test voltages to detect dielectric insulation weakness.



- A) Any deck rating
- B) Certified High Voltage Authorised Person (HVAP) / Chief Engineer / Senior Electrical Officer
- C) Chief Steward
- D) Port Watchman

Correct Answer: B (Certified High Voltage Authorised Person (HVAP) / Chief Engineer / Senior Electrical Officer)

Explanation: Only formally trained and certified Authorised Persons (HVAP) can issue HV permits and approve switching schedules.

Q11. Under STCW Code Table A-III/1-HV, what is the mandatory requirement regarding regulatory compliance and STCW code requirements during High Voltage Safety & Switchgear operations?

- A) Strict compliance with approved safety procedures and flag state regulations
- B) Verbal recommendation without documentation
- C) Optional adherence based on vessel size
- D) Applicable only during drydock operations

Correct Answer: A (Strict compliance with approved safety procedures and flag state regulations)

Explanation: STCW Code Table A-III/1-HV mandates strict compliance with approved safety protocols for High Voltage Safety & Switchgear.

Q12. What specific safety precaution must be observed when managing regulatory compliance and STCW code requirements for High Voltage Safety & Switchgear on board?

- A) Disabling automated safety alarms to save time
- B) Conducting a thorough risk assessment and briefing all involved personnel prior to starting work
- C) Delegating tasks exclusively to untrained crew members
- D) Proceeding without informing the officer on watch

Correct Answer: B (Conducting a thorough risk assessment and briefing all involved personnel prior to starting work)

Explanation: Risk assessments and pre-job briefings ensure all team members understand hazards during High Voltage Safety & Switchgear operations.

Q13. What is creepage distance on High Voltage insulators?

- A) Distance between bow and stern
- B) Cable length
- C) Busbar thickness
- D) Shortest distance along outer surface of insulating material between two conductive parts

Correct Answer: D (Shortest distance along outer surface of insulating material between two conductive parts)

Explanation: Insulators use corrugated fins to increase creepage surface distance, preventing surface flashover tracking.

Q14. What condition occurs when electrical stress breaks down insulating properties of air or solid insulation?

- A) Magnetic hysteresis
- B) Phase sync
- C) Dielectric breakdown / Flashover
- D) Resistance increase

Correct Answer: C (Dielectric breakdown / Flashover)

Explanation: Dielectric breakdown creates conductive plasma paths, resulting in violent short-circuit arc flashes.



- A) Step up to 100 kV
- B) Cool generators
- C) Step down High Voltage (e.g. 6.6 kV) to safe Low Voltage (e.g. 110V) for metering and relays
- D) Convert AC to DC

Correct Answer: C (Step down High Voltage (e.g. 6.6 kV) to safe Low Voltage (e.g. 110V) for metering and relays)

Explanation: VTs provide accurate low-voltage signals for instruments and protective relays without exposing meters to HV.

Q16. What is the function of a Current Transformer (CT) in HV switchgear?

- A) Store energy
- B) Step up to 10,000A
- C) Measure water temp
- D) Step down high primary currents (e.g. 1000A) to standard low secondary currents (1A or 5A) for relays

Correct Answer: D (Step down high primary currents (e.g. 1000A) to standard low secondary currents (1A or 5A) for relays)

Explanation: CTs isolate measurement circuits while converting heavy busbar currents into safe relay inputs.

Q17. What protective relay detects imbalances between incoming and outgoing currents in HV generator windings?

- A) Differential Protection Relay (87G)
- B) Under Voltage Relay (27)
- C) Reverse Power Relay (32)
- D) Over Frequency Relay (81)

Correct Answer: A (Differential Protection Relay (87G))

Explanation: Differential relays trip instantaneously if internal winding insulation fails, clearing internal generator faults.

Q18. What is the function of a Neutral Grounding Resistor (NGR) in marine HV electrical systems?

- A) Ground antenna
- B) Limit earth fault current to a safe value (e.g. 10A - 20A), preventing core damage during single phase-to-ground faults
- C) Increase fault current
- D) Heat engine room

Correct Answer: B (Limit earth fault current to a safe value (e.g. 10A - 20A), preventing core damage during single phase-to-ground faults)

Explanation: NGRs restrict phase-to-ground fault currents to manageable levels while maintaining system protection tripping.

Q19. What hazard is associated with opening the secondary circuit of an energized Current Transformer (CT)?

- A) Fuse blows
- B) Extremely high induced open-circuit voltage causing lethal electric shock and explosive CT failure
- C) CT cools down
- D) Voltage drops to zero

Correct Answer: B (Extremely high induced open-circuit voltage causing lethal electric shock and explosive CT failure)

Explanation: NEVER open-circuit a live CT secondary; high induced voltage spikes (> 1000V) cause fatal shocks.



Q20. What testing device is used to check insulation integrity of HV rubber gloves before use?

- A) Manual air inflation pump / glove tester to check for pinhole leaks, plus visual inspection
- B) Seawater dip
- C) Pliers stretch
- D) Flame check

Correct Answer: A (Manual air inflation pump / glove tester to check for pinhole leaks, plus visual inspection)

Explanation: Air testing inflates gloves to reveal microscopic punctures that could pass high voltage currents.

Q21. What color is standard for High Voltage warning hazard signs on marine switchboards?

- A) Green sign
- B) Yellow background with black skull/lightning symbol and 'DANGER - HIGH VOLTAGE' text
- C) Pink sign
- D) White sign with blue text

Correct Answer: B (Yellow background with black skull/lightning symbol and 'DANGER - HIGH VOLTAGE' text)

Explanation: High Voltage enclosures require high-visibility danger signs specifying operating voltage (e.g. DANGER 6.6 kV).

Q22. What protection is provided by a Reverse Power Relay (32) on a marine HV generator?

- A) Protects high temp
- B) Protects low oil
- C) Trips generator breaker if electrical power flows BACK into generator (motoring the prime mover)
- D) Protects low frequency

Correct Answer: C (Trips generator breaker if electrical power flows BACK into generator (motoring the prime mover))

Explanation: Reverse power relays prevent a failed engine from being driven as an electric motor by parallel generators.

Q23. Which international regulation specifies the minimum standard for regulatory compliance and STCW code requirements concerning High Voltage Safety & Switchgear?

- A) Port State Control advisory note only
- B) Tonnage Measurement Convention 1969
- C) International Load Line Certificate Annex 3
- D) STCW Code Section A-III/1-HV and relevant SOLAS/MARPOL conventions

Correct Answer: D (STCW Code Section A-III/1-HV and relevant SOLAS/MARPOL conventions)

Explanation: STCW Code Section A-III/1-HV sets international standards for training and operational competency in High Voltage Safety & Switchgear.

Q24. In the event of an emergency involving regulatory compliance and STCW code requirements during High Voltage Safety & Switchgear tasks, what immediate action is required?

- A) Attempt to resolve the incident silently without raising the alarm
- B) Evacuate the vessel immediately without informing the bridge
- C) Raise the alarm, notify the Officer of the Watch, and execute assigned muster list duties
- D) Wait until the end of the watch to log the issue

Correct Answer: C (Raise the alarm, notify the Officer of the Watch, and execute assigned muster list duties)

Explanation: Prompt alarm activation ensures emergency response teams can mobilize immediately.



- A) Turn on cabin lights
- B) Detect smoke
- C) Take photos
- D) Detect light flash via fiber-optic sensors and trip main breaker in milliseconds before pressure explosion develops

Correct Answer: D (Detect light flash via fiber-optic sensors and trip main breaker in milliseconds before pressure explosion develops)

Explanation: Optical arc sensors combined with overcurrent relays trip switchgear in under 2-5 milliseconds to minimize arc flash damage.

Q26. What is partial discharge (PD) in High Voltage electrical apparatus?

- A) Battery charge
- B) Load shedding
- C) Microscopic electrical sparks inside insulation voids that gradually erode dielectric strength
- D) Complete breaker trip

Correct Answer: C (Microscopic electrical sparks inside insulation voids that gradually erode dielectric strength)

Explanation: Partial discharge monitoring detects insulation degradation early, preventing catastrophic breakdown.

Q27. What insulation class is standard for marine HV electric motor windings (Class F or Class H)?

- A) Wood insulation
- B) Paper insulation
- C) Cotton thread
- D) Class F (155 degreesC max temp) or Class H (180 degreesC max temp) with vacuum pressure impregnation (VPI)

Correct Answer: D (Class F (155 degreesC max temp) or Class H (180 degreesC max temp) with vacuum pressure impregnation (VPI))

Explanation: Class F/H resin impregnation provides high dielectric strength and thermal resistance for marine motor windings.

Q28. What device is used to safely discharge stored electrical energy in large HV capacitor banks before maintenance?

- A) Water spray
- B) Screwdriver touch
- C) Fan
- D) Built-in discharge resistors and portable earthing/shorting probe

Correct Answer: D (Built-in discharge resistors and portable earthing/shorting probe)

Explanation: Capacitors retain lethal charges long after power is disconnected; earthing probes ensure complete discharge.

Q29. What safety distance (air clearance) must be maintained from exposed un-insulated 6.6 kV conductors?

- A) 1 mm
- B) Minimum safe clearance distance (~150 mm to 250 mm depending on standard, plus safety margin)
- C) Zero
- D) 10 meters

Correct Answer: B (Minimum safe clearance distance (~150 mm to 250 mm depending on standard, plus safety margin))

Explanation: High Voltage requires minimum physical air clearance gaps to prevent flashover ionization.



- A) Titration
- B) SF6 gas purity, dew point, and decomposition product analysis
- C) Salt water test
- D) Smoke test

Correct Answer: B (SF6 gas purity, dew point, and decomposition product analysis)

Explanation: SF6 gas purity and moisture content must be verified to ensure high dielectric breakdown strength.