Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	000007EK2.03 Knowledge of the interrelationships between a reactor trip and the following: Reactor trip status panel.	
Importance:		3.5	

Question: #1

Given:

- Unit 2 is at 60% Power.

The following sequence of events occurs:

- A Main Turbine trip occurs.
- OHA F-36, TURB TRIP & P-9, is illuminated.
- One of the Turbine Stop Valve Closed indicating lights on 2RP4 is flashing.

The flashing light on 2RP4 indicates that …

A. the valve has left its open seat, but has NOT fully closed.

B. SSPS Train “A” and SSPS Train “B” disagree as to the position of the valve.

C. EHC fluid pressure to the valve operator remains above 45 psig.

D. the solenoid-operated dump valve in the EHC fluid supply line has NOT de-energized.

Answer: B

Explanation / Justification

A. Incorrect. Plausible because the candidate may believe that the indicator lights start to flash as the valves stroke closed and then are fully lit only once they are full closed. Incorrect, because the indicating lights fully lit for turbine stop valves indicate both trains see the valve at ≤ 85% open, if information sent by Trains A and B differ, the control board status lamps will flash.
B. Correct. As stated in the Reactor Protection System lesson plan; “if information sent by Trains A and B differ, the control board status lamps will flash.”
C. Incorrect. Plausible because the candidate may believe that Auto Stop Oil > 45 psig (as 45 psig is the Tech Spec value) is maintaining the “interface valve” closed and therefore

preventing the stop valve from fully closing. However, the pressure is set to ≤ 50 psig and OHA-36 confirms that a turbine trip above P-9 has occurred.

D. Incorrect. Plausible because the candidate may believe that the 2RP4 indicator lights will flash went a turbine trip demand signal has been sent, but if the EHC fluid is still being maintained to the stop valves, then the indicating lights won't fully light. Incorrect because there are redundant trip solenoids, the 20-ET, 20-AST-1, and 20-AST-2. Also incorrect, because the OHA F-36 is a demand for a reactor trip, but confirms that a turbine trip above P-9 has taken place. It confirms that either 4/4 Turbine Stop Valves are ≤ 85% open or 2/3 Auto Stop Oil Pressures ≤ 50 psig.

Technical References:	NOS05RXPROT-12, 2-EOP-TRIP-1
Proposed References to be provided:	None
Learning Objective:	Objective 18
Question Source:	Bank – Salem Vision Database, modification made to stem only.
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.7 / 45.7

K/A Match: The K/A is matched because the candidate must recognize the immediate actions in EOP-TRIP-1, Reactor Trip or Safety Injection and that verification of turbine tripped per procedure is all 4 stop valves closed. The K/A requires knowledge of the interrelations between reactor trip status and the Reactor Trip Status panel (2RP4), the question tests that knowledge by ensuring they understand what condition causes a "flashing light" on 2RP4 and also what causes OHA F-36, Turbine Trip & P-9.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	000008AK2.02 Knowledge of the interrelationships between the Pressurizer Vapor Space Accident and the following: Sensors and detectors.	
Importance:		2.7	

Question: #2

Given:

- Unit 2 is in MODE 3.
- RCS Pressure is 2235 psig
- PZR Power Operated Relief Valve (PORV) 2PR1 is leaking.
- Pressurizer Relief Tank (PRT) pressure is 5 psig.
- PORV discharge temperature has stabilized at 230 °F.

Which ONE of the following will directly cause the indicated PORV discharge temperature to LOWER?

A. PRT rupture disk develops a leak.

B. PRT pressure is allowed to rise to 10 psig.

C. RCS pressure is reduced to 2000 psig.

D. PORV leakrate rises by 5 gpm.

Answer: A

Explanation / Justification

A. Correct. Leaking rupture disk lowers PRT pressure, constant enthalpy process to lower PRT pressure results in lower discharge temperature. (see constant enthalpy process on Mollier Diagram)
B. Incorrect. Plausible because candidate may believe that rising PRT pressure causes discharge temperature to lower. Incorrect because higher PRT pressure results in higher discharge temperature. (see constant enthalpy process on Mollier Diagram)
C. Incorrect. Plausible because candidate may believe that the lowering of RCS pressure will reduce the discharge temperature. (see constant enthalpy process on Mollier Diagram)

D. Incorrect. Plausible because candidate may believe that an increasing leak rate will lower discharge temperature. (see constant enthalpy process on Mollier Diagram)

Technical References:	NOS05PZRPRT-06
Proposed References to be provided:	None
Learning Objective:	Objective 15
Question Source:	Modified – Salem 2004 NRC Exam
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.7 / 45.7

K/A Match: The K/A is matched because the candidate must recognize the thermodynamic relationship between a vapor space leak (PORV) in the pressurizer and the corresponding discharge temperature (sensor) and PRT pressure (sensor). Also needs to recognize the effects of changes in RCS leakrate, pressure, and PRT pressure on the final discharge temperature indication (sensor).

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	000009EK1.02 Knowledge of the operational implications of the following concepts as they apply to the small break LOCA: Use of steam tables.	
Importance:		3.5	

Question: #3

Given:

- Unit 2 has experienced a Small Break LOCA with a Loss of Off-Site Power.
- A fault developed on the 2A 4KV Bus and the Bus is de-energized.
- All available ECCS Pumps are currently running.
- Containment Pressure is currently 4.3 psig.
- RCS Pressure is currently 1035 psig.
- The crew has transitioned to 2-EOP-LOCA-2, Post LOCA Cooldown and Depressurization.
- The crew is implementing "*Charging Pump Reduction*" major action of EOP-LOCA-2.
- Based on operability concerns with the Subcooling Margin Monitor, the CRS has directed the RO to determine subcooling requirements using Steam Tables.

Which ONE of the following choices is the **MAXIMUM** RCS (Core Exit) temperature that will allow stopping one Charging Pump in accordance with step 21 of 2-EOP-LOCA-2?

[REFERENCES PROVIDED]

A. 500°F

B. 415°F

C. 409°F

D. 407°F

Answer: C

Explanation / Justification

A. Incorrect. Plausible because candidate may believe two SI Pumps are running and choose a required subcooling of 135°F from Table C. Incorrect because only one SI Pump is running due to the fault on 2A 4Kv Bus.
B. Incorrect. Plausible because candidate may use the normal containment value and choose a required subcooling of 50°F from Table C. Incorrect because containment pressure is 4.3 psig and therefore adverse numbers apply.
C. Correct. Only one SI Pump is running, all RCPs are stopped, and Containment Adverse conditions exist per the question stem. The required subcooling is 141°F from Table C. Using steam tables, the T-Sat for 1035 psig (1049.7 psia) is 550.56°F. Therefore the max core exit temperature that will allow stopping one Charging Pump is 409°F.
D. Incorrect. Plausible because candidate may incorrectly use 1035 psig instead of 1049.7 psia. Using 1035 psia, the candidate incorrectly calculates T-Sat as 548.83°F.

Technical References:	2-EOP-LOCA-2, Sheet 2
Proposed References to be provided:	2-EOP-LOCA-2, Post LOCA Cooldown and Depressurization, Sheet 2 & Steam Tables.
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.8 / 41.10 / 45.3

K/A Match: The K/A is matched because the candidate must use both steam tables and 2-EOP-LOCA-2, Post LOCA Cooldown and Depressurization to determine what operational condition (max temperature) that will allow SI flow reduction (charging pump reduction) to stabilize the plant following a SBLOCA.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	000015AK3.01 Knowledge of the reasons for the following responses as they apply to the Reactor Coolant Pump Malfunctions (Loss of RC Flow): Potential damage from high winding and/or bearing temperatures.	
Importance:		2.5	

Question: #4

Which ONE of the following would be an indication of the potential for damage to a Reactor Coolant Pump and require tripping the Reactor Coolant Pump in accordance with S2.OP-AB.RCP-0001, Reactor Coolant Pump Abnormality, Attachment 2, Stopping Reactor Coolant Pumps.

A. Closure of CC-131, RCP Thermal Barrier Valve for > 2 minutes.

B. Reactor Coolant Pump Motor Bearing Temperature of 170°F.

C. Reactor Coolant Pump Motor Flange Vibration of 3 mils.

D. Reactor Coolant Pump Motor Winding Temperature of 320°F.

Answer: D

Explanation / Justification

A. Incorrect. Plausible because the candidate may remember the Continuous Action Statement that says if RCP Seal Injection Flow and RCP Thermal Barrier Component Cooling Water Flows are lost concurrently, then RCPs should be secured within 2 minutes to prevent RCP damage. Incorrect as RCP Seal Injection Flow is unaffected.
B. Incorrect. Plausible because the candidate may believe the Continuous Action Statement requires stopping RCPs if Motor Bearing Temperature is greater than 170°F. Incorrect in that the CAS temperature is greater than 175°F.
C. Incorrect. Plausible because the candidate may remember that motor flange vibration of greater than 3 mils is an entry condition for AB.RCP-0001. Incorrect as the CAS requiring the stopping of RCPs is motor flange vibration greater than 5 mils.
D. Correct. The Continuous Action Statement requiring stopping of RCPs is a Motor Winding temperature greater than 302°F.

Technical References:	S2.OP-AB.RCP-0001(Q), Reactor Coolant Pump Abnormality.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Modified – Vision Database & Salem 2004 NRC Exam.
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.5 / 41.10 / 45.6 / 45.13

K/A Match: The K/A is matched because the candidate is required to know the Continuous Action Statement (CAS) requirements that indicate potential RCP pump / motor damage if the CAS actions are not taken.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	000022AA1.07 Ability to operate and / or monitor the following as they apply to the Loss of Reactor Coolant Makeup: Excess letdown containment isolation valve switches and indicators.	
Importance:		2.8	

Question: #5

Given:

- Unit 2 is at 100% Power.
- Normal Letdown has been isolated due to a problem with the Letdown Pressure Control Valve, 2CV18.
- Excess Letdown has been established to the VCT in accordance with S2.OP-SO.CVC-0003, Excess Letdown Flow.

Immediately following a Safety Injection (SI) signal, Excess Letdown will ________________.

Note: 2CV278, Excess Letdown Isolation Valve
2CV131, Excess Letdown Isolation Valve
2CV284, Seal Return Isolation Valve
2CV116, Seal Return Isolation Valve

A. Continue to flow to the RCDT due to seal return relief valve CV115 cycling following the automatic closure of CV116 and CV284.

B. Continue to flow to the PRT due to seal return relief valve CV115 cycling following the automatic closure of CV278 and CV131.

C. Continue to flow to the RCDT due to seal return relief valve CV115 cycling following the automatic closure of CV278 and CV131.

D. Continue to flow to the PRT due to seal return relief valve CV115 cycling following the automatic closure of CV116 and CV284.

Answer: D

Explanation / Justification

A. Incorrect. Plausible because the candidate may believe that the CV115 relief valve relieves to the RCDT. Candidate may also remember that Excess Letdown flow can be directed via the 3-way valve, CV134 to the RCDT instead of the VCT. Incorrect as CV115 relieves to the PRT and normal excess letdown flow is directed to the VCT (see stem). CV-134 also fails to the VCT on loss of power and air.
B. Incorrect. The first part is correct as excess letdown flow will relieve to the PRT via the seal return relief valve CV115. Incorrect as the Excess Letdown Isolation valves do not receive any automatic closure signals. Incorrect as Seal Return Isolation Valves CV116 & 284 do receive automatic closure signals via Phase A Isolation.
C. Incorrect. The first part is plausible because the candidate may believe that the CV115 relief valve relieves to the RCDT. Candidate may also remember that Excess Letdown flow can be directed via the 3-way valve, CV134 to the RCDT instead of the VCT. Incorrect as CV115 relieves to the PRT and normal excess letdown flow is directed to the VCT (see stem). CV-134 also fails to the VCT on loss of power and air. The second part is plausible because the candidate may remember that although the excess letdown valves themselves do not receive a Phase A signal, when the control air (CA-330s) valves are isolated on Phase A, control air pressure will bleed off in containment and the CV278 & CV131 will fail closed isolating excess letdown flow. Incorrect as the flow would then be terminated and not flow through the CV115 relief valve. Incorrect as Seal Return Isolation Valves CV116 & 284 do receive automatic closure signals via Phase A Isolation. It will take considerable time for the control air pressure to bleed down and cause the valves to fail closed.
D. Correct. Normal Excess Letdown flow is directed to the VCT (see stem) via the CV134 3-way valve and following a Safety Injection signal, Seal Return Isolation valves CV116 & 284 will close causing both seal return and excess letdown flow to continue to flow to the PRT due to the cycling of relief valve CV115.

Technical References:	S2.OP-SO.CVC-0003(Q), Excess Letdown Flow
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.7 / 45.5 / 45.6

K/A Match: The K/A is matched because the candidate is required to know what happens to excess letdown flow during a containment isolation signal such as Phase A.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	000025AA2.04 Ability to determine and interpret the following as they apply to the Loss of Residual Heat Removal System: Location and isolability of leaks.	
Importance:		3.3	

Question: #6

Given:

- 21 RHR Pump is in service aligned for Shutdown Cooling.
- RCS Temperature is 325 °F.
- RCS Pressure is 300 psig and lowering.
- PZR Level is 10% and lowering rapidly.
- Containment Pressure is 0.1 psig.
- 2R41D, Plant Vent, radiation monitor is rising.

Which ONE of the following identifies the required procedure and action to mitigate this event?

A. Enter S2.OP-AB.RHR-0001, Loss of RHR, Isolate letdown and Start Safety Injection and Charging Pumps as required to Control Pressurizer Level between 5% and 50%.

B. Enter S2.OP-AB.RC-0001, Reactor Coolant System Leak, Isolate Letdown and Start one Charging or Safety Injection Pump to maintain Pressurizer Level between 11% and 50%.

C. Enter S2.OP-AB.LOCA-0001, Shutdown LOCA, Stop the operating RHR Pump aligned for Shutdown Cooling and Close 2RH1 and 2RH2 (RHR Common Suction).

D. Enter S2.OP-AB.RC-0001, Reactor Coolant System Leak, Stop the operating RHR Pump aligned for Shutdown Cooling and close 21SJ49 (RHR Discharge to Cold Legs).

Answer: C

Explanation / Justification

A. Incorrect. Plausible because the candidate may believe that AB.RHR-0001 is the appropriate procedure for an RCS leak outside of containment effecting RHR shutdown cooling. It is also plausible that isolating letdown sources will stop the leak and charging/safety injection will restore RCS inventory. Both of these are actions taken in AB-

RHR-0001 for a loss of inventory in Modes 5 or 6 affecting RHR. Incorrect because AB-RHR-0001 will direct you per a CAS to AB.LOCA-0001 if in Mode 4.

B. Incorrect. Plausible because AB.RC-0001 can be appropriately entered for any indication of an RCS leak, but incorrect because Unit is in Mode 4 and the procedure will direct you to AB.LOCA-0001. It is also plausible that isolating letdown sources will stop the leak and charging/safety injection will restore RCS inventory. Both of these are actions taken in AB.RC-0001.

C. Correct. The entry conditions for AB.LOCA-0001 are any uncontrolled reduction in Pressurizer Level in Mode 4. The first step of the procedure is to initiate Attachment 1, Continuous Action Summary and the CAS states if Pressurizer Level is <11%, then stop the operating RHR Pump aligned for Shutdown Cooling and Close 2RH1 and 2RH2.

D. Incorrect. Plausible because AB.RC-0001 can be appropriately entered for any indication of an RCS leak, but incorrect because Unit is in Mode 4 and the procedure will direct you to AB.LOCA-0001. Plausible because the candidate may believe that the loss of inventory is related to an intersystem LOCA on the discharge loops for 21 RHR Pump, isolating 21RH49 could stop that leakage. The action is taken in AB.RC-0001 after isolating RHR suction valves in Modes 1-3.

Technical References:	S2.OP-AB.LOCA-0001, Shutdown LOCA
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.10 / 43.5 / 45.13

K/A Match: The K/A is matched because the candidate is required to know that the leak is outside containment associated with RHR operations and understand how to isolate the leak IAW the appropriate procedure for the stated conditions. RO knowledge of abnormal procedure entry conditions and major flowpaths.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	000027AK3.03 Knowledge of the reasons for the following responses as they apply to the Pressurizer Pressure Control Malfunctions: Actions contained in EOP for PZR PCS malfunction.	
Importance:		3.7	

Question: #7

Given:

- Unit 2 is at 100% Power.
- 2PR1, Pressurizer PORV, fails opens while in Automatic and cannot be closed in Manual from the control console in accordance with S2.OP-AB.PZR-0001, Pressurizer Pressure Malfunction.

In accordance with S2.OP-AB.PZR-0001, which ONE of the following identifies the **NEXT** required action, and if pressure continues to lower, what subsequent action is taken and why?

A. **OPEN** the associated control power breaker. IF AT ANY TIME RCS pressure drops to 2000 psig and continues to drop, THEN: **TRIP** the Reactor. Manually tripping the reactor at 2000 psig and decreasing, to prevent an automatic trip from OTΔT.

B. **CLOSE** the associated block valve. IF AT ANY TIME RCS pressure drops to 2000 psig and continues to drop, THEN: **TRIP** the Reactor. Manually tripping the reactor at 2000 psig and decreasing, to prevent an automatic trip from OTΔT.

C. **CLOSE** the associated block valve. IF AT ANY TIME RCS pressure drops to 1900 psig and continues to drop, THEN: **TRIP** the Reactor. Manually tripping the reactor at 1900 psig and decreasing, to prevent an automatic trip from Low RCS Pressure.

D. **OPEN** the associated control power breaker. IF AT ANY TIME RCS pressure drops to 1900 psig and continues to drop, THEN: **TRIP** the Reactor. Manually tripping the reactor at 1900 psig and decreasing, to prevent an automatic trip from Low RCS Pressure.

Answer: B

Explanation / Justification

A. Incorrect. Plausible because the procedure does have the operator open the associated control power breaker, but only if the PORV Block Valve fails to close. The second part of the answer is correct as the CAS requires tripping the reactor if pressure drops to 2000 psig and continues to drop. The procedure bases states that simulator scenarios were run and based on a failed open PORV, the reactor tripped at 1950 psig on OTΔT. It then states that this is why the 2000 psig value was chosen.

B. Correct. The next required step per the procedure is to close the associated block valve. The second part of the answer is also correct as the CAS requires tripping the reactor if pressure drops to 2000 psig and continues to drop. The procedure bases states that simulator scenarios were run and based on a failed open PORV, the reactor tripped at 1950 psig on OTΔT. It then states that this is why the 2000 psig value was chosen.

C. Incorrect. The first part of the answer is correct as the next required step per the procedure is to close the associated block valve. The second part is plausible as 1900 psig is before the low pressure reactor trip setpoint of 1865 psig.

D. Incorrect. Plausible because the procedure does have the operator open the associated control power breaker, but only if the PORV Block Valve fails to close. The second part is plausible as 1900 psig is before the low pressure reactor trip setpoint of 1865 psig.

Technical References:	S2.OP-AB.PZR-0001(Q), Pressurizer Pressure Malfunction
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.5 / 41.10 / 45.6 / 45.13

K/A Match: The K/A is matched because the student is not only required to know what actions are required IAW S2.OP-AB.PZR-0001(Q), Pressurizer Pressure Malfunction, the student also needs to know the reason behind the action.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	000029EK3.12 Knowledge of the reasons for the following responses as they apply to ATWS: Action contained in EOP for ATWS.	
Importance:		4.4	

Question: #8

Given:

- Unit 2 was at 100% Power when a trip of both Steam Generator Feed Pumps occurred.

The following sequence of events occurs:

- ALL SG NR LO-LO level setpoints are reached, but the reactor failed to trip.
- ALL attempts to trip the reactor from the control room were unsuccessful and the reactor trip is NOT confirmed.
- The crew enters 2-EOP-TRIP-1, Reactor Trip or Safety Injection.

Complete the following statements:

In accordance with **2-EOP-TRIP-1**, which one of the following is the **NEXT** required action and why?

A. Trip the Turbine to maintain steam generator inventory.

B. Start 21 and 22 AFW Pumps to maintain steam generator inventory.

C. Initiate rod insertion to insert negative reactivity.

D. Initiate rapid boration to insert negative reactivity.

Answer: A

Explanation / Justification

A. Correct. Although the step is included in 2-EOP-TRIP-1 as an immediate action, the bases documents for 2-EOP-FRSM-1 states that; “The turbine is tripped to prevent an uncontrolled cooldown of the RCS due to steam flow that the turbine would require. For an ATWS event where a loss of normal feedwater has occurred, analyses have shown that a turbine trip is necessary (within 30 seconds) to maintain SG inventory." The first action in TRIP-1 if the reactor trip is not confirmed is to trip the turbine.

B. Incorrect. The first part of the answer is plausible because the first step of 2-EOP-FRSM-1 is to initiate auxiliary feedwater and the candidate may believe it is first in TRIP-1 as well. The second part of the answer regarding the bases is correct. Incorrect the turbine is tripped in TRIP-1 prior to transition to FRSM-1 for an ATWS condition.
C. Incorrect. The first part of the answer is plausible because the initiation of rod insertion is a step in TRIP-1 prior to transitioning to FRSM-1. Incorrect as the step is after tripping the turbine. The second part of the answer regarding the bases is correct.
D. Incorrect. The first part of the answer is plausible because if BIT flow has not been established FRSM-1 initiates rapid boration. The candidate may also remember that critical task completion for an ATWS includes rapid boration as a success path when being graded on an operating exam during an ATWS event. Incorrect as rapid boration is not initiated in TRIP-1 prior to transition to FRSM-1.

Technical References:	2-EOP-TRIP-1, 2-EOP-FRSM-1 and Bases.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.5 / 41.10 / 45.6 / 45.13

K/A Match: The K/A is matched because the student is not only required to know what actions are required IAW 2-EOP-TRIP-1 and 2-EOP-FRSM-1, the student also needs to know the reason behind the action.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	000040G2.4.46 Steam Line Rupture – Excessive Heat Transfer; Ability to verify that the alarms are consistent with the plant conditions.	
Importance:		4.2	

Question: #9

Given:

- A design bases Main Steam Line Break coincident with a Loss of Off-Site Power has occurred on Unit 2.

The PO reviewing the OHAs and Control Console Bezel Alarms recognizes and announces the following event relevant alarms:

- J-3, 2C 4KV VTL BUS DIFF PROT
- C-6, CNTMT PRESS HI-HI
- C-5, 21 CFCU WTRFLO TRBL
- BEZEL 1-2, 21 CFCU AIR FLOW LO

The PO verifies 21SW58 (21 CFCU Inlet) and 21SW72 (21 CFCU Outlet) service water valves are OPEN.

Which ONE of the following completes the statements below?

Containment cooling design bases configuration __(1)__ met. This is because ____(2)___.

A. (1) is
(2) 21, 23, 25 CFCUs and 21 Containment Spray Pump are operating.

B. (1) is NOT
(2) 23, 25 CFCUs and 22 Containment Spray Pump are operating.

C. (1) is NOT
(2) 22, 24 CFCUs and 21 Containment Spray Pump are operating.

D. (1) is
(2) 22, 24 CFCUs and both 21 & 22 Containment Spray Pumps are operating.

Answer: C

Explanation / Justification

A. Incorrect. Plausible because design bases requirements are met if three CFCUs and one Containment Spray Pump is running. Also plausible because the candidate may not recognize that OHA C-5 indicates a problem with 21 CFCU, specifically that the 21SW223 OUTLET FLOW CONTROL VALVE is closed. 21 SW223 being closed indicates the CFCU is not operable. Additionally 23 & 25 CFCUs are not powered due to OHA J-3.
B. Incorrect. Plausible because the candidate may believe that 23 & 25 CFCUs and 22 CS Pump are powered by the “B” Vital Bus. Plausible because the candidate will recognize that this combination is less than the design of 3 CFCUs and 1 CS Pump. Incorrect because these components are powered by the unavailable “C” Vital Bus.
C. Correct. Because of the failure of 21 CFCU (based on indications given, 21SW223 flow control valve closed, low air flow) and the loss of “C” Vital Bus, minimum containment cooling design requirements are not being met. Only 22 & 24 CFCUs (“B” Bus) and 21 CS Pump (“A” Bus) are available.
D. Incorrect. Plausible because the candidate may believe that 22 CS Pump is powered from the “B” Vital Bus and therefore recognize that two containment spray pumps running meets the minimum design requirements. Incorrect because 22 CS Pump is unavailable due to the loss of “C” Vital Bus (OHA J-3).

Technical References:	2-LOSC-1, 2-FRCE-1
Proposed References to be provided:	None.
Learning Objective:	NOS05CSSPRAY-06, ELO-2 and ELO-6 NOS05CONTMT-15, ELO-1 and ELO-4
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.10 / 45.3 / 45.12

K/A Match: The K/A is matched because the candidate needs to review a set of relevant alarms (OHA & BEZEL) during a design bases steam line break and then decide whether the required design mitigation components are available.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	000054AK1.02 Knowledge of the operational implication of the following concepts as they apply to Loss of Main Feedwater (MFW): Effects of feedwater introduction on dry S/G.	
Importance:		3.6	

Question: #10

Given:

- Unit 2 was at 100% Power when a Loss of all Main Feedwater occurred.
- Operators have not been able to initiate Auxiliary Feedwater (AFW) and have transitioned to 2-EOP-FRHS-1, Response to Loss of Secondary Heat Sink.
- Bleed and Feed has been initiated.
- Core Exit Temperatures (CETs) are now **LOWERING**.
- All SG Wide Range (WR) Levels are 7 % and stable.

Subsequently, feed flow capability has just been restored and the crew has returned to the major action step for "*SECONDARY HEAT SINK RESTORATION*".

Based on the above conditions and In accordance with 2-EOP-FRHS-1, complete the statement below concerning the limitation when restoring feed flow and why?

Feed one SG…

A. at maximum flowrate to prevent lifting a PZR Safety Relief Valve.

B. at maximum flowrate to prevent a severe challenge to the Core Cooling CFST.

C. between 1E04 and 5E04 lbm/hr to prevent thermal shocking SG tubes.

D. between 1E04 and 5E04 lbm/hr to prevent thermal shock of the reactor pressure vessel.

Answer: C

Explanation / Justification

A. Incorrect. Plausible because if core exit temperatures were still rising, the procedure requires feeding at desired rate. This is incorrect because the stem states that CETs are lowering. The second statement is plausible because the candidate may believe that if CETs are still rising and feed is not initiated at a maximum rate, RCS pressurization could result in a PZR Safety lifting.

B. Incorrect. Plausible because if core exit temperatures were still rising, the procedure requires feeding at desired rate. This is incorrect because the stem states that CETs are lowering. The second statement is plausible because the candidate may believe that if CETs are still rising and feed is not initiated at a maximum rate, a severe challenge to the Core Cooling CFST could occur.
C. Correct. The bases states the following; “If RCS temperatures are stable or decreasing when feedwater flow is restored the flow should be directed to one steam generator and the rate should be limited to the plant-specific equivalent of 25 - 100 gpm until wide range level is established. With stable or decreasing RCS temperatures, the feedwater flow rate is limited to minimize the potential impact of excessive thermal stresses since a direct measure of the steam generator temperature is not available. The remaining dry SGs may have their levels recovered at the direction of the plant engineering staff (TSC).”
D. Incorrect. Plausible because the first part is correct. Plausible as the candidate may believe that this action will result in preventing thermal shock to the reactor vessel by preventing excessive cooldown of the RCS. Incorrect as the specific step is protecting the steam generator.

Technical References:	2-EOP-FRHS-1 and BASES
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.8 / 41.10 / 45.3

K/A Match: The K/A is matched because the student is required to know feedwater flow restrictions are for a “dry” SG and what the operational implications (component concern) would be feeding a “dry” SG.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	000056AA1.03 Ability to determine and interpret the following as they apply to the Loss of Offsite Power: Adjustment of EDG load by selectively energizing PZR backup heaters.	
Importance:		3.2	

Question: #11

Given:

- Unit 2 was at 100% Power when a Loss of Off-Site Power occurred.
- Operators have transitioned to 2-EOP-TRIP-2, Reactor Trip Response.
- All Emergency Diesel Generators are loaded onto their respective 4KV Vital Buses.

The CRS has directed you to energize the 21 PZR Backup Heaters from the 2C Vital Bus in accordance with the station operating procedure.

A procedural caution states the following; "*Aligning pressurizer heaters to vital bus adds approximately 210 KW to bus load*".

The 2C diesel is currently loaded to the 2000 hour limit. In order to add the PZR heater load of 210 KW and NOT exceed the 2000 hour limit, the current 2C diesel loading must be adjusted to no greater than ______.

A. 2890 KW

B. 2650 KW

C. 2390 KW

D. 2540 KW

Answer: D

Explanation / Justification

A. Incorrect. Plausible if the candidate believes that the 2000 hour limit is 3100 Kw (actual 30 minute rating).
B. Incorrect. Plausible if the candidate believes that the 2000 hour limit is 2860 Kw (actual 2 hour rating).

C. Incorrect. Plausible if the candidate believes that the 2000 hour limit is 2600 Kw (actual Continuous rating).
D. Correct. The station operating procedure, S2.OP-SO.PZR-0010, Pressurizer Backup Heaters Power Supply Transfer, states; "Maximum diesel generator load is 2750 KW (2000 hr rating)".

Technical References:	2-EOP-TRIP-2 and BASES, S2.OP-SO.PZR-0010, NOS05TRP002-07, ELO 1
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.7 / 45.5 / 45.6

K/A Match: The K/A is matched because the student is required to know the EDG loading limits and given the PZR heater load they are showing the ability to "monitor" the EDG loading while selectively energizing PZR backup heaters. Procedural direction is from 2-EOP-TRIP-2, step 15.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	000057AA2.13 Ability to determine and interpret the following as they apply to the Loss of Vital Instrument Bus: VCT level and pressure indicators and recorders.	

Importance: 3.0

Question: #12

Given:

- Unit 2 was at 100% Power when a Loss of the 2A 115V Vital Instrument Bus occurred.
- The CRS has entered S2.OP-AB.115-0001, Loss of 2A Vital Instrument Bus.

The following Volume Control Tank (VCT) components and indications have been affected:

- LT-112, VCT Level - Loss of indication and alarms.
- PI-139, VCT Pressure - Loss of indication.
- The VCT makeup system will be unavailable for normal makeup.

The crew has restored normal letdown in accordance with the procedure and has selected 2CV35 to **MANUAL FLOW TO VCT.**

Complete the following statements:

The 2LT-114 VCT level can be monitored in the control room using the __(1)__. If VCT level continues to rise above 77%, over-pressurization protection of the VCT is provided by __(2)__.

A. (1) plant computer
(2) LT-114 automatically diverting the 2CV35 to the CVCS HUT
.

B. (1) plant computer
(2) 2CV241, VCT relief valve, relieving to the CVCS HUT.

C. (1) control console
(2) LT-114 automatically diverting the 2CV35 to the CVCS HUT.

D. (1) control console
(2) 2CV241, VCT relief valve, relieving to the CVCS HUT.

Answer: B

Explanation / Justification

A. Incorrect. The first part is correct, LT-114 is only available in the control room using the plant computer. The second part is plausible because the LT-114 controller is a separate Hagen Controller located in the instrument racks behind the control room and not on the control console. It could be believed that the LT-114 could still function in automatic control, even with the LT-112 controller in **MANUAL FLOW TO VCT** on the console. However, either controller in manual will override the auto function of the other, therefore the CV35 valve will not automatically divert to the CVCS HUT between 77 – 87% level.
B. Correct. LT-114 is only available in the control room using the plant computer. LT-114 is also located in Panel 216 in charging pump alley. The VCT is protected by a relief valve 2CV241 which is set to 75 psig and relieves to the CVCS HUT. The AUTO control of the LT-114 Hagen controller will not function in auto with the LT-112 controller in manual.
C. Incorrect. The first part is plausible because the candidate could believe that there is indication for VCT LT-114 Level on the control console. Incorrect as LT-114 is only available in the control room using the plant computer. LT-114 is also located in Panel 216 in charging pump alley. The second part is plausible because the LT-114 controller is a separate Hagen Controller located in the instrument racks behind the control room and not on the control console. It could be believed that the LT-114 could still function in automatic control, even with the LT-112 controller in **MANUAL FLOW TO VCT** on the console. However, either controller in manual will override the auto function of the other, therefore the CV35 valve will not automatically divert to the CVCS HUT between 77 – 87% level.
D. Incorrect. The first part is plausible because the candidate could believe that there is indication for VCT LT-114 Level on the control console. Incorrect as LT-114 is only available in the control room using the plant computer. LT-114 is also located in Panel 216 in charging pump alley. The second part is correct because the VCT is protected by a relief valve 2CV241 which is set to 75 psig and relieves to the CVCS HUT. The AUTO control of the LT-114 Hagen controller will not function in auto with the LT-112 controller in manual.

Technical References:	S2.OP-AB.115-0001(Q), Loss of 2A Vital Instrument Bus.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.7 / 45.13

K/A Match: The K/A is matched because the student is provided information from the Loss of Vital Instrument Bus abnormal procedure regarding VCT level and pressure indication loss and then must determine how VCT level and pressure could be monitored and controlled based on certain procedural steps already taken.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	000058AA2.03 Ability to determine and interpret the following as they apply to the Loss of DC Power: DC Loads lost, impact on ability to operate and monitor plant systems.	
Importance:		3.5	

Question: #13

Given:

- Unit 2 is at 100% Reactor Power

At time 16:00

- OHA B-2, "2A 125 VDC CNTRL BUS VOLT LO" actuates
- 2A Vital 125 VDC Bus voltage is reading 0 VDC on 2RP9

Considering **ONLY** the following equipment malfunctions below:

1. #1 SGFP Emergency Oil Pump loses power
2. Main Turbine Emergency Oil Pump loses power
3. 2A EDG is **NOT** available for start

Which ONE of the following completes the statement below?

With a confirmed 2A Vital 125 VDC Bus voltage of 0 VDC, Unit 2 will experience equipment malfunction(s) ______.

A. 3 **ONLY**

B. 2 **ONLY**

C. 1 and 2 **ONLY**

D. 2 and 3 **ONLY**

Answer: A

Explanation / Justification

A. Correct: When OHA B-2, “2A 125 VDC CNTRL BUS VOLT LO” actuates, the only affected malfunction is that 2A EDG is not available for start.

B. Incorrect: All of the equipment malfunctions can be caused by a loss of a portion of the DC Power System (250 VDC, 125 VDC or 28 VDC). Consequently, all the distractors are plausible.

C. Incorrect: All of the equipment malfunctions can be caused by a loss of a portion of the DC Power System (250 VDC, 125 VDC or 28 VDC). Consequently, all the distractors are plausible.

D. Incorrect: All of the equipment malfunctions can be caused by a loss of a portion of the DC Power System (250 VDC, 125 VDC or 28 VDC). Consequently, all the distractors are plausible.

Technical References:	S2.OP-AR.ZZ-0002, Alarm B-2.
Proposed References to be provided:	None.
Learning Objective:	NOS05DCELEC-09, ELO 14
Question Source:	Bank – Salem 2019 NRC Exam – Q59
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	43.5 / 45.13

K/A Match: K/A is matched because the candidate must be able to determine the DC Loads lost / impact on plant equipment following a Loss of 2A 125 VDC Bus.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	000062G2.2.40 Loss of Nuclear Service Water: Ability to apply Technical Specifications for a system.	
Importance:		3.4	

Question: #14

Given:

- Unit 2 is at 100% Power.
- 24 Service Water Pump is Cleared & Tagged for a silt inspection.
- 21, 25, and 26 Service Water Pumps are in service.
- 23 Service Water Pump is in AUTO.

The following OHA alarms are received:

- B-13, 21 SW HDR PRESS LO
- B-14, 22 SW HDR PRESS LO
- B-29, 21-23 SW PUMP SMP AREA LVL HI

Which Abnormal Operating Procedure will isolate the identified service water leak, and once the leak is isolated, what Technical Specification LCO is applicable?

A. S2.OP-AB.SW-0001, Loss of Service Water Header Pressure; enter Tech Spec 3.7.4 for one INOPERABLE SW loop.

B. S2.OP-AB.SW-0003, Service Water Bay Leak; enter Tech Spec 3.0.3 for two INOPERABLE SW loops.

C. S2.OP-AB.SW-0003, Service Water Bay Leak; enter Tech Spec 3.7.4 for one INOPERABLE SW loop.

D. S2.OP-AB.SW-0001, Loss of Service Water Header Pressure; enter Tech Spec 3.0.3 for two INOPERABLE SW loops.

Answer: B

Explanation / Justification

A. Incorrect. Plausible because S2.OP-AB.SW-0001(Q), Loss of Service Water Header Pressure may be the first procedure entered due to responding to OHAs B-13 & B-14, low service water header pressures. This procedure also provides an attachment for isolating various leaks, the candidate may believe the steps for isolating a SW Bay are included. However, the loss of service water header pressure procedure will immediately transition the crew to S2.OP-AB.SW-0003(Q), Service Water Bay Leak which is the correct procedure. The Tech Spec entry of 3.7.4 is plausible because the LCO requires 2 operable loops and only one SW Bay has been isolated. This is not correct because the initial conditions also state that #24 SW Pump is C/Ted for silt inspection.

B. Correct. S2.OP-AB.SW-0003(Q), Service Water Bay Leak is the correct mitigating procedure because the stem indicated OHA B-29, 21-23 SW PMP SMP AREA LVL HI was also alarming indicating a leaking #2 SW Bay and requiring isolation. Tech Spec 3.0.3 is applicable because S2.OP-SO.SW-0005(Q), Service Water System Operation, P&L 3.2 states; “When a Service Water Bay is removed from service in Modes 1-4, and the Service Water Pump fed from “B” bus in the OPERABLE Service Water Bay is unavailable (23 or 24 SWP), then L.C.O 3.0.3 is applicable.” It is also system knowledge that an OPERABLE SW Loop consists of two service water pumps powered from separate buses.
C. Incorrect. Plausible because the first part is correct and the Tech Spec entry of 3.7.4 is plausible because the LCO requires 2 operable loops and only one SW Bay has been isolated. This is not correct because the initial conditions also state that #24 SW Pump is C/Ted for silt inspection.
D. Incorrect. Plausible because the Tech Spec entry requirement is correct. Also plausible because S2.OP-AB.SW-0001(Q), Loss of Service Water Header Pressure may be the first procedure entered due to responding to OHAs B-13 & B-14, low service water header pressure. This procedure also provides an attachment for isolating various leaks, the candidate may believe the steps for isolating a SW Bay are included.

Technical References:	S2.OP-AB.SW-0001(Q), Loss of Service Water Header Pressure and Bases. S2.OP-AB.SW-0003(Q), Service Water Bay Leak and Bases. S2.OP-SO.SW-0005(Q), Service Water System Operation.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.10 / 45.3

K/A Match: The K/A is matched because the student is required to identify the proper mitigating abnormal procedure for a loss of service water (leak) and then apply Technical Specifications for the mitigated actions of the procedure (isolating #2 Bay) and the initial conditions (#24 SW Pump C/Ted).

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	000065AA1.04 Ability to operate and / or monitor the following as they apply to the Loss of Instrument Air: Emergency air compressor	
Importance:		3.5	

Question: #15

Given:

- Unit 2 is at 100% Power.
- The crew recognizes degrading Control Air Header pressures.
- The CRS enters S2.OP-AB.CA-0001, Loss of Control Air.
- 2A Control Air Header pressure is 93 psig.
- 2B Control Air Header pressure is 88 psig.

Note: ECAC = Emergency Control Air Compressor

In accordance with S2.OP-AB.CA-0001, what action is required, and if control air (CA) header pressure continues to **LOWER,** what subsequent action will be required?

A. Start #2 ECAC and if BOTH CA headers lowers to < 80 psig then Trip the Reactor.

B. Notify Unit 1 to start #1 ECAC and if EITHER CA headers lowers to < 80 psig then Trip the Reactor.

C. Start #2 ECAC and if EITHER CA headers lowers to < 80 psig then Trip the Reactor.

D. Notify Unit 1 to start #1 ECAC and if BOTH CA headers lowers to < 80 psig then Trip the Reactor.

Answer: D

Explanation / Justification

A. Incorrect. Plausible because the candidate may believe that #1 ECAC feeds the 2A header and that #2 ECAC feeds to 2B header. Incorrect because #2 ECAC senses CA header A and # 1 ECAC senses CA header B. 2A header is presently 93 psig and does not require starting per the abnormal procedure. The second part is correct IAW the CAS of S2.OP-AB.CA-0001(Q), Loss of Control Air.

B. Incorrect. Plausible because the first part is correct, S2.OP-AB.CA-0001(Q) states if 2B Control Air Header is ≤ 88 psig, then notify Unit 1 NCO to start #1 ECAC. The second part is plausible because the candidate may believe that the procedure CAS is performed if either header pressure lowers to < 80 psig.
C. Incorrect. The first part is plausible because the candidate may believe that #1 ECAC feeds the 2A header and that #2 ECAC feeds to 2B header. Incorrect because #2 ECAC senses CA header A and # 1 ECAC senses CA header B. 2A header is presently 93 psig and does not require starting per the abnormal procedure. The second part is plausible because the candidate may believe that the procedure CAS is performed if either header pressure lowers to < 80 psig.
D. Correct. S2.OP-AB.CA-0001(Q) states if 2B Control Air Header is ≤ 88 psig, then notify Unit 1 NCO to start #1 ECAC. The second part is correct IAW the CAS of S2.OP-AB.CA-0001(Q), Loss of Control Air.

Technical References:	S2.OP-AB.CA-0001(Q), Loss of Control Air and Bases.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Modified Bank - Salem 16-01 NRC Exam – Q61
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.7 / 45.5 / 45.6

K/A Match: The K/A is matched because the student is required to know actions contained in the Loss of Control Air Abnormal Procedure with respect to emergency air compressor use and what actions are required if they fail to maintain control air pressure.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	WE04EK2.1 Knowledge of the interrelations between the (LOCA Outside Containment) and the following: Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	
Importance:		3.5	

Question: #16

Given:

- Unit 2 has experienced a LOCA.
- RCS Pressure is 1300 psig.
- Total ECCS Injection Flow is 400 gpm.
- The CRS has transitioned from 2-EOP-TRIP-1, Reactor Trip or Safety Injection, to 2-EOP-LOCA-6, LOCA Outside Containment.

In accordance with 2-EOP-LOCA-6, what indication is specifically checked to ensure successful leak isolation and allow exit from the procedure?

A. RCS Pressure rising.

B. PZR Level rising.

C. Dynamic Range RVLIS Level rising.

D. RCS Subcooling > 0 °F.

Answer: A

Explanation / Justification

A. Correct. After performing individual flowpath isolations in 2-EOP-LOCA-6, LOCA Outside Containment, the question; “Is RCS Pressure Rising” is asked. The procedure basis states; “If the break is isolated in EOP steps …, a significant RCS pressure increase will occur due to the ECCS flow filling up the RCS with break flow stopped.”
B. Incorrect. Plausible because if break flow has been successfully terminated, then RCS inventory should increase resulting in rising PZR Level. Also plausible because a number of

EOPs check PZR Level when checking if SI can be terminated. Incorrect because LOCA-6 specifically asks if RCS Pressure is rising.

C. Incorrect. Plausible because if break flow has been successfully terminated, then RCS inventory should increase resulting in rising RVLIS Level. The procedure basis even states that if the RCS is saturated or a cooldown is in progress, RCS re-pressurization will proceed more slowly and other means of verifying break isolation should be checked like an increasing RVLIS trend. Incorrect because LOCA-6 specifically asks if RCS Pressure is rising. Also incorrect because dynamic range RVLIS would not be valid during a small break LOCA as the RCPs would have been stopped IAW CAS at < 1350 psig.

D. Incorrect. Plausible because if break flow has been successfully terminated, then RCS pressure should increase and subsequently RCS subcooling will rise as well. Again plausible because RCS subcooling > 0°F is used throughout the EOP network to check if SI can be terminated. Incorrect because LOCA-6 specifically asks if RCS Pressure is rising.

Technical References:	2EOP-LOCA-6, LOCA Outside Containment and Bases.
Proposed References to be provided:	None.
Learning Objective:	NOS05LOCA06-03, ELO 5.
Question Source:	Modified Bank - Salem Vision Database
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.7 / 45.7

K/A Match: The K/A is matched because the student is required to know what specific RCS indication (instrumentation) is checked when determining a successful leak isolation IAW LOCA-6.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	WE11EK1.2 Knowledge of the operational implications f the following concepts as they apply to the (Loss of Emergency Coolant Recirculation): Normal, abnormal and emergency operating procedures associated with (Loss of Emergency Coolant Recirculation).	
Importance:		3.6	

Question: #17

Given:

- Unit 2 has experienced a **design bases Large Break LOCA** coincident with a Loss of Off-Site Power.
- 2B Emergency Diesel Generator tripped.
- 21 RHR Pump tripped.
- The CRS has transitioned to 2-EOP-LOCA-5, Loss of Emergency Recirculation.

In accordance with 2-EOP-LOCA-5, which of the following mitigation strategies are applicable based on **CURRENT** plant conditions and will **NEED** to be implemented?

1. Run All CFCUs in High Speed.
2. Minimize SI Flow to minimum for adequate decay heat removal.
3. Depressurize the RCS to minimize RCS subcooling.
4. Make up to the RWST.

A. 1, 2, 3, and 4 Only.

B. 2, 3, and 4 Only.

C. 1 and 4 Only.

D. 2 and 4 Only.

Answer: D

Explanation / Justification

A. Incorrect. Plausible because they are all actions / mitigation strategies provided in 2-EOP-LOCA-5, Loss of Emergency Recirculation. Incorrect because of the failure of 2B EDG to start, 22 & 24 CFCUs were not available and a DBA LOCA has already resulted in the RCS being completely depressurized and RCS Subcooling would not exist.
B. Incorrect. Plausible because they are all actions / mitigation strategies provided in 2-EOP-LOCA-5, Loss of Emergency Recirculation. Incorrect because a DBA LOCA has already resulted in the RCS being completely depressurized and RCS Subcooling would not exist.
C. Incorrect. Plausible because they are all actions / mitigation strategies provided in 2-EOP-LOCA-5, Loss of Emergency Recirculation. Incorrect because of the failure of 2B EDG to start, 22 & 24 CFCUs were not available.
D. Correct. Because of the failure of 2B EDG to start, 22 & 24 CFCUs were not available and a DBA LOCA has already resulted in the RCS being completely depressurized and RCS Subcooling would not exist.

Technical References:	2EOP-LOCA-5, Loss of Emergency Recirculation and Bases.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.8 / 41.10 / 45.3

K/A Match: The K/A is matched because the student is required to know the major mitigation strategies provided in 2EOP-LOCA-5, Loss of Emergency Recirculation and which ones can be implemented based on plant conditions (operational implications).

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	1	
	K/A #	WE05EA2.1 Ability to determine and interpret the following as they apply to the (Loss of Secondary Heat Sink): Facility conditions and selection of appropriate procedures during abnormal and emergency operations.	
Importance:		3.4	

Question: #18

Given:

- Unit 2 has experienced a Reactor Trip from 100% Power.
- Safety Injection has immediately actuated on low RCS Pressure.
- ALL Auxiliary Feed Pumps have been lost and can't be recovered.
- The CRS has transitioned to 2-EOP-FRHS-1, Response to Loss of Secondary Heat Sink at step 20 of 2-EOP-TRIP-1, Reactor Trip or Safety Injection.

2-EOP-FRHS-1 Step 3 asks; "*IS RCS PRESSURE GREATER THAN ANY INTACT OR RUPTURED SG PRESSURE*?"

Which ONE of the following actions is required if the operator answers **NO** and why?

A. Check if RCS T-Hots are < 350 °F and Place RHR in Service. If RCS temperature is low enough to place the RHR System in service, then the RHR System is an alternate heat sink to the secondary system.

B. Return to Procedure in Effect. When the RCS depressurizes below the intact SG pressures, for larger LOCA break sizes, the secondary heat sink is not required and actions to restore secondary heat sink are not necessary.

C. Continue attempts to Restore Auxiliary Feed Water flow and if 3/4 SG WR Levels are less than 20% (25% Adverse), initiate Bleed and Feed. There is no decay heat removal through the Steam Generators and the RED Path requiring transition to 2-EOP-FRHS-1 is still valid.

D. Trip all RCPs and immediately transition to 2-EOP-LOCA-1, Loss of Reactor Coolant. To prevent further loss of reactor coolant through the LOCA, since a LOOP later in the event could cause a more severe loss of coolant or two-phase RCS flow.

Answer: B

Explanation / Justification

A. Incorrect. Plausible because FRHS-1, Step 3.1 places RHR in service if RCS T-Hots are < 350°F. Incorrect, because this step is only taken if the answer to Step 3 was a YES. Second part is the correct bases for Step 3.1, not Step 3.0.
B. Correct. FRHS-1, Step 3 directs a return to the procedure in effect if it is answered NO. In accordance with the Bases, before implementing actions to restore flow to the SGs, the operator should check if secondary heat sink is required. For larger LOCA break sizes, the RCS will depressurize below the intact SG pressures. The SGs no longer function as a heat sink and the core decay heat is removed by the RCS break flow. For this range of LOCA break sizes, the secondary heat sink is not required and actions to restore secondary heat sink are not necessary. For these cases, the operator returns to the procedure and step in effect.
C. Incorrect. Plausible because the key mitigation strategies of FRHS-1 are to continue to attempt to restore feed water flow to the SGs and if WR SG Levels in 3/4 SGs are < 20% level to immediately initiate Bleed and Feed. Incorrect because these strategies are not necessary if a large break LOCA has occurred and the break is the heat removal mechanism.
D. Incorrect. Plausible because LOCA-1 will be the ultimate procedure transition for a large break LOCA from TRIP-1. Also plausible because the second part describes the reasons for tripping the RCPs due to a SBLOCA. Based on this event, the RCPs would have likely been tripped already due to the TRIP-1 CAS. Incorrect because Step 3 will transition you back to procedure in effect (TRIP-1).

Technical References:	2EOP-FRHS-1, Response to Loss of Secondary Heat Sink and Bases.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Modified Bank – Salem 2008 NRC Exam, Q23
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.10 / 43.5 / 45.13

K/A Match: The K/A is matched because the student is required to know the major mitigation strategies and bases of FRHS-1 and recognize that a procedure transition back to the procedure in effect (proper procedure selection) is the correct path based on the plant conditions (LBLOCA) after entering FRHS-1, Response to Loss of Secondary Heat Sink.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	2	
	K/A #	APE03AK3.04 Knowledge of the reasons for the following responses as they apply to the Dropped Control Rod: Actions contained in EOP for dropped control rod.	
Importance:		3.8	

Question: #19

Given:

- Unit 2 reactor power was reduced to 74% Power.
- A dropped Control Bank D Group 1 rod is being recovered in accordance with S2.OP-AB.ROD-0002, Dropped Rod.

Shortly before the crew starts withdrawing the dropped rod, S2.OP-AB.ROD-0002 directs the crew to reset the control bank D group 1 step counter to zero.

Why does the affected group step counter need to be reset to zero?

A. This prevents OHA E-8 RIL LO and E-16 RIL LO-LO alarms from coming in during rod recovery.

B. This prevents a OHA E-40 ROD BANK URGENT FAILURE alarm from coming in during rod recovery.

C. This ensures that the step counter matches actual rod position and the rod is withdrawn to the proper height.

D. This ensures that the P/A converter will send the proper rod height data to the RIL circuitry.

Answer: C

Explanation / Justification

A. Incorrect. Since this is a control bank group 1 rod, the P/A converter will be reset to zero IAW AB.ROD-2. After the P/A converter is reset to zero, OHAs E-8 RIL LO and E-16 RIL LO-LO will annunciate.
B. Incorrect. OHA E-40 will annunciate following rod withdrawal due to a Power Cabinet Regulation failure for the affected bank with the lift coil disconnect switches in OFF position.
C. Correct. The group step counter is reset to zero IAW AB.ROD-2 to ensure that the

step counter matches actual rod position and that the recovered dropped rod position is at the proper height before the event.

D. Incorrect. Control bank D group 1 rods will need the P/A converter reset to zero IAW AB.ROD-2 which is performed locally at the RPI-2 cabinet. The group step counter does not input into the P/A converter. Input to the P/A converter is from the Group 1 Data Logging card. Resetting the P/A converter ensures bank overlap is maintained.

Technical References:	S2.OP-AB.ROD-0002(Q), Dropped Rod and Bases.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Modified Bank – Salem Vision Database
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.5 / 41.10 / 45.6 / 45.13

K/A Match: The K/A is matched because the student is required to know the reason behind actions (alarms received) during performance of the abnormal procedure for a dropped control rod recovery.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	2	
	K/A #	APE05AA1.04 Ability to operate and / or monitor the following as they apply to the Inoperable / Stuck Control Rod: Reactor and turbine power.	
Importance:		3.9	

Question: #20

Given:

- Unit 2 was initially at 100% Power.

Subsequently, the following sequence of events occurs:

- Automatic Turbine runback occurs due to an issue with the stator water cooling system.
- During the load reduction, the RO reports that two (2) Control Bank D rods have stopped moving at 215 steps.
- The CRS enters S2.OP-AB.ROD-0001, Immovable / Misaligned Control Rods.
- The RO has placed the Rod Bank Selector Switch in MANUAL.
- Control Bank D Group Demand counters are presently at 185 steps.
- The runback terminates with reactor power at 80 %.
- Tavg is being maintained within +/- 1.5 °F of program.

In accordance with S2.OP-AB.ROD-0001, and assuming the two control rods will not be restored to operable status, which ONE of the following describes a required action that the crew will take.

A. Place the Unit in Hot Shutdown.

B. Reduce power to < 50 % rated thermal power.

C. Place the Unit in Hot Standby.

D. Reduce power to < 75 % rated thermal power.

Answer: C

Explanation / Justification

A. Incorrect. Plausible because the candidate may believe that the procedure directs placing the unit in Hot Shutdown vice the actual directed Hot Standby.
B. Incorrect. Plausible because the procedure, S2.OP-AB.ROD-0001(Q), Immovable / Misaligned Control Rods, directs reviewing QPTR based on the misaligned rod/rods. If QPTR Technical Specification limits were exceeded, Tech Spec 3.2.4 requires reducing power to less than 50% if the QPTR is not returned to within limits after 24 hours. Incorrect as the procedure specifically directs placing the unit in Hot Standby if more than one rod is stuck / misaligned.
C. Correct. S2.OP-AB.ROD-0001(Q), Immovable / Misaligned Control Rods directs placing the unit in Hot Standby if more than one rod is stuck / misaligned.
D. Incorrect. Plausible because this is true if only one control rod was stuck / misaligned. Incorrect because the stem states two rods are misaligned.

Technical References:	S2.OP-AB.ROD-0001(Q), Immovable / Misaligned Control Rods and Bases.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.7 / 45.5 / 45.6

K/A Match: The K/A is matched because the student is required to know the major mitigation actions of the procedure, including the plant conditions (reactor / turbine power) required for mitigation.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	2	
	K/A #	APE24AK2.01 Knowledge of the interrelations between Emergency Boration and the following: Valves.	
Importance:		2.7	

Question: #21

Given:

- Following a Unit 2 Reactor Trip, the crew has transitioned to 2-EOP-TRIP-2, Reactor Trip Response.
- The crew is performing the Control Rod Insertion Step.
- Two Control Rods have failed to fully insert.
- 2CV175, RAPID BORATE STOP VALVE will **NOT** open.

Which of the following describes the valve manipulations required in accordance with 2-EOP-TRIP-2, Reactor Trip Response, to establish rapid boration.

A. OPEN RWST to CHARGING SUCTION VALVES 2SJ1 and 2SJ2, then CLOSE VCT to CHARGING SUCTION VALVES 2CV40 and 2CV41.

B. OPEN the BLENDER BYP VALVE 2CV174 locally, then OPEN the BA FLOW CONTROL TO BLENDER 2CV172.

C. OPEN BA FLOW CONTROL TO BLENDER 2CV172, then OPEN MAKE UP FROM BLENDER TO CHG PUMP SUCTION LINE 2CV185.

D. OPEN BA FLOW CONTROL TO BLENDER 2CV172, then OPEN MAKE UP FROM BLENDER TO VCT 2CV181.

Answer: A

Explanation / Justification

A. Correct. 2-EOP-TRIP-2, Reactor Trip Response directs the opening of the SJ1 & 2 to provide rapid boration flow from the RWST if the attempted opening of CV175 fails to establish rapid boration.
B. Incorrect. Plausible because the candidate may believe that the procedure directs initiation of rapid boration through the 2CV174 when flow through the 2CV175 fails. This alternate path is actually utilized in S2.OP-SO.CVC-0008(Q), Rapid Boration, but not directed in TRIP-2.

C. Incorrect. Plausible because the candidate may believe that the procedure directs initiation of rapid boration by utilizing the normal boration flowpath via the CV172 & CV185. This alternate path is actually utilized in S2.OP-SO.CVC-0008(Q), Rapid Boration, but not directed in TRIP-2.
D. Incorrect. Plausible because the candidate may believe that the procedure directs initiation of rapid boration through the blender and the VCT via the CV172 & CV181. The candidate may not remember which valve is the normal boration flow path, the CV-181 or CV-185. Incorrect as boration flow is never directed to the top of the VCT (spray nozzle). Also not directed in TRIP-2.

Technical References:	2-EOP-TRIP-2, Reactor Trip Response and Bases.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Modified – Salem Vision Database
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.7 / 45.7

K/A Match: The K/A is matched because the student is required to know which valves to operate to initiate Rapid Boration IAW 2-EOP-TRIP-2, Reactor Trip Response.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	2	
	K/A #	APE33AA2.09 Ability to determine and interpret the following as they apply to the Loss of Intermediate Range Nuclear Instrumentation: Conditions which allow bypass of an intermediate-range level trip switch.	
Importance:		3.4	

Question: #22

Given:

- Unit 2 is at 100% Power.
- The Intermediate Range (IR) Channel N35 has just failed high.
- The crew has entered S2.OP-AB.NIS-0001(Q), Nuclear Instrumentation System Malfunction.
- The PO is removing N35 from service in accordance with S2.OP-SO.RPS-0001(Q), Nuclear Instrumentation Channel Trip / Restoration and OHA E-29, SR & IR TRIP BYP, annunciates.

Which of the following identifies the cause of the alarm?

A. Control Power Fuses have been removed.

B. Instrument Power Fuses have been removed.

C. LEVEL TRIP switch has been placed in bypass.

D. POWER MISMATCH BYPASS switch has been placed in bypass.

Answer: C

Explanation / Justification

A. Incorrect. Plausible because the candidate may believe that SO.RPS-0001 removes the IR channel from service by removing the control power fuses. The procedure removes the control power fuses when removing a PR channel from service, but not for and IR channel.
B. Incorrect. Plausible because the candidate may believe that SO.RPS-0001 removes the IR channel from service by removing the instrument power fuses. Could remember that the procedure removes fuses for a power range channel and confuse power with instrument. Incorrect as the procedure does not remove instrument power fuses.

C. Correct. SO.RPS-0001 places the LEVEL TRIP switch in bypass and then verifies that OHA E-29 has illuminated/alarmed.
D. Incorrect. Plausible because the candidate may confuse the procedural steps for removing an intermediate range channel with that of a power range channel. He may remember the power range having a POWER MISMATCH BYPASS switch and believe that a similar one exists for removing intermediate range channels from service. Incorrect as there is no POWER MISMATCH BYPASS switch for IR Channels.

Technical References:	S2.OP-AB.NIS-0001(Q), Nuclear Instrumentation System Malfunction and Bases. S2.OP-SO.RPS-0001(Q), Nuclear Instrumentation Channel Trip / Restoration.
Proposed References to be provided:	None.
Learning Objective:	NOS05FISHERNI-00, ELO 9
Question Source:	Bank
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.10 / 43.5 / 45.13

K/A Match: The K/A is matched because the student is required to know under what conditions the level trip switch is taken to bypass (allowed) for IR Nuclear Instrumentation. The conditions include the proper removal from service IAW S2.OP-SO.RPS-0001(Q), Nuclear Instrumentation Channel Trip / Restoration as directed from S2.OP-AB.NIS-0001(Q), Nuclear Instrumentation System Malfunction.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	2	
	K/A #	APE61AK3.02 Knowledge of the reasons for the following responses as they apply to the Area Radiation Monitoring (ARM) System Alarms: Guidance contained in alarm response for ARM system.	
Importance:		3.4	

Question: #23

Which of the following interlocks are activated when Area Radiation Monitor 2R32A, Fuel Handling Crane fails to its' alarm setpoint?

A. ALL crane hoist operation is prevented, but the hoist may be lowered after pressing the BYP INT pushbutton.

B. FHB exhaust shifts to 22 HEPA plus Charcoal.

C. ALL Crane trolley operation is prevented.

D. ONLY Crane hoist-up operation is prevented

Answer: D

Explanation / Justification

A. Incorrect. Plausible because the candidate may believe that all crane hoist operation is prevented and that a BYP INT pushbutton exists to defeat the interlock. Incorrect as there is no bypass interlock pushbutton and the alarm only prevents upward motion of the hoist.
B. Incorrect. Plausible because the candidate may remember that two other area radiation monitors in the FHB (R5 & R9) do cause the FHB exhaust filter to swap to 22HEPA plus Charcoal. Incorrect as the R32A only affect the crane. Plausible that the candidate could feel the cause of an actual high alarm condition would cause R5 & R9 to alarm as well. Incorrect, the stem states the monitor has failed to its alarm setpoint.
C. Incorrect. Plausible because the candidate may believe that all crane trolley operation is prevented. Incorrect as only the crane hoist-up operation is affected.
D. Correct. Only crane hoist-up operation is prevented. Conservative operation would allow the assembly to be lowered back into the spent fuel location (increased water shielding).

Technical References:	S2.OP-AB.RAD-0001(Q), Abnormal Radiation and Bases. OHA Alarm Response A-6.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.5 / 41.10 / 43.6 / 45.13

K/A Match: The K/A is matched because the student is asked to determine IAW alarm response and abnormal procedures what actions / interlocks an area radiation monitor, R32A could be causing.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	2	
	K/A #	EPE74G2.1.19 Inadequate Core Cooling: Ability to use plant computers to evaluate system or component status.	
Importance:		3.9	

Question: #24

Given:

- Unit 2 has experienced a LOCA.
- The crew is implementing the Critical Function Status Trees.
- The RO has identified that the SPDS Overview Screen indicates a Red Path for Core Cooling.
- RCS Subcooling is < 0 °F.
- No RCPs are running.

Which ONE of the following RCS Parameters would validate a Core Cooling Red Path?

A. Three (3) hottest CETs reading 751 °F – 755 °F, with RVLIS Upper Range reading 38 %.

B. Five (5) hottest CETs reading 701 °F – 705 °F, with RVLIS Full Range reading 39 %.

C. Three (3) hottest CETs reading 1200 °F, with RVLIS Upper Range reading 44 %.

D. Five (5) hottest CETs reading 750 °F – 800 °F with RVLIS Full Range reading 43 %.

Answer: B

Explanation / Justification

A. Incorrect. Plausible because the first part is correct, five CETs are > 700°F. The candidate may believe that CETs need to be > 750°F as well. The second part is plausible as RVLIS Full Range reading ≤ 39% would be correct, however it says “Upper Range”. Incorrect, because the bases states that “the Upper Range is not applicable for use in accessing core cooling status since it only provides indication from the hot leg piping connection to the top of the reactor vessel.”
B. Correct. Five CETs are > 700°F and RVLIS Full Range is reading ≤ 39%.
C. Incorrect. Plausible because the candidate may believe that for inadequate core cooling, only three (3) CETs need to be ≥ 1200°F. Incorrect because five (5) CETs need to be > 1200°F. Also plausible because, although the stem says RCPs are out of service, the

candidate may remember that ≤ 44% RVLIS Dynamic Range results in a Purple Path of degraded core cooling being met. Upper Range is also incorrect, see choice "A" discussion.

D. Incorrect. Plausible because the first part is correct, five CETs are > 700°F. The candidate may believe that CETs need to be ≥ 750°F as well. The second part is plausible because Full Range Level is correct and the value of 43% is below the existing dynamic level of 44%. Incorrect because RVLIS Full Range Level needs to be ≤ 39% for a Red Path. This would be a Purple Path.

Technical References:	2-EOP-CFST-1, Critical Safety Function Status Trees and Bases. 2-EOP-FRCC-1, Response to Inadequate Core Cooling and Bases.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.10 / 45.12

K/A Match: The K/A is matched because the student is asked to determine what RCS indications would validate the SPDS Overview Computer Screen indication of a Red Core Cooling Status.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	2	
	K/A #	WE02G2.4.45 SI Termination: Ability to prioritize and interpret the significance of each annunciator or alarm.	
Importance:		4.1	

Question: #25

Given

- Unit 2 has experienced a Small Break LOCA.
- The CRS has transitioned to 2-EOP-TRIP-3, SI Termination.
- 21 Charging Pump has been stopped and a normal charging alignment has been established.
- 21 and 22 Safety Injection Pumps have been stopped.
- 21 and 22 RHR Pumps have been stopped.

Prior to attempting to establish normal letdown, a number of overhead annunciators alarm and or reflash. The RO reports the following indications and OHA annunciators:

- A-6, RMS HI RAD OR TRBL, due to 2R41D, Plant Vent Effluent
- A-41, AUX ALM SYS PRINTER, due to 23 and 24 RHR Sump Pump starts.
- C-34 22 RHR SUMP OVRFLO
- D-40, SUBCLG CH A MARGIN LO, due to subcooling at 9 °F
- D-48, SUBCLG CH B MARGIN LO, due to subcooling at 9 °F
- E-36 PZR HTR OFF LVL LO, due to Pressurizer Level off scale low and unable to be recovered.

What procedure will be used to mitigate this event?

A. 2-EOP-LOCA-6, LOCA Outside Containment.

B. 2-EOP-LOCA-5, Loss of Emergency Recirculation.

C. 2-EOP-LOCA-2, Post LOCA Cooldown and Depressurization.

D. 2-EOP-TRIP-3, SI Termination.

Answer: A

Explanation / Justification

A. Correct. Based on the alarm indications given, the candidate will recognize that the CAS; "PZR Level cannot be maintained greater than 11%" is not met. They will "Start ECCS Pumps as necessary and GO TO EOP-LOCA-1." However, other alarms indicate that there is a LOCA outside containment and EOP-LOCA-6 will be required to mitigate the event. A direct transition from TRIP-3 to LOCA-6 does not exist.
B. Incorrect. Plausible because the candidate may believe that because alarms indicate a LOCA outside containment, that both RHR trains are now unavailable, therefore requiring a transition to EOP-LOCA-5, Loss of Emergency Recirculation to mitigate the event. Incorrect as a transition to EOP-LOCA-6 is required to mitigate the leak outside containment.
C. Incorrect. Plausible because 2-EOP-TRIP-3, SI Termination, Steps 7 and 9 both direct transition to LOCA-2, Post LOCA Cooldown and Depressurization. Incorrect because the SI and RHR Pump steps are already completed, crew is to attempt letdown restoration next. The CAS is the applicable direction and subsequent transition from LOCA-1 to LOCA-6 for the indicated leak outside containment.
D. Incorrect. Plausible because the candidate may believe that although there are indications of a leak outside containment, subcooling at 9°F is adequate and that TRIP-3, SI Termination should continue. They may also believe that since the RHR pumps are stopped, the leak in RHR is insignificant and that TRIP-3 will provide adequate mitigation and core protection.

Technical References:	2-EOP-TRIP-3, SI Termination and Bases.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.10 / 43.5 / 45.3 / 45.12

K/A Match: The K/A is matched because the student is asked to determine what actions (prioritize & determine significance) to take based on a number of OHA alarms.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	2	
	K/A #	WE16EK2.1	
		Knowledge of the interrelations between the (High Containment Radiation) and the following: Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	
Importance:		3.0	

Question: #26

Given:

Unit 2 has experienced a LOCA.

At T+0:

- Containment Pressure has peaked at 10 psig.
- 2R44A, Containment High Range Monitor is reading 5E05 R/HR.
- 2R44B, Containment High Range Monitor is reading 7E05 R/HR.

At T+3 hours:

- Containment Pressure is currently reading 2.5 psig.
- 2R44A, Containment High Range Monitor is reading 2E04 R/HR.
- 2R44B, Containment High Range Monitor is reading 1E04 R/HR.

Complete the following statements concerning operation of the Subcooling Margin Monitor (SMM):

> At T+0 the SMM is operating in _____ Mode, and at T+3 hours the SMM will ______ reset to Normal Mode.

A. NORMAL; automatically

B. ADVERSE; automatically

C. NORMAL; require manual action to

D. ADVERSE; require manual action to

Answer: D

Explanation / Justification

A. Incorrect. Plausible because the candidate may believe that the High Radiation signal for Adverse Containment condition is > 1E06 R/HR (integrated dose number used in procedure) rather that > 1E05 R/HR and they may believe that both high radiation and high containment pressure are required for adverse conditions. They could also believe that containment high-high pressure of 15 psig is required for adverse conditions. The second part is plausible because when containment pressure lowers to < 3 psig, the SMM will reset due to a previous adverse containment signal. Incorrect as both radiation and containment pressure indicate adverse conditions (only one required) and the SMM does not automatically reset due to radiation levels lowering below adverse numbers.
B. Incorrect. The first part is true, containment radiation levels are adverse (> 1E05 R/HR) as well as containment pressure (> 4 psig). The second part is plausible because when containment pressure lowers to < 3 psig, the SMM will reset from to a previous adverse containment signal. Incorrect as both radiation and containment pressure indicate adverse conditions (only one required) and the SMM does not automatically reset due to radiation levels lowering below adverse numbers.
C. Incorrect. Plausible because the candidate may believe that the High Radiation signal for Adverse Containment condition is > 1E06 R/HR (integrated dose number used in procedure) rather that > 1E05 R/HR and they may believe that both high radiation and high containment pressure are required for adverse conditions. They could also believe that containment high-high pressure of 15 psig is required for adverse conditions. Incorrect as both radiation and containment pressure indicate adverse conditions (only one required). The second part is correct.
D. Correct. Containment conditions are ADVERSE due to R44A & B indications > 1E05 R/HR and Containment pressure > 4 psig. Although Containment pressure conditions have reset, the SMM does not automatically reset due to radiation levels lowering below adverse numbers.

Technical References:	2-EOP-CFST-1, Critical Safety Function Status Trees and Bases.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.7 / 45.7

K/A Match: The K/A is matched because the student is asked to determine the interrelationship between containment high radiation and its input to the Subcooling Margin Monitor (SMM) instrumentation.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	1	
	Group #	2	
	K/A #	WE03EK1.3 Knowledge of the operational implications of the following concepts as they apply to the (LOCA Cooldown and Depressurization): Annunciators and conditions indicating signals, and remedial actions associated with the (LOCA Cooldown and Depressurization).	
Importance:		3.5	

Question: #27

Given:

- Unit 2 has experienced a Small Break LOCA.
- An automatic Reactor Trip and SI have occurred.
- All RCPs have been stopped.
- The crew has transitioned to 2-EOP-LOCA-2, Post LOCA Cooldown and Depressurization.

In accordance with 2-EOP-LOCA-2, which ONE of the following operational indications describes how voiding can be identified in the RCS?

A. Rapidly rising Pressurizer Level.

B. Lowering Safety Injection Flow.

C. Rising RCS Pressure.

D. Rapidly lowering RCS Subcooling.

Answer: A

Explanation / Justification

A. Correct. Without RCPs running, the upper head remains relatively hot compared with the active regions of the RCS. Therefore steam formation during depressurization in the upper head will displace water into the Pressurizer, causing rapidly increasing Pressurizer level. (step 14 NOTE)
B. Incorrect. Plausible because the RCS pressure is lowering, and SI flow is expected to increase during depressurization of the RCS but lowering SI flow would indicate saturation conditions exist which would promote void growth.

C. Incorrect. Plausible because the RCS pressure is expected to be reduced during depressurization of the RCS, but increasing pressure would indicate saturation conditions exist to promote void growth.
D. Incorrect. Plausible because subcooling is expected to be reduced during depressurization of the RCS and would indicate saturation conditions exist to promote void growth.

Technical References:	2-EOP-LOCA-2, Post LOCA Cooldown and Depressurization and Bases.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Bank – 2012 Harris NRC Exam / 2019 BV2 NRC Exam
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.8 / 41.10 / 45.3

K/A Match: The K/A is matched because the student is asked to determine possible operational implications and indications that would exist while performing the major actions in 2-EOP-LOCA-2, Post LOCA Cooldown and Depressurization.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	003000A1.10 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the RCPS controls including: RCP standpipe levels	
Importance:		2.5	

Question: #28

Given:

- Unit 2 is at 100% Power.
- Control Console Bezel Alarm for 21 RCP "STANDPIPE LEVEL HI" annunciates.
- The RO reports 21 RCP Seal Leak-off Flow recorder indication has LOWERED.

The "STANDPIPE LEVEL HI" alarm is an indication of excessive leakage from the RCP _____.

A. #3 seal.

B. #2 seal.

C. #2 and #3 seals.

D. #1 seal.

Answer: B

Explanation / Justification

A. Incorrect. Plausible because the candidate may confuse the implications of a high standpipe alarm with a low standpipe alarm. A standpipe level low alarm is an indication of a number 3 seal problem.
B. Correct. Both a standpipe level high alarm and reduced #1 seal leak-off flow are indications of a #2 seal failure.
C. Incorrect. Plausible because the candidate may remember that reduced #1 seal leak-off flow is an indication of a #2 seal failure and then confuse the implications of a high standpipe alarm with a low standpipe alarm. A standpipe level low alarm is an indication of a number 3 seal problem.

D. Incorrect. Plausible because the candidate may believe that the high standpipe level can only be caused by increased leakage from the #1 seal and that the standpipe is the path of lowest resistance for the excessive flow.

Technical References:	S2.OP-AR.ZZ-0011(Q), Control Console 2CC1 and S2.OP-AB.RCP-0001(Q), Reactor Coolant Pump Abnormality.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Modified – Salem Vision Database
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.5 / 45.5

K/A Match: The K/A is matched because the candidate is required to be able to predict RCP seal failures based on changes in certain parameters such as standpipe level and seal leak-off flow.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	004000K2.03 Knowledge of bus power supplies to the following: Charging Pumps	
Importance:		3.3	

Question: #29

Given:

- Unit 2 is at 100% Power
- 2C Bus Differential Protection relay actuates and results in the 2C 4KV Bus de-energized.

Which ONE of the following lists the available Charging Pumps following the loss of the 2C 4KV Vital Bus?

A. 21 Charging and 23 Charging Pumps

B. 21 Charging Pump ONLY

C. 21 Charging and 22 Charging Pumps

D. 22 Charging Pump ONLY

Answer: A

Explanation / Justification

A. Correct: IAW S2.OP-AB.4KV-0003, 22 CV Pump is supplied from 2C 4KV bus and if 22 CV Pump was in service the operators would place either 21 or 23 CV Pump in service.
B. Incorrect: 21 CV Pump is available from 2B 4KV bus, but 23 CV Pump is also available from 2A 460V bus. Plausible since the operator may believe that 23 CV pump is also powered from 2C 4KV bus.
C. Incorrect: 21 CV Pump is powered from 2B 4KV bus, but 22 CV Pump is NOT available with loss of 2C 4KV Bus.
D. Incorrect: 22 CV Pump is NOT available from 2C 4KV bus, but 23 CV Pump is also available from 2A 460V.

Technical References:	S2.OP-AR.ZZ-0009(Q), Overhead Annunciators – Window J and NOS05CVCS00-17 lesson plan.
Proposed References to be provided:	None.
Learning Objective:	NOS05CVCS00-17, ELO 5.a
Question Source:	New
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.7

K/A Match: The K/A is matched because the candidate is required to know the power supplies for the CVCS Charging Pumps.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	004000G2.1.28 Knowledge of the purpose and function of major system components and controls.	
Importance:		4.1	

Question: #30

Given:

- A Unit 2 Pressurizer Safety Valve has failed open.
- A Reactor Trip and **Safety Injection (SI)** have automatically actuated.

The Reactor Operator is throttling closed on 2CV71, Seal Pressure Control Valve.

What is the effect on Charging Pump discharge pressure and charging flow to the RCS?

Charging Pump discharge pressure will...

A. rise and total Charging flow will remain constant.

B. rise and total Charging flow will lower.

C. remain constant and RCP Seal Injection flow will rise.

D. remain constant and Charging flow will remain constant.

Answer: D

Explanation / Justification

A. Incorrect. Plausible because during normal power alignment, throttling the CV-71 will result in a rise in charging discharge pressure and total charging flow will remain constant. Flow will increase to the RCP seals, while charging flow to the regenerative heat exchanger will lower. Incorrect because CV-68 & 69, Charging Header Isolation Valves go closed on an SI signal and are in series with the CV-71 flow path. The second part is correct, total charging flow will remain constant.
B. Incorrect. Plausible because during normal power alignment, throttling the CV-71 will result in a rise in charging discharge pressure. Additionally the candidate may confuse total charging flow will charging flow to the regenerative heat exchanger which will lower.

Incorrect because CV-68 & 69, Charging Header Isolation Valves go closed on an SI signal and are in series with the CV-71 flow path.

C. Incorrect. The first part is correct, charging discharge pressure will remain constant as the CV-68 & 69, Charging Header Isolation Valves go closed on an SI signal and are in series with the CV-71 flow path. The second part is plausible because during a normal power alignment, closing down on the CV-71 would increase seal injection flow.
D. Correct. CV-68 & 69, Charging Header Isolation Valves go closed on an SI signal and are in series with the CV-71 flow path, therefore no change to charging pump discharge pressure or flow occur.

Technical References:	NOS05CVCS00-17 lesson plan.
Proposed References to be provided:	None.
Learning Objective:	NOS05CVCS00-17, ELO 4.a
Question Source:	Bank – Salem Vision Database
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.7

K/A Match: The K/A is matched because the candidate is required to know the charging and seal injection flow paths, including following a safety injection signal. This is testing the purpose and function of CVCS components and controls (charging pumps & CV-71) following a safety injection.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	005000K6.03 Knowledge of the effect of a loss or malfunction on the following will have on the RHRS: RHR heat exchanger.	
Importance:		2.5	

Question: #31

Given:

- Unit 2 is in MODE 5.
- 21 RHR HX Loop is providing Shutdown Cooling with a cooldown rate of 20 °F/hr.
- 21RH18, RHR HX Flow Control Valve, is throttled at 40 % to maintain total flow at 2500 gpm.
- 2RH20, RHR HX Bypass Valve, is throttled at 30 % open.

Subsequently the following occurs:

- Foreign material dropped in the Refueling Cavity is introduced into the RHR system causing partial blockage on the 21 RHR HX tubes.
- Cooldown rate has lowered to 5 °F/hr.

Based on the above conditions, in order to maintain a 20 °F/hr cooldown rate, the operator will be required to _______. (Assume decay heat load remains constant)

A. Lower the demand on the 21RH18 and Lower the demand on the 2RH20.

B. Lower the demand on the 21RH18 and Raise the demand on the 2RH20.

C. Raise the demand on the 21RH18 and Raise the demand on the 2RH20.

D. Raise the demand on the 21RH18 and Lower the demand on the 2RH20.

Answer: D

Explanation / Justification

A. Incorrect. Plausible because the candidate may confuse system configuration and valve demand operation and believe that this will increase flow through the heat exchanger.

B. Incorrect. Plausible because the candidate may confuse system configuration and valve demand operation and believe that this will increase flow through the heat exchanger.
C. Incorrect. Plausible because the candidate may confuse system configuration and valve demand operation and believe that this will increase flow through the heat exchanger.
D. Correct. Raising the controller demand for the 21RHR18 will increase flow through the RHR HX and lowering the controller demand for the 2RH20 will decrease the RHR HX bypass flow.

Technical References:	S2.OP-SO.RHR-0001(Q), Initiating RHR.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Bank Modified – 2015 Beaver Valley RO #31
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.7 / 45.7

K/A Match: The K/A is matched because the candidate is required to know how to control RHR temperature and cooldown rate using the valve control stations on the control console following a malfunction of the RHR HX from debris.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	006000K5.04 Knowledge of the operational implications of the following concepts as they apply to ECCS: Brittle fracture, including causes and preventative actions.	
Importance:		2.9	

Question: #32

Given:

The Unit 2 crew has entered 2-EOP-FRTS-1, Response to Imminent Pressurized Thermal Shock.

The procedure directs various mitigating actions including termination of SI and the starting of an RCP. What are the basis for these two mitigating actions?

A. The soak required by EOP-FRTS-1 requires SI to be secured. Starting an RCP provides the ability to utilize normal spray to depressurize the RCS.

B. ECCS flow is a contributor to the RCS cooldown and can prevent subsequent reduction in RCS pressure. Starting an RCP provides mixing of cold ECCS and warm RCS.

C. ECCS flow is a contributor to the RCS cooldown and can prevent subsequent reduction in RCS pressure. Starting an RCP minimizes the temperature gradient across the S/G tube sheets.

D. The soak required by EOP-FRTS-1 requires SI to be secured. Starting an RCP is used to equalize boron concentration throughout the RCS to ensure proper shutdown margin as the RCS cools.

Answer: B

Explanation / Justification

A. Incorrect. Plausible because the candidate may believe that because no pressure changes are to be made during the soak that SI would be required to be terminated. Not correct as there are some SBLOCA conditions that SI flow cannot be terminated. Second part is true, but not relevant to the mitigation strategy in FRTS-1.
B. Correct. FRTS-1 bases states; “for an imminent PTS condition, ECCS flow may have contributed to the RCS cooldown or may prevent a subsequent reduction in RCS pressure.”

Additionally, the bases states; “in order to mix the cold incoming ECCS water and the warm reactor coolant water and thereby decrease the likelihood of a PTS condition, an RCP restart is attempted.”

C. Incorrect. Plausible because the first part is correct. Also plausible because the candidate may believe that thermal stresses across the S/G tube sheet are of an immediate concern and that starting the RCP would mitigate or lower the temperature gradient. Incorrect because it is not relevant to the mitigation strategy of FRTS-1.
D. Incorrect. Plausible because the candidate may believe that because no pressure changes are to be made during the soak that SI would be required to be terminated. Not correct as there are some SBLOCA conditions that SI flow cannot be terminated. Second part is plausible as forced flow can help equalize boron concentrations, but incorrect as it is not relevant to the mitigation strategy of FRTS-1.

Technical References:	2-EOP-FRTS-1, Response to Imminent Pressurized Thermal Shock Conditions and Bases.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Bank – Salem Vision Database
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.5 / 45.7

K/A Match: The K/A is matched because the candidate is required to know mitigating actions and the basis. This information shows an understanding of “preventative actions” involving the ECCS (SI termination) system to prevent brittle fracture.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	007000K3.01 Knowledge of the effect that a loss or malfunction of the PRTS will have on the following: Containment.	
Importance:		3.3	

Question: #33

Given:

- Unit 2 is at 100% Power.
- Containment pressure is 0 psig.
- Containment temperature is 99 °F.

Subsequently, the following sequence of events occurs:

- A load rejection results in a reactor trip.
- Following the trip, a Pressurizer Safety Valve opens, and does not completely reseat.
- The PRT rupture disk has relieved to the containment.
- Containment pressure is rising at 0.1 psig every 5 minutes.
- Containment temperature is rising at 1 °F every 5 minutes.

Assuming containment pressure and temperature trends remain constant, which ONE of the following Containment Technical Specification LCO(s), if any, will **NOT BE MET** ONE HOUR from now?

A. BOTH LCO 3.6.1.4, Containment Internal Pressure, and LCO 3.6.1.5, Containment Air Temperature will be exceeded.

B. ONLY LCO 3.6.1.4, Containment Internal Pressure, will be exceeded.

C. ONLY LCO 3.6.1.5, Containment Air Temperature, will be exceeded.

D. NEITHER LCO 3.6.1.4, Containment Internal Pressure, and LCO 3.6.1.5, Containment Air Temperature will be exceeded.

Answer: B

Explanation / Justification

A. Incorrect. Plausible because the containment pressure tech spec limit has been exceeded, (0+1.2 = 1.2 psig) greater than 0.3 psig. Additionally plausible if the candidate believes that the tech spec limit for air temperature is 110°F (99 + 12 = 111°F). Incorrect because the temperature limit is 120°F.
B. Correct. The containment pressure tech spec limit has been exceeded, (0+1.2 = 1.2 psig) greater than 0.3 psig. The containment temperature limit has not been exceeded after one hour, (99 + 12 = 111°F) less than 120°F.
C. Incorrect. Plausible because the candidate may believe that the containment pressure limit is 1.5 psig because the negative pressure limit is -1.5 psig (0 + 1.2 < 1.5). Also plausible if the candidate believes that the tech spec limit for air temperature is 110°F (99 + 12 = 111°F). Incorrect because the temperature limit is 120°F and the pressure limit is 0.3 psig.
D. Incorrect. Plausible because the containment temperature limit has not been exceeded after one hour, (99 + 12 = 111°F) less than 120°F. Candidate may also believe that the containment pressure limit is 1.5 psig because the negative pressure limit is -1.5 psig (0 + 1.2 < 1.5). Incorrect because the pressure limit is 0.3 psig.

Technical References:	S2.OP-SO.CBV-002(Q), Containment Pressure – Vacuum Relief System Operation and Technical Specifications 3.6.1.4 & 3.6.1.5.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Bank – Robinson 2016 NRC Exam – Q35
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.7 / 45.6

K/A Match: The K/A is matched because the candidate is required to calculate the pressure and temperature effects in containment following the rupture of the PRT rupture disk (loss of PRT).

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	008000K1.04 Knowledge of the physical connections and/or cause-effect relationships between CCWS and the following systems: RCS, in order to determine source(s) of RCS leakage into the CCWS.	

Importance: 3.3

Question: #34

Given:

- Unit 2 is at 100% Power.

The RO reports the following console alarms on 2CC1:

- CC HDR ACTIVITY HI.
- SURGE TANK LEVEL HI-LO.
- DISCHARGE FLOW LO.

The crew has entered S2.OP-AB.CC-0001, Component Cooling Abnormality. Based on just the above plant conditions, which ONE of the following is the source of leakage into the Component Cooling System?

A. RHR Heat Exchanger.

B. Letdown Heat Exchanger.

C. Thermal Barrier Heat Exchanger.

D. Seal Water Heat Exchanger.

Answer: C

Explanation / Justification

A. Incorrect. Plausible because the RHR Heat Exchanger is a high pressure in-leakage source to CCW when in service for RCS Cooldown. Incorrect as RHR is out of service at 100%.

B. Incorrect. Plausible because the Letdown Heat Exchanger is a high pressure in-leakage source. Incorrect, because the “Discharge Flow Lo” alarm is indicative of the automatic closure of 2CC131, RCP Thermal Barrier Valve.
C. Correct. A thermal barrier heat exchanger leak would result in high activity in the CCW System, a high CC Surge tank Level, and a subsequent automatic closure of the 2CC131, RCP Thermal Barrier Valve. The “Discharge Flow Lo” alarm is unique to the automatic response of the 2CC131 closure. The Discharge Flow Hi alarm would have occurred first, resulting in the isolation of the thermal barrier and then subsequent Discharge Flow Lo alarm. The Hi alarm was acknowledged and is therefore presently clear.
D. Incorrect. Plausible because the Seal Water Heat exchanger is cooled by component cooling and the candidate may believe it is a high pressure source. Incorrect as the seal water heat exchanger cools #1 seal leakoff and pressure has been reduced to less than CCW system pressure. Also incorrect as the “Discharge Flow Lo” alarm is indicative of the automatic closure of 2CC131, RCP Thermal Barrier Valve.

Technical References:	S2.OP-AB.CC-0001(Q), Component Cooling Abnormality and Bases. NOS05CCW000-11.
Proposed References to be provided:	None.
Learning Objective:	NOS05CCW000-11, ELO 8
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.2 to 41.9 / 45.7 to 45.9

K/A Match: The K/A is matched because the candidate is required to know system cause-effect relationships between the RCS and CCW (control console alarms) to determine what is the source of RCS leakage into the CCW system.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	008000K4.09 Knowledge of CCWS design feature(s) ad/or interlock(s) which provide for the following: The "standby" feature for the CCW pumps.	
Importance:		2.7	

Question: #35

Given:

- Unit 2 is at 100% power.
- 21 and 22 CCW Pumps are running.
- 23 CCW Pump is in AUTO.

Subsequently;

- The Unit experiences a valid Safety Injection actuation coincident with a Loss of Off-Site Power.

Which of the following describes the status of the CCW Pumps following successful SEC loading?

A. All CCW pumps are running, all CCW pumps are in Manual.

B. All CCW pumps are stopped, 23 CCW pump remains in AUTO.

C. All CCW pumps are stopped, all CCW pumps are in Manual.

D. All CCW pumps are running, 23 CCW pump remains in AUTO.

Answer: C

Explanation / Justification

A. Incorrect. Plausible because the candidate may confuse the MODE III SEC loading sequence with that of the MODE II loading sequence. Plausible because this would be correct for MODE II (Blackout), but incorrect as CCW pumps are not loaded in a MODE III (Blackout + Safety Injection). The second part is correct.

B. Incorrect. Plausible because the first part is correct, CCW pumps are not loaded during a Blackout + Safety Injection condition. The second part is plausible as this would be the case for a MODE I (Safety Injection) loading. Incorrect as MODES II, III, and VI cause a pump selected to AUTO to shift to Manual.

C. Correct. During a MODE III (Blackout + Safety Injection) SEC loading, CCW pumps are stripped and not restarted. CCW pumps are not loaded in MODE III loading. In MODE III, if a pump was selected for AUTO, it is transferred to Manual.

D. Incorrect. Plausible because the candidate may confuse the MODE III SEC loading sequence with that of the MODE II loading sequence. Plausible because this would be correct for MODE II (Blackout), but incorrect as CCW pumps are not loaded in a MODE III (Blackout + Safety Injection). The second part is plausible as this would be the case for a MODE I (Safety Injection) loading. Incorrect as MODES II, III, and VI cause a pump selected to AUTO to shift to Manual.

Technical References:	S2.OP-AR.ZZ-0011(Q), Component Cooling Water System Bezel 1-19 ARP. NOS05CCW000-11.
Proposed References to be provided:	None.
Learning Objective:	NOS05CCW000-11, ELO 9
Question Source:	Bank, Salem ILT 16-01 NRC Exam, Q7
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.7

K/A Match: The K/A is matched because the candidate is required to know CCW Pump status following various SEC MODE OPS, including the status of pumps selected to AUTO (standby).

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	010000A3.02 Ability to monitor automatic operation of the PZR PCS, including PZR pressure.	
Importance:		3.6	

Question: #36

Given:

- Unit 2 is in MODE 3.
- Pressurizer (PZR) Pressure is 2235 psig.
- RCS Temperature is 547 °F.
- PZR Pressure Channel I (2PT-455) is selected for Control.
- PZR Pressure Channel II (2PT-456) is selected for Alarm.

If PZR Pressure Channel I fails **LOW** and with NO operator action, PZR pressure will rise until ______.

A. PZR PORV 2PR1 opens.

B. BOTH PZR PORVs, 2PR1 and 2PR2 open.

C. BOTH PZR Spray Valves, 2PS1 and 2PS3 open.

D. PZR PORV 2PR2 opens.

Answer: D

Explanation / Justification

A. Incorrect. Plausible because the candidate may believe that Channels II & IV control 2PR1 and therefore it will open. Incorrect as Channel I failing low will block the AUTO operation of 2PR1.
B. Incorrect. Plausible because the candidate may believe that only a single channel is required to cause a PORV to open and therefore both would open. Incorrect as Channel I failing low will block the AUTO operation of 2PR1.
C. Incorrect. Plausible because the PZR Spray valves open in automatic prior to the PORV open setpoint and therefore would control pressure. Incorrect as the pressurizer spray valves will only function in AUTO via the controlling channel and it is failed low.

D. Correct. Channel I failing low will block the AUTO operation of 2PR1. Additionally, 2PR2 is controlled by channels II & IV and therefore will operate as pressure rises to the open setpoint.

Technical References:	NOS05PZRP&L-10, Pressurizer Pressure and Level Control
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Bank – Salem Vision Database
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.7 / 45.5

K/A Match: The K/A is matched because the candidate is required to know how pressurizer pressure will respond to a malfunction of a controlling pressure channel.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	012000K5.01 Knowledge of the operational implications of the following concepts as they apply to the RPS: DNB.	

Importance: 3.3

Question: #37

Which ONE of the following lists the correct operational plant parameters used as input to the OTΔT reactor protection setpoint calculation?

A. Tavg, Reactor Power, and ΔT only.

B. Tavg and ΔT only.

C. Tavg, Pressurizer Pressure, and ΔI only.

D. Tavg and Pressurizer Pressure only.

Answer: C

Explanation / Justification

A. Incorrect. Plausible because the candidate may believe that reactor power is an input to the OTΔT setpoint calculation to establish a rated or nominal ΔT value to be used in the calculation.
B. Incorrect. Plausible because the candidate may confuse the inputs for OPΔT with those for OTΔT. Candidate may believe that over-temperature only includes temperature inputs.
C. Correct. OTΔT is a DNB protection trip and uses Tavg, Pressure, and delta flux as input values.
D. Incorrect. Plausible because the candidate may confuse some of the inputs for OPΔT with those for OTΔT. Delta flux is set to zero for OPΔT, not OTΔT.

Technical References:	Safety Limits Section of Technical Specifications.
Proposed References to be provided:	None.
Learning Objective:	NOS05RCTEMP-08, ELO 6.a
Question Source:	Bank – Indian Point Vision Database
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.5 / 45.7

K/A Match: The K/A is matched because the candidate is required to know the operational inputs to the OTΔT protection trip. OTΔT being a protection trip for DNB.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	012000G2.4.31 Knowledge of annunciator alarms, indications, or response procedures.	

Importance: 4.2

Question: #38

Given:

- Unit 2 is at 100% Power
- Control Console Bezel Alarm "LOSS OF TRIPPING CAPABILITY" is received for Reactor Trip Breaker (RTB) "A"

Which ONE of the following describes the effect on Reactor Trip Breaker (RTB) "A" from this alarm condition?

A. RTB 'A' will NOT trip open on ANY Reactor Trip signals.

B. RTB 'A' will open when the Reactor Trip Breaker 'A' pushbutton on 2CC2 is depressed.

C. The UV trip coil will NOT be capable of opening RTB "A".

D. The shunt trip coil will NOT be capable of opening RTB 'A".

Answer: D

Explanation / Justification

A. Incorrect. Plausible because the candidate may believe that the alarm indicated both a loss of the UV coil and shunt coil tripping capability. The candidate may confuse how a UV Coil is actuated with how the shunt coil is actuated. Incorrect because the signal will de-energize the UV Coil.
B. Incorrect. Plausible because the candidate may believe that all manual trip capabilities are the same, believing that the 2CC2 pushbuttons send signals to both shunt & UV Coils. Incorrect because the 2CC2 pushbuttons ONLY energize the shunt trip coil which has no power to energize.
C. Incorrect. Plausible because the candidate may confuse how a UV Coil is actuated with how the shunt coil is actuated. Incorrect because there is no power to the shunt coil and the UV coil would de-energize.

D. Correct. The shunt trip coil is energized to trip. The alarm is indicating a loss of power to the shunt coil, preventing it from being energized to initiate a trip. Only reactor trip signals that de-energize the UV trip coil will open the RTB.

Technical References:	S2.OP-AR.ZZ-0012(Q), Control Console 2CC2, Bezel 4-17. Drawing 221051, Sheet 2, Reactor Protection System Reactor Trip Signals.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Bank – Salem 2010 NRC Exam, Q42
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.10 / 45.3

K/A Match: The K/A is matched because the candidate is required to know how annunciator alarms and indications effect the Reactor Protection System, in this case the tripping capability of the “A” RTB.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	013000K4.12 Knowledge of ESFAS design feature(s) and/or interlocks which provide the following: Safety injection block.	

Importance: 3.7

Question: #39

Given:

- Unit 2 is in MODE 3.
- The crew is implementing S2.OP-IO.ZZ-0006, Hot Standby to Cold Shutdown.
- The crew has commenced a cooldown and depressurization to Cold Shutdown to comply with a Technical Specification action requirement.
- RCS Temperature is 535°F
- RCS Pressure is 1890 psig
- All actions for current plant conditions have been completed in accordance with S2.OP-IO.ZZ-0006.

Multiple failures have just occurred resulting in rapid depressurization of **ALL** Steam Generators (SGs) **INSIDE** containment causing a Safety Injection actuation.

Which of the following ESFAS initiation signals and logic caused the Safety Injection actuation to occur?

A. Containment High Pressure - 2/3 Containment Pressure Channels

B. Pressurizer Pressure Low - 2/3 Pressurizer Pressure Channels

C. Pressurizer Pressure Low – 2/4 Pressurizer Pressure Channels

D. Containment High Pressure – 2/4 Containment Pressure Channels

Answer: A

Explanation / Justification

A. Correct. Although the High Steam Flow SI and the Low PZR Pressure SI have been blocked IAW IOP-6, the Containment High Pressure SI at 4 psig is not blocked and an Automatic Safety Injection will occur (4 S/Gs blowing down inside containment).

B. Incorrect. Plausible because the Low Pressurizer Pressure SI signal / logic is 2/3 channels less than 1765 psig and PZR pressure will lower to less than 1765 psig from the SGs blowing down in containment. Incorrect because both the High Steam Flow SI and the Low PZR Pressure SI have been blocked IAW IOP-6. Low Pressurizer PZR Pressure SI is blocked at < 1915 psig (P-11).
C. Incorrect. Plausible because the Low Pressurizer Pressure Reactor Trip is 2/4 channel logic and the candidate may confuse that logic for the SI signal/logic. Incorrect because both the High Steam Flow SI and the Low PZR Pressure SI have been blocked IAW IOP-6. Low Pressurizer PZR Pressure SI is blocked at < 1915 psig (P-11).
D. Incorrect. Plausible because the High-High Containment Pressure (Phase B / Containment Spray) signal logic is 2/4 channels. Incorrect as the Containment High Pressure SI signal /logic is 2/3 channels.

Technical References:	S2.OP-IO.ZZ-0006, Hot Standby to Cold Shutdown.
Proposed References to be provided:	None.
Learning Objective:	NOS05ESF000-02, Introduction to Engineering Safety Features and Design Criteria, ELO 21.
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.7

K/A Match: The K/A is matched because the candidate is required to know the ESFAS actuation signals / logic and which Safety Injection Signals can be blocked. The question tests the candidate's knowledge of available Automatic SI signals in MODE 3 that will mitigate multiple SG depressurizations inside containment.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	022000A1.01 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CCS controls including: Containment temperature.	
Importance:		3.6	

Question: #40

Given:

- Unit 2 is at 100 % Power.
- Four (4) CFCUs are in service in HIGH speed.
- Containment temperature is 95 °F.
- Containment pressure is 0.10 psig.

Consider the below conditions and its impact to Containment Fan Coil Unit performance during normal plant operation.

Which of the following conditions could result in a **RISE** in containment temperature?

1. Running CFCUs in LOW speed.
2. Starting additional Service Water Pumps.
3. Increase in service water temperature.
4. Erosion of the flow orifice upstream of the SW223.

A. 1 and 3 Only.

B. 2 and 4 Only.

C. 2, 3, and 4 Only.

D. 1, 2, 3, and 4.

Answer: A

Explanation / Justification

A. Correct. Running CFCUs in LOW speed will result in lower air flow (47,000 cfm low speed vs 110,000 cfm high speed) through the CFCUs and therefore reduce heat transfer across the cooling coils. Increase in SW temperature will result in a reduced heat transfer across the CFCU cooling coils.
B. Incorrect. Starting additional SW Pumps will increase the SW header pressure and cause an increase of SW flow across the orifice thereby increasing heat transfer across the cooling coils. Erosion on the flow orifice will result in increased SW flow and thereby increased heat transfer across the cooling coils.
C. Incorrect. Choices 2 and 4 are incorrect as stated above. Choice 3 is correct.
D. Incorrect. Choices 2 and 4 are incorrect as stated above. Choices 1 and 3 are correct as stated above.

Technical References:	NOS05CONTMT-15, Containment and Containment Support Systems. UFSAR Sections 6.2 and 15.4.
Proposed References to be provided:	None.
Learning Objective:	ELOs 3 & 4
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.5 / 45.5

K/A Match: The K/A is matched because the candidate is required to know how CFCU performance is affected by changes in fan speed operation, SW flow, and SW temperatures to ensure that containment pressure and temperature design limits are not exceeded. Maintaining limits with normal tech spec limits ensure that design limits are not exceeded. They are also required to know fundamentals of thermal hydraulics and flow orifice theory.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	026000K4.08 Knowledge of CSS design feature(s) and/or interlock(s) which provide for the following: Automatic swapover to containment sump suction for recirculation phase after LOCA (RWST low-low level alarm).	
Importance:		4.1	

Question: #41

Given:

- Unit 2 has experienced a Reactor Trip and Safety Injection due to a Large Break LOCA.
- RWST Level has lowered to less than 15.2 feet on 2/4 RWST Level Channels.

With NO operator action, which choice describes **AUTOMATIC** actions that will occur based on the above RWST Level?

A. 21 & 22 SJ44s, RHR Pump Sump Suction Valves OPEN.

B. 21 & 22 SJ113s, SI to Charging Pump Crossover Valves OPEN.

C. 21 & 22 RH4s, RHR Pump Suction Valves CLOSE.

D. 21 & 22 CS36s, RHR Discharge to Containment Spray Header OPEN.

Answer: B

Explanation / Justification

A. Incorrect. Plausible because the operator subsequently manually “arms” the SJ44s if sump level is > 62% and the valves will then automatically open.
B. Correct. Normal 100% Power ECCS Lineup would have both the SJ113 valves “armed” for semi-automatic switchover signal.
C. Incorrect. Plausible because the candidate may remember the Unit 1 valve interlock that requires the RH4 to be closed prior to opening the SJ44 and believe that these valves are already “armed”.
D. Incorrect. Plausible because the CS36 valve will get manually manipulated depending on the available RHR pump to ensure continued containment spray header flow. These valves are manipulated at LO-LO RWST Level however and also manually.

Technical References:	NOS05ECCS00-09, Emergency Core Cooling System.
Proposed References to be provided:	None.
Learning Objective:	ELO 9
Question Source:	Bank – Salem Vision Database
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.7

K/A Match: The K/A is matched because the candidate is required to know the actuation interlocks associated with Semi-Automatic Switchover (AUTO actions on Unit 2 for cold leg recirculation) at RWST Lo Level.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	026000G2.1.25 Containment Spray: Ability to interpret reference materials, such as graphs, curves, tables, etc.	
Importance:		3.9	

Question: #42

Given:

- Unit 2 has experienced a design bases Large Break LOCA.
- The 2A Vital Bus is de-energized due to a Differential Protection Fault on the bus.
- The 22 RHR Pump has tripped.

At T+0:
- The crew enters 2-EOP-LOCA-5, Loss of Emergency Recirculation
- RO reports RWST Level is 20 feet.

At T+6 minutes:
- The crew is performing Step 9 of EOP-LOCA-5 to determine the required number of Containment Spray Pumps using Table C.
- RO reports Containment pressure is 18 psig.

At T+6 minutes, determine the relative RWST Level and the number of Containment Spray Pumps required in accordance with EOP-LOCA-5, Table C?

[REFERENCES PROVIDED]

A. RWST Level is < 15.24 ft., 0 Containment Spray Pumps are required.

B. RWST Level is > 15.24 ft., 0 Containment Spray Pumps are required.

C. RWST Level is > 15.24 ft., 1 Containment Spray Pump is required.

D. RWST Level is < 15.24 ft., 1 Containment Spray Pump is required.

Answer: B

Explanation / Justification

A. Incorrect. Plausible because the operator may incorrectly determine how many ECCS & CS Pumps are operating and believe that after 6 minutes, RWST Level has decreased to less than 15.24'. If the candidate assumed the equivalent of "B" Bus loads were lost, then level would drop to 147,700 gallons in 6 minutes and therefore be below 15.24'. The second part is correct.
B. Correct. RWST level only lowers to 163,900 gallons (>16') after 6 minutes based on "A" Bus loads being lost. (Uses 1100 gpm for both charging pumps, 650 gpm or 1 SI pump, and 2600 gpm for 1 CS pump) 4350gpm x 6 minutes = 26,100 gallons. 20' in RWST = 190,000 gallons, therefore 190,000 - 26,100 = 163,900 gallons (>16'). Using Table C of LOCA-5, RWST Level > 15.24', 18 psig containment pressure, and 4 CFCUs operating, then zero (0) CS pumps are required.
C. Incorrect. The first part is correct. Plausible because the candidate may believe that "A" bus powers 2 CFCUs and therefore determine that 1 CS pump is required.
D. Incorrect. Plausible because the operator may incorrectly determine how many ECCS & CS Pumps are operating and believe that after 6 minutes, RWST Level has decreased to less than 15.24'. If the candidate assumed the equivalent of "B" Bus loads were lost, then level would drop to 147,700 gallons in 6 minutes and therefore be below 15.24'. The second part is plausible, if the candidate incorrectly interprets Table C and/or doesn't understand CFCU power supplies.

Technical References:	2-EOP-LOCA-5, Loss of Emergency Recirculation.
Proposed References to be provided:	**2-EOP-LOCA-5, Table C and U2 RWST Tank Curve.**
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.7

K/A Match: The K/A is matched because the candidate is required to interpret both the RWST Level graph and EOP-LOCA-5 Table C to determine the number of required containment spray pumps in the situation described in the stem.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	039000K1.02 Knowledge of the physical connections and/or cause-effect relationships between the MRSS and the following systems: Atmospheric relief dump valves.	
Importance:		3.3	

Question: #43

Given:

- Unit 2 is at 100% Power when the 21MS10, 21 SG Atmospheric Relief Valve, fails open.
- The operator is unable to close the valve using the control console valve controller.
- The crew enters S2.OP-AB.STM-0001, Excessive Steam Flow.

Complete the following statements:

1) The rated design flow through the 21MS10 is __(1)__ steam flow.
2) After performing the actions of the Continuous Action Statement of S2.OP-AB.STM-0001 to trip the reactor and initiate a Main Steam Line Isolation, a Safety Injection (SI) __(2)__ required.

A. (1) 2.5%; (2) is

B. (1) 10%; (2) is NOT

C. (1) 10%; (2) is

D. (1) 2.5%; (2) is NOT

Answer: A

Explanation / Justification

A. Correct. The design capacity of the MS-10 (SG Atmospheric Relief Valves) is 10% design rated steam flow total, therefore each valve is 2.5% rated steam flow. After tripping the reactor and initiating a Main Steam Line Isolation, the CAS of AB.STM-0001 asks if the steam leak is isolated. If the leak is not isolated (MS-10 failed open), then initiate a manual Safety Injection.

B. Incorrect. Plausible because the candidate may remember that Design capacity is 10% of rated steam line flow at plant no-load steam pressure (390,147 lb/hr at 1005 psig). However, this is incorrect because it is the design rating for all 4 SG atmospheric relief valves together. The second part is plausible if the candidate believes that the leak would be isolated by the Main Steam Isolation signal or thinks the transition is directly to EOP-TRIP-1.
C. Incorrect. Plausible because the candidate may remember that Design capacity is 10% of rated steam line flow at plant no-load steam pressure (390,147 lb/hr at 1005 psig). However, this is incorrect because it is the design rating for all 4 SG atmospheric relief valves together. The second part is correct.
D. Incorrect. The first part is correct. The second part is plausible if the candidate believes that the leak would be isolated by the Main Steam Isolation signal or thinks the transition is directly to EOP-TRIP-1.

Technical References:	S2.OP-AB.STM-0001, Excessive Steam Flow, NOS05MSTEAM-12 Lesson Plan.
Proposed References to be provided:	None
Learning Objective:	ELOs 4c, 15.b
Question Source:	New
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.2 to 41.9 / 45.7 / 45.8

K/A Match: The K/A is matched because the candidate is required to know the cause / effect of the failure of the 21MS10.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	059000K1.02 Knowledge of the physical connections and/or cause-effect relationships between the MFW and the following systems: AFW system.	
Importance:		3.4	

Question: #44

Given:

- Unit 2 is performing a Technical Specifications required shutdown in accordance with S2.OP-IO.ZZ-0004, Power Operation.
- 22 SGFP has been removed from service in accordance with S2.OP-SO.CN-0002, Steam Generator Feed Pump Operation.
- Reactor Power is now 24% and the 21 SGFP has just tripped.

With NO operator action, what will be the status of the Auxiliary Feed Pumps?

A. ONLY the MDAFW pumps start immediately upon the trip of 21SGFP.

B. ONLY the TDAFW pump starts immediately upon the trip of 21 SGFP.

C. The MDAFW pumps AND the TDAFW pump start immediately upon the trip of 21 SGFP.

D. The MDAFW pumps AND the TDAFW pump start when NR level in 1/4 SGs lowers to 14 %.

Answer: A

Explanation / Justification

A. Correct. A trip condition on both SGFPs generates an Automatic start of both the MDAFW pumps. S2.OP-SO.CN-0002(Q), Steam Generator Feed Pump Operation will ensure that the removed from service pump is in the tripped condition.
B. Incorrect. Plausible because the candidate may believe that the automatic start signal from the trip of both SGFPs only starts the TDAFW pump. This is incorrect, only the MDAFW pumps get a start signal from the trip of both SGFPs.
C. Incorrect. Plausible because the candidate may believe that the automatic start signal from the trip of both SGFPs also includes the TDAFW pump. This is incorrect, only the MDAFW pumps get a start signal from the trip of both SGFPs. .

D. Incorrect. Plausible because the candidate may believe that the removed from service 22 SGFP is not tripped and that all AFW pumps will start on the SG low-low level signal. Incorrect as S2.OP-SO.CN-0002(Q), Steam Generator Feed Pump Operation will ensure that the removed from service pump is in the tripped condition. Also incorrect because the TDAFW pump does not start until 2/4 SGs reach 14%.

Technical References:	Logic Drawing 221064 (AFW pump starts).
Proposed References to be provided:	None
Learning Objective:	N/A
Question Source:	Bank, Salem 2015 NRC Exam
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.2 to 41.9 / 45.7 / 45.8

K/A Match: The K/A is matched because the candidate is required to know the cause-effect of the tripping of both SGFPs (MFW system) on the AFW system (auto MDAFW pump starts).

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	059000A2.12	
		Ability to (a) predict the impacts of the following malfunctions or operations on the MFW; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Failure of feed water regulating valves.	
Importance:		3.1	

Question: #45

Given:

- Unit 2 is at 100% Reactor Power.
- A complete loss of ALL Station Air has occurred.
- The crew has entered S2.OP-AB.CA-0001, Loss of Control Air.
- BOTH Control Air Header Pressures are 95 psig and LOWERING.

What is the expected impact, if any, to the Main Feedwater Regulating Valves (21-24BF19) and what action will the crew take, if control air pressure continues to lower, in accordance with S2.OP-AB.CA-0001?

A. No impact to the 21-24BF19s since redundant air panel will swap to Unit 1 control air; the procedural action will be to ensure the #2 ECAC has automatically started.

B. The 21-24BF19s will start to close at 85 psig control air header pressure; procedural action will be to monitor BF19s and trip the reactor if both control air header pressure drops to less than 85 psig.

C. The 21-24BF19s will start to close at 80 psig control air header pressure; procedural action will be to monitor BF19s and trip the reactor if both control air header pressure drops to less than 80 psig.

D. No impact to the 21-24BF19s since #2 ECAC supplies backup control air, the procedural action will be to ensure the #1 ECAC has automatically started and monitor BF19s.

Answer: C

Explanation / Justification

A. Incorrect. Plausible because the BF19s do receive air from Unit 1 via redundant (Lunkenheimer) air panels. Incorrect because there is no Unit 1 CA since total loss of all SA compressors and if all station air is lost, a check valve will prevent the either units ECAC from supplying the BF19s control air header.
B. Incorrect. Plausible because the BF19 will begin to close as control air pressure decreases and 85 psig is a familiar set point as it is the pressure that results in the ECAC starting. Incorrect as the procedural action is based on 80 psig.
C. Correct. In accordance with the AB.CA-0001 bases, the BF19s will start to close at 80 psig control air header pressure. Procedural direction via CASs will be to monitor BF19s for closure and inability to control SG level or less than 80 psig control air header pressure and then trip the reactor.
D. Incorrect. Plausible because AB.CA-1 does notify Unit 1 to start the #1 ECAC if the 2B CA header is 88 psig. Incorrect because either units ECAC does not supply CA to the BF19s due to a check valve isolating the turbine building headers.

Technical References:	S2.OP-AB.CA-0001(Q), Loss of Control Air and Bases.
Proposed References to be provided:	None
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.5 / 43.5 / 45.3 / 45.13

K/A Match: The K/A is matched because the candidate is required to know the effects of a loss of control air (loss of all station air) malfunction on the BF19s and then knowledge of what procedural mitigating actions to take.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	061000A3.03 Ability to monitor automatic operation of the AFW, including: AFW S/G level control on automatic start.	
Importance:		3.9	

Question: #46

Given:

- Unit 2 is at 100% Reactor Power.
- The Unit experiences a Reactor Trip coincident with a **Loss of Off-Site Power**.
- 21 AFW Pump PRESSURE OVERRIDE console bezel is illuminated and the associated AF21's remain closed.

With **NO** operator action, which ONE of the following indications will exist regarding SG level control?

A. AFW flow indication reading 0 gpm for 21 and 22 SGs.

B. AFW flow indication reading 0 gpm for 23 and 24 SGs.

C. 21 and 22 SG levels rising SLOWER than 23 and 24 SG levels.

D. 23 and 24 SG levels rising SLOWER than 21 and 22 SG levels.

Answer: D

Explanation / Justification

A. Incorrect. Plausible because 21 AFW Pump's runout protection is preventing the pumps AF21 valves from opening (they remain closed due to < 1085 psig discharge pressure) and the candidate may believe that 21AFW Pump feeds the 21 and 22 SGs. Incorrect because 21 AFW Pump feeds the 23 and 24 SGs and the 23 AFW Pump will also be running and feeding all 4 SGs. A 23 AFW Pump start will typically be demanded on a trip from 100% power, but will certainly be running due to the loss of off-site power (4KV Group Bus Undervoltage).
B. Incorrect. Plausible because 21 AFW Pump's runout protection is preventing the pumps AF21 valves from opening (they remain closed due to < 1085 psig discharge pressure) and the 21 AFW Pump feeds 23 and 24 SGs. Incorrect because the 23 AFW Pump will also be

running and feeding all 4 SGs. A 23 AFW Pump start will typically be demanded on a trip from 100% power, but will certainly be running due to the loss of off-site power (4KV Group Bus Undervoltage).

C. Incorrect. Plausible because 21 AFW Pump's runout protection is preventing the pumps AF21 valves from opening (they remain closed due to < 1085 psig discharge pressure) and the candidate may believe that 21AFW Pump feeds the 21 and 22 SGs. Also plausible because the 23 AFW Pump will also be running and feeding all 4 SGs. Incorrect because 21 AFW Pump feeds the 23 and 24 SGs.
D. Correct. 21 AFW Pump's runout protection is preventing the pumps AF21 valves from opening (they remain closed due to < 1085 psig discharge pressure) and the 21AFW Pump feeds the 23 and 24 SGs combined with the fact that the 23 AFW Pump will also be running and feeding all 4 SGs. Therefore 23 and 24 SG levels will be rising slower due to less AFW flow.

Technical References:	NOS05AFW000-15, Auxiliary Feedwater System
Proposed References to be provided:	None
Learning Objective:	ELOs 6 & 9
Question Source:	Modified, Salem 2014 NRC Exam, Q56
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.7 / 45.5

K/A Match: The K/A is matched because the candidate is required to know the automatic operation of the AFW System, including the pressure override interlocks that will effect SG level control during an automatic start of the AFW pumps.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	062000K1.02 Knowledge of the physical connections and/or cause-effect relationships between the ac distribution system and the following systems: EDG.	
Importance:		4.1	

Question 47

Given:

- Unit 2 is responding to a valid Safety Injection (SI) signal.
- Safety Injection has been RESET.
- ALL SECs have been RESET.
- ALL EDGs are running unloaded.
- 4KV Buses 2A and 2C are aligned to 23 Station Power Transformer (SPT).
- 4KV Bus 2B is aligned to 24 SPT.

Subsequently, 24 SPT experiences a failure causing its secondary voltage to drop and stabilize at 3600 volts.

Complete the following statement concerning the effect of this failure on the 2B 4KV Vital Bus:

The 2B 4KV Vital Bus will...

A. fast transfer to 23 SPT.

B. remain loaded onto 24 SPT.

C. be energized by its EDG in MODE IV (SI & Single Bus Degraded Voltage).

D. be energized by its EDG in MODE II* (Single Bus Degraded Voltage).

Answer: D

Explanation / Justification

A. Incorrect. Plausible because the candidate may believe that the < 70% vital bus transfer relay will energize and transfer the bus to 23 SPT. Incorrect because 3600 volts is not less than 70%.
B. Incorrect. Plausible because the candidate may recognize that the voltage has stabilized at > 70% and believe that the bus will remain energized by 24 SPT. Incorrect because the sustained degraded voltage relay will cause a UV signal to be generated for that bus (95% for > 13 seconds)
C. Incorrect. Plausible because the candidate may not recognize from the stem that SI has been reset. Incorrect because after SI has been reset, the SEC will not actuate in MODE III or Mode IV.
D. Correct, because 3600 volts is below the setpoint for degraded voltage (95%) relays. When these relays actuate, then 2B SEC will strip 2B 4KV bus from off-site power and load the bus on the EDG in MODE II* (Single Bus Degraded UV).

Technical References:	NOS054KVAC0-08, 4160 Electrical Systems
Proposed References to be provided:	None
Learning Objective:	ELO 9
Question Source:	Bank, Salem 2016 NRC Exam, Q55
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.7 / 45.5

K/A Match: The K/A is matched because the candidate is required to know the cause-effect of degraded vital bus voltage (AC Electrical Distribution) and the EDG (SEC loading mode).

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	062000A4.07 Ability to manually operate and/or monitor in the control room: Synchronizing and paralleling of different ac supplies.	
Importance:		3.1	

Question: #48

Given:

- Unit 2 is at 100% Power.
- The 2A EDG is paralleled to the 2A 4KV Bus for Surveillance Testing in accordance with S2.OP-ST.DG-0001, 2A Diesel Generator Surveillance Test.
- Reactive load is 1200 KVAR OUT.

In accordance with S2.OP-ST.DG-0001, what action is needed to **RAISE** reactive load to 1400-1500 KVAR OUT?

A. Raise on the Speed Control Switch.

B. Lower on the Speed Control Switch.

C. Raise on the Voltage Control Switch.

D. Lower on the Voltage Control Switch.

Answer: C

Explanation / Justification

A. Incorrect. Plausible because the candidate may believe that because the speed control switch is used to adjust voltage once paralleled to the bus / grid that this would adjust KVARs in the correct direction.
B. Incorrect. Plausible because the candidate may believe that because the speed control switch is used to adjust voltage once paralleled to the bus / grid that this would adjust KVARs in the correct direction.
C. Correct. The voltage control switch is used to adjust KVAR load. To raise KVAR loading, the direction of the switch would be the raise direction. (see step 5.3.11 of surveillance)
D. Incorrect. Plausible because it is true that the voltage control switch is used to adjust KVAR loading, but the candidate may confuse the required direction for KVAR OUT.

Technical References:	S2.OP-ST.DG-0001(Q), 2A Diesel Generator Surveillance Test
Proposed References to be provided:	None
Learning Objective:	N/A
Question Source:	Salem Vision Database
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.7 / 45.5 / 45.8

K/A Match: The K/A is matched because the candidate is required to know how to operate, monitor and maintain KVAR loading when an EDG is paralleled to the bus / grid.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	063000A4.03 Ability to manually operate and/or monitor in the control room: Battery discharge rate.	
Importance:		3.0	

Question: #49

Given:

- The Unit 2 125 VDC Vital Bus Batteries are aligned to “float charge” mode.
- A Loss of All AC Power event has occurred.

What 125 VDC Battery indications in the control room will indicate that the batteries are discharging? How many hours of operation by design are the batteries sized for after a loss of all AC power?

A. Battery voltage indication will rise greater than 0 volts on 2RP9 panel volt meters. 2 Hours.

B. Battery amp indication will rise greater than 0 amps on 2RP9 panel amp meters. 2 Hours.

C. Battery amp indication will rise greater than 0 amps on 2RP9 panel amp meters. 4 Hours.

D. Battery voltage indication will rise greater than 0 volts on 2RP9 panel volt meters. 4 Hours.

Answer: B

Explanation / Justification

A. Incorrect. Plausible because the candidate may believe that when the battery chargers are supplying the loads, the battery volt meters read zero. The second part is correct.
B. Correct. When the batteries are normally in “float charge” mode, the typical volt meter reading on 2RP9 would be 134 volts and the amp meter is reading zero amps because the battery charger is supplying the loads. On a loss of all AC, the batteries start to discharge, and this is indicated by rising amps on the amp meters on 2RP9. Also, by design, the batteries are sized for 2 hours of operation after a loss of AC power, based upon the required operation of the DC emergency equipment.
C. Incorrect. The first part is correct. The candidate may believe that the design hours of operation are 4.

D. Incorrect. Plausible because the candidate may believe that when the battery chargers are supplying the loads, the battery volt meters read zero. The candidate may also believe that the design hours of operation are 4.

Technical References:	NOS05DCELEC-09, DC Electrical Distribution
Proposed References to be provided:	None
Learning Objective:	ELOs 2 & 8
Question Source:	New
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.7 / 45.5 / 45.8

K/A Match: The K/A is matched because the candidate is required to know what indications exist in the control room that would indicate battery discharge and, also know the design life or hours of operation available during a loss of all AC power.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	064000K6.07 Knowledge of the effect of a loss or malfunction of the following will have on the ED/G system. Air Receivers	
Importance:		2.7	

Question: #50

Given:

- The Unit 2 is at 100% Power.
- 2A Emergency Diesel Generator (EDG) Starting Air Receiver 21A is isolated and cleared tagged for maintenance.
- A Loss of Off-Site Power has just occurred.

Complete the following statement regarding the 2A Emergency Diesel Generator (EDG) starting air system capability and response.

Following an SEC start signal, the 2A EDG __(1)__ start and achieve rated speed of 900 RPM in ≤ 13 seconds. The 21B starting air receiver is aligned to supply __(2)__ air start motors.

A. (1) will
   (2) four

B. (1) will NOT
   (2) two

C. (1) will
   (2) two

D. (1) will NOT
   (2) four

Answer: C

Explanation / Justification

A. Incorrect. Plausible because the first part is correct. Each receiver is capable of 3 cold starts and only two motors are required to start the diesel in < 10 seconds. The second part is plausible because the candidate may believe that each air receiver is lined up to supply all four air start motors. Incorrect as each receiver only supplies two air start motors.
B. Incorrect. Plausible because the candidate may believe that only two air start motors are not capable of starting the diesel in ≤ 13 seconds. Incorrect, because just one air start motor can enable the diesel to reach full speed within 14 seconds. The second part is correct.
C. Correct. Each air receiver supplies two air start motors (one train). Two air start motors will start the diesel in < 10 seconds.
D. Incorrect. Plausible because the candidate may believe that one air receiver is not capable of starting the diesel in ≤ 13 seconds. The second part is plausible because the candidate may believe that each air receiver is lined up to supply all four air start motors. Incorrect as each receiver only supplies two air start motors.

Technical References:	NOS05EDG000-12, Emergency Diesel Generators
Proposed References to be provided:	None
Learning Objective:	ELOs 14
Question Source:	New
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.7 / 45.7

K/A Match: The K/A is matched because the candidate is required to know EDG starting capability and design with the loss / malfunction on one starting air receiver.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	073000K4.01 Knowledge of PRM system design feature(s) and/or interlock(s) which provide for the following: Release termination when radiation exceeds setpoint.	
Importance:		4.0	

Question: #51

Which ONE of the following describes the **AUTOMATIC** actuations, if any, that will occur if a R19, Steam Generator Blowdown Radiation Monitor reaches its **WARNING** setpoint?

A. Causes NO automatic actuations on either unit. The R19 warning setpoint is an early warning function only.

B. On Unit 1, causes NO automatic actions. On Unit 2, will automatically close ALL GB10s, GB185s, and 2GB50.

C. On Unit 2, causes NO automatic actions. On Unit 1, will automatically close ALL GB10s, GB185s, and 1GB50.

D. On Unit 1, closes ALL GB4s, GB8s, GB10s, GB185s, and 1GB50. On Unit 2, isolates blowdown from the affected SGs by closing the associated GB4.

Answer: B

Explanation / Justification

A. Incorrect. Plausible because the warning does not have any automatic functions on Unit 1 and the candidate may believe this is true for both Units. Incorrect as automatic actions do occur on Unit 2.
B. Correct. The warning setpoint on Unit 1 does not result in any automatic actuations. The warning setpoint on Unit 2 will close 21-24GB10, 21-24GB185, and 2GB50.
C. Incorrect. Plausible because the candidate may forget which Unit has or does not have automatic actuations at the warning setpoint. Incorrect as this is opposite of the actual correct answer.
D. Incorrect. Plausible because these statements are correct for the “ALARM” setpoint. Candidate may confuse warning & alarm actions.

Technical References:	S1(2).OP-AB.RAD-0001(Q), Abnormal Radiation
Proposed References to be provided:	None
Learning Objective:	N/a
Question Source:	Bank, Salem Vision Database
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.7

K/A Match: The K/A is matched because the candidate is required to know what automatic actions (release termination) occur if a process radiation monitor goes into warning or alarm.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	076000K3.07 Knowledge of the effect that a malfunction of the SWS will have on the following: ESF loads.	
Importance:		3.7	

Question: #52

Given:

- Unit 2 is at 100% power.
- The crew is implementing S2.OP-AB.SW-0001, Loss of Service Water Header Pressure.
- The problem has been identified as a large Service Water leak in the Auxiliary Building just downstream of the 21SW22, Nuclear Header Inlet Valve.
- 21SW22 has been closed to isolate the leak.
- 21SW23 and 22SW23 (Header tie valves) remain closed.

Given the above conditions, which of the following describes Service Water Cooling supplies to the Emergency Diesel Generators (EDGs) and the Containment Fan Coil Units (CFCUs) if a Design Basis LOCA was to occur?

A. All 3 EDGs are supplied by 21 and 22 Service Water Headers and 3 CFCUs are supplied by 22 Service Water Header.

B. All 3 EDGs are supplied by 21 and 22 Service Water Headers and 5 CFCUs are supplied by 22 Service Water Header.

C. All 3 EDGs and 3 CFCUs are supplied by only the 22 Service Water Header.

D. All 3 EDGs and 5 CFCUs are supplied by either 21 or 22 Service Water Header.

Answer: A

Explanation / Justification

A. Correct. Closing 21SW22 will isolate all 21 SW Header loads downstream, however the EDG supply valves, 21SW21 & 22SW21 are upstream of Nuclear Header Inlet Valves 21SW22 & 22SW22. With 21SW22 closed all nuclear safety related loads from 21 Nuclear Header will be isolated except the EDGs. Also 23 CFCU, based on check valve locations can be supplied from either 21 or 22 SW Header. Therefore all 3 EDGs can be supplied be both SW headers, but only 3 CFCUs can be supplied via 22 SW Header.

B. Incorrect. The first part is correct. The second part is plausible because the candidate may believe that all the CFCUs can be supplied by either Nuclear Header. Incorrect as the check valve placements only allow 23 CFCU to be supplied by either SW Header.
C. Incorrect. The first part is plausible because the candidate may believe that the EDG supplies are downstream of the closed 21SW22 isolation. The second part is correct.
D. Incorrect. Plausible because the candidate may believe that both the EDG and CFCU supplies are upstream of the closed 21SW isolation.

Technical References:	S2.OP-AB.SW-0001(Q), Loss of Service Water Header Pressure. Drawing 205342, Service Water – Nuclear.
Proposed References to be provided:	None
Learning Objective:	N/A
Question Source:	Bank - Salem Vision Database
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.7 / 45.6

K/A Match: The K/A is matched because the candidate is required to know which ESF loads would be effected by a SW Nuclear Header Leak.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	076000A2.01 Ability to (a) predict the impacts of the following malfunctions or operations on the SWS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of SWS.	
Importance:		3.5	

Question: #53

Given:

Initial Conditions:

- Unit 1 is at 100% Power.
- #3 Service Water Bay is cleared and tagged (isolated) due to a leak on the 15SW3, 15 SW Pump Discharge Valve.
- The 1A EDG is running paralleled to the bus for a normally scheduled monthly surveillance.
- 11 and 13 SW Pumps are in service.
- 12 SW Pump is in AUTO.

Current Conditions:

- 13 SW Pump trips
- One minute later the 1A EDG output breaker opens due to 1A 4KV Vital Bus Differential.

Which ONE of the following describes the required mitigating actions for the event?

A. Enter S1.OP-AB.4KV-0001, Loss of 1A 4KV Vital Bus, and verify that 12 SW Pump has started and SW header pressure has returned to normal.

B. Enter S1.OP-AB.SW-0005, Loss of All Service Water, trip the Rx, confirm the trip, and stop the RCPs to limit heat input to the RCS.

C. Enter S1.OP-AB.SW-0005, Loss of All Service Water, trip the Rx, confirm the trip, and stop the RCPs to limit heat input to the CCW System.

D. Enter S1.OP-AB.SW-0004, Loss of Service Water During Service Water Header Outage, and verify that 12 SW Pump has started and SW header pressure has returned to normal.

Answer: A

Explanation / Justification

A. Correct. The trip of the 13 SW Pump will cause a reduction in SW header pressures and an automatic start of the 12 SW Pump (C Bus). The 1A Bus differential will not effect the service water system as 15 and 16 SW Pumps are powered from 1A Bus and they are already C/Ted for the #3 SW Bay Outage. This involves a unit difference knowledge of which buses power which pumps. (see step 3.33 of AB-4KV-0001)
B. Incorrect. Plausible because the candidate may believe that 11 and 12 SW Pumps are powered from the 1A Bus, therefore resulting in a Loss of All Service Water, requiring entry in AB-SW-0005. They also may believe that the RCPs are tripped to limit heat input to the RCS (like in FRHS).
C. Incorrect. Plausible because the candidate may believe that 11 and 12 SW Pumps are powered from the 1A Bus, therefore resulting in a Loss of All Service Water, requiring entry in AB-SW-0005. The remainder of the actions are correct if entry into AB-SW-005 was required.
D. Incorrect. Plausible because the candidate may believe that S1.OP-AB.SW-0004(Q), Loss of Service Water During Service Water Header Outage is the appropriate procedure to enter due to the #3 SW Bay being C/Ted. AB-SW-0004 is for outage situations.

Technical References:	S1.OP-AB.SW-0001(Q), Loss of Service Water Header Pressure, S1.OP-AB.SW-0005(Q), Loss of All Service Water. S1.OP-AB.4KV-0001(Q), Loss of 1A 4KV Vital Bus.
Proposed References to be provided:	None
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.5 / 43.5 / 45.3 / 45.13

K/A Match: The K/A is matched because the candidate is required to predict the impacts of SW System malfunctions (13 SW Pump Trip) and based on that use appropriate procedures to correct / mitigate the event / malfunction.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	078000K2.02	
		Knowledge of the bus power supplies to the following: Emergency air compressor.	
Importance:		3.3	

Question: #54

Given:

- Unit 1 is at 100% Power.
- The #1 Emergency Control Air Compressor (ECAC) is running for testing in accordance with S1.OP-PT.CA-0001, Emergency Control Air Compressor Test.

Which ONE of the following would result in the loss of the #1 ECAC?

A. 1A 4KV to 460V breaker 1A4D trips.

B. 1C 4KV to 460V breaker 1C4D trips.

C. 1E 4KV to 460V breaker 1E6D trips.

D. 1H 4KV to 460V breaker 1H5D trips.

Answer: B

Explanation / Justification

A. Incorrect. Plausible because the candidate may believe that 1A 460V Vital Bus feeds the #1ECAC.
B. Correct. The 1C 460V Vital Bus feeds the #1ECAC.
C. Incorrect. Plausible because the candidate may believe that the 1E 460V Group Bus feeds the #1ECAC. The group buses provide power to Station Air Compressors, but 4KV and not 1E.
D. Incorrect. Plausible because the candidate may believe that 1H 460V Group Bus feeds the #1 ECAC. The 1H group bus provides power to #1 Station Air Compressor, but 4KV.

Technical References: NOS05CONAIR-12, Control Air System.

Proposed References to be provided:	None
Learning Objective:	ELO 5
Question Source:	Bank, Salem 2016 NRC Exam, Q62
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.7

K/A Match: The K/A is matched because the candidate is required to the power supply to the #1ECAC.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	1	
	K/A #	103000A3.01 Ability to monitor automatic operation of the containment system, including: Containment isolation.	

Importance: 3.9

Question: #55

Given:

- Unit 1 Operators are responding to a Reactor Trip and Safety Injection.
- The crew is verifying valves in their Safeguards positions in accordance with 1-EOP-TRIP-1, Reactor Trip or Safety Injection.

Which of the following valves receive a **Phase A Isolation** signal to close?

A. 1CV2, 1CV277 (Letdown)

B. 1CC131, 1CC190 (RCP Thermal Barrier)

C. 11-14BF13 (Feedwater)

D. 1CC113, 1CC215 (Excess Letdown)

Answer: D

Explanation / Justification

A. Incorrect. Plausible because the candidate may believe that the "letdown isolation" valves (CV2,277) receive a Phase A signal. Incorrect as CV2, 277 only close on low PZR level signal, they are not containment isolation valves. CV3,4,5 & 7 are Phase A isolation valves for letdown.
B. Incorrect. Plausible because the candidate may believe the RCP Thermal Barrier and Charging Isolation Valves receive a Phase A signal. Incorrect as the RCP Thermal Barrier is isolated on a Phase B signal.
C. Incorrect. Plausible because the candidate may believe that the "Feedwater Isolation" valves (BF13s) receive a Phase A signal. Incorrect as the BF13s receive a Feedwater Isolation Signal, not Phase A.

D. Correct. The Excess Letdown Component Cooling Valves (CC113, 215) receive a Phase A signal to close.

Technical References:	1-EOP-TRIP-1, Reactor Trip or Safety Injection.
Proposed References to be provided:	None
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.7 / 45.5

K/A Match: The K/A is matched because the candidate is required to verify all safeguards valves in their proper position in 1-EOP-TRIP-1. This includes knowing which valves receive a Phase A Isolation signal to close.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	2	
	K/A #	001000K2.05 Knowledge of bus power supplies to the following: M/G sets.	
Importance:		3.1	

Question: #56

Given:

- Unit 1 is operating at 100% Power.
- The 1E 460 volt bus is de-energized following a trip of its feeder breaker.
- Tagging is in progress to allow troubleshooting of 1E 460 volt bus.

The operator mistakenly opens the 1F 460 volt bus feeder breaker, de-energizing the 1F 460 volt bus.

What is the consequence, if any, of this action?

A. The Reactor will trip due to the loss of BOTH Rod Drive Motor Generators.

B. The Reactor will trip due to the loss of a SINGLE Rod Drive Motor Generator.

C. The Reactor will NOT trip because BOTH Rod Drive Motor Generators are still in service.

D. The Reactor will NOT trip because ONE Rod Drive Motor Generator is sufficient to maintain power to the Rod Control System.

Answer: D

Explanation / Justification

A. Incorrect. Plausible because the candidate may believe that the power supplies to the MG sets are 1E & 1F 460V buses.
B. Incorrect. Plausible because the candidate may believe that the loss of a single MG set is enough to cause the reactor to trip.
C. Incorrect. Plausible because the candidate may believe that the power supplies to the MG sets have not been affected by the actions described in the stem.

D. Correct. The 1E 460V bus supplies power to the 11 MG set, but 12 MG set is powered from the 1G 460V bus. Therefore, one MG set is still powered and is sufficient to maintain power to the Rod Control System.

Technical References:	1-EOP-TRIP-1, Reactor Trip or Safety Injection.
Proposed References to be provided:	None
Learning Objective:	N/A
Question Source:	Bank, Salem Vision Database
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.7

K/A Match: The K/A is matched because the candidate is required to know the power supplies to the MG sets.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	2	
	K/A #	016000K3.02 Knowledge of the effect that a loss or malfunction of the NNIS will have on the following: PZR LCS.	
Importance:		3.4	

Question: #57

Given:

- Unit 1 is operating at 100% Power.
- All systems are operating in AUTO.
- PZR Level Control System selected to Channel I for Control.
- PZR Level Control System selected to Channel II for Alarm.

A failure causes the following sequential plant events. Assume **NO** operator actions are taken.

- Charging Flow reduces to minimum.
- Actual PZR level drops slowly.
- Letdown isolates and PZR heaters turn off.
- A Reactor Trip eventually occurs on high PZR level.

Which ONE of the following failures would cause the above sequential events?

A. Auctioneered Tavg failed high.

B. PZR Level Channel I failed low.

C. PZR Level Channel I failed high.

D. PZR Level Channel II failed low.

Answer: C

Explanation / Justification

A. Incorrect. Plausible because the student may confuse this with the controlling channel failing high. Incorrect because PZR program level will only fail to approximately 59% and level will be maintained around that value.
B. Incorrect. Plausible because a failure of the controlling channel low will result in immediate letdown isolation and an eventual Rx Trip on high level with NO operator action, but not in the SEQUENTIAL order discussed in the question stem. Charging flow will actually rise due to the low failure of the controlling channel.
C. Correct. A high failure of the controlling channel of PZR Level will result in a lowering of charging flow to minimum, actual level slowly dropping until 17% actual level is seen by the alarm channel which then results in letdown isolation and PZR heaters off. Now minimum charging flow with no letdown will eventually lead to a Rx Trip on high PZR Level as seen by channels II & III (2/3 @92%).
D. Incorrect. Plausible because the alarm channel failing low will result in immediate letdown isolation and an eventual Rx Trip on high level with NO operator action, but not in the SEQUENTIAL order discussed in the question stem.

Technical References:	NOS05PZRP&L-10, Pressurizer Pressure and Level Control.
Proposed References to be provided:	None
Learning Objective:	ELOs 4b, 15, and 16
Question Source:	Bank, Salem Vision Database
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.7 / 45.6

K/A Match: The K/A is matched because the candidate is required to know the effect of a level channel failure / malfunction on the automatic PZR Level Control System.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	2	
	K/A #	017000K4.01 Knowledge of ITM system design feature(s) and/or interlock(s) which provide for the following: Input to subcooling monitors.	
Importance:		3.4	

Question: #58

Which ONE of the following lists the parameters used by the Subcooling Margin Monitor to calculate subcooling margin?

A. RCS pressure and RCS hot leg temperatures.

B. PZR pressure and CET temperatures.

C. RCS pressure and CET temperatures.

D. PZR pressure and RCS hot leg temperatures.

Answer: C

Explanation / Justification

A. Incorrect. The first part is correct. The second part is plausible because the student may believe that RCS hot leg temperatures are used to calculate subcooling margin. Incorrect as the representative CET temperature is used in the calculation.
B. Incorrect. Plausible because the student may believe that PZR pressure is used in the subcooling calculation. Incorrect because RCS wide range pressure is used, PZR pressure instrumentation is a narrow range indication, reading no lower than 1700 psig. The second part is correct.
C. Correct. The temperature margin to saturation is calculated by the CETPS. The inputs to this calculation are the representative CET temperature, RCS pressure, Containment pressure, and Containment radiation level. (page 17 of Incore Instrumentation Lesson Plan)
D. Incorrect. The first part is plausible because the student may believe that PZR pressure is used in the subcooling calculation. Incorrect because RCS wide range pressure is used, PZR pressure instrumentation is a narrow range indication, reading no lower than 1700 psig. The second part is correct. The second part is plausible because the student may believe

that RCS hot leg temperatures are used to calculate subcooling margin. Incorrect as the representative CET temperature is used in the calculation.

Technical References:	NOS05INCORE-05, Incore Instrumentation.
Proposed References to be provided:	None
Learning Objective:	ELOs 7, 18, and 19
Question Source:	Bank, Salem Vision Database
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.7

K/A Match: The K/A is matched because the candidate is required to know the inputs to the subcooling monitors.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	2	
	K/A #	029000K1.03 Knowledge of physical connections and/or cause-effect relationships between the Containment Purge System and the following systems: Engineering safeguards.	
Importance:		3.6	

Question: #59

1. **MANUALLY** initiating which of the following from the Control Room Console will also result in a Containment Ventilation Isolation signal?

2. Which valves receive a closed demand from the Containment Ventilation Isolation signal?

A. (1) Phase B and Spray Actuation
   (2) VC1, 4 Only

B. (1) Phase A Isolation
   (2) VC1, 4 Only

C. (1) Phase A Isolation
   (2) VC1, 4, 5, and 6

D. (1) Phase B and Spray Actuation
   (2) VC1, 4, 5, and 6

Answer: D

Explanation / Justification

A. Incorrect. The first part is correct, the Phase B and Spray Actuation pushbuttons / keys also actuate Containment Ventilation Isolation. The second part is plausible because the candidate may believe that the signal only sends a closed signal to the purge isolation valves. Incorrect as the signal goes to all the purge and pressure/vacuum relief valves.
B. Incorrect. Plausible because the student may believe that a Containment Phase "A" Isolation signal would also cause a Containment Ventilation Isolation. The second part is

plausible because the candidate may believe that the signal only sends a closed signal to the purge isolation valves. Incorrect as the signal goes to all the purge and pressure/vacuum relief valves.

C. Incorrect. Plausible because the student may believe that a Containment Phase “A” Isolation signal would also cause a Containment Ventilation Isolation. The second part is correct.

D. Correct. The Phase B and Spray Actuation pushbuttons / keys also actuate Containment Ventilation Isolation. The signal goes to all the purge and pressure/vacuum relief valves. See drawing 221057.

Technical References:	Safeguards Action Signals, Logic Diagram Sheet 8, drawing 221057.
Proposed References to be provided:	None
Learning Objective:	N/A
Question Source:	Bank, Salem Vision Database
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.2 to 41.9 / 45.7 to 45.8

K/A Match: The K/A is matched because the candidate is required to know which Engineering Safeguards signals will generate a Containment Ventilation Isolation (closing Purge Valves).

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	2	
	K/A #	035000K6.03 Knowledge of the effect of a loss or malfunction on the following will have on the S/GS: S/G level detector.	
Importance:		2.6	

Question: #60

Given:

- Unit 2 is at 100% Power.
- Steam Generator level control and SGFPs are in AUTO.
- 21 Steam Generator NR Level Channel I failed high due to a sensor malfunction.
- No corrective actions have been initiated yet.

Complete the following statement concerning the response of the feedwater control system if 21 Steam Generator NR Level Channel II fails LOW?

The Ovation Advanced Digital Feedwater System will initiate OHA G-7, ADFCS ALTERNATE ACTION, and ....

A. ONLY 21BF19 will shift to MANUAL

B. BOTH 21BF19 and 21BF40 will shift to MANUAL

C. ALL BF19's and BF40's remain in AUTOMATIC

D. 21BF19, 21BF40, and BOTH SGFPs shift to MANUAL

Answer: B

Explanation / Justification

A. Incorrect. Plausible because at high power level only the BF19 is being controlled.
B. Correct. Two inputs in Quality Alarm (BAD) will result in ADFCS Alternate Action (OHA G-7) and the transfer of both BF19 & BF40 controllers to MANUAL.
C. Incorrect. Plausible because the candidate may believe that digital feed circuitry will use to remaining good channel III and the controllers will remain in AUTO.

D. Incorrect. Plausible because the previous digital feed system design would have resulted in this configuration.

Technical References:	NOS05ODFWCS-02, Ovation Advanced Digital Feedwater Control System.
Proposed References to be provided:	None
Learning Objective:	ELO 12
Question Source:	Bank, Salem Vision Database
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.7 / 45.7

K/A Match: The K/A is matched because the candidate is required to know the effect of a S/G level channel failure / malfunction on the S/GS (Steam Generator Level Control).

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	2	
	K/A #	041000K3.05 Ability to monitor automatic operation of the SDS, including: Main Steam Pressure.	

Importance: 2.9

Question: #61

Given:

- Unit 2 is operating at 100% Power.
- The Steam Dumps are in Main Steam Pressure Control Mode - AUTO due to a previous failure of 2PT-506, Main Turbine Steam Line Inlet Pressure Channel II.

A Reactor Trip and a malfunction causing 2PT-507, Main Steam Header Pressure, to fail high have just occurred.

With 2PT-507 failed **HIGH**, which ONE of the following describes how the Steam Dump System and the plant will respond, assuming no operator action is taken?

A. Steam Dumps remain CLOSED. RCS temperature rises until the MS10s, Atmospheric Dump valves, open to control RCS temperature.

B. Steam Dumps remain CLOSED. RCS temperature rises until Main Steam Safety Valves open to control RCS temperature.

C. Steam Dumps OPEN. RCS temperature rapidly lowers until 543°F when Main Steam Line Isolation (MSLI) and Safety Injection (SI) actuate.

D. Steam Dumps OPEN. RCS temperature rapidly lowers until steam dumps close at 543°F. Steam Dumps will then cycle and maintain RCS temperature at 547°F.

Answer: C

Explanation / Justification

A. Incorrect. Plausible because the candidate might believe that the steam dumps are not armed due to the previous failure of PT-506 or may confuse the response with that of a low failure of PT-507. Incorrect as the steam dumps are automatically armed in the pressure control mode and this is a failure high, resulting in the dumps opening.

B. Incorrect. Plausible for the same reasons as A above, but the candidate may also believe the MS10s will not open or handle the loss of load by themselves.

C. Correct. Following the Rx Trip, all steam dumps will fully open due to the failure of 2PT-507. This will result in high steam flows on each SG and rapidly lowering RCS temperatures. When Tavg is < 543°F, a Main Steam Line Isolation (MSLI) and Safety Injection (SI) signal will actuate based on high steam flow coincident with low-low Tavg signal. At the same time, all the steam dumps will close due to low-low Tavg of 543°F and Tavg will be below 543°F.

D. Incorrect. Plausible because the steam dumps will close on the P-12 Tavg Low-Low Tavg Block signal. Incorrect because when Tavg lowers to < 543°F, the steam dumps will all close and not maintain steam header pressure due to P-12 block signal. The steam dumps (Group 1 only cooldown valves) will not re-open until the operator manually selects BYPASS TAVG on both trains on 2CC3.

Technical References:	NOS05STDUMP-12, Steam Dump System.
Proposed References to be provided:	None
Learning Objective:	ELO 8
Question Source:	Bank – Salem Vision Database
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.7 / 45.5

K/A Match: The K/A is matched because the candidate is required to know how main steam header pressure failures affect the Steam Dump System (monitoring operation of).

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	2	
	K/A #	033000K4.03	
		Spent Fuel Cooling: Knowledge of design feature(s) and/or interlock(s) which provide for the following: Anti-siphon devices.	
Importance:		2.6	

Question: #62

Design features of the Spent Fuel Cooling and Purification System ensure the fuel stored in the Spent Fuel Pool will not become uncovered as a result of any postulated loss of system integrity.

Complete the following statement that best describes this design feature.

The Spent Fuel Pool is designed with…

A. a suction pipe inlet located above the top of fuel, and an anti-siphon hole on the return line that discharges above the top of the fuel.

B. an anti-siphon hole on the suction pipe, and a low level cut-off switch that automatically trips the Spent Fuel Cooling Pump.

C. an anti-siphon hole on the suction pipe, and the return line that discharges above the top of the fuel assemblies.

D. no drains on the pool, and double check valves on the pump discharge line to prevent backflow.

Answer: A

Explanation / Justification

A. Correct. The SFP cooling pump suction is approximately 4 feet below the pool surface and the SFP pump return line discharges into the pit approximately 6 feet above the top of the fuel assemblies. A 1/2 anti-siphon hole located below the pool surface on the discharge pipe prevents draining due to return line failure.

B. Incorrect. Plausible because the return line has a 1/2 inch hole to prevent siphoning and the student may confuse suction and discharge piping design features.

C. Incorrect. Plausible because the return line has a 1/2 inch hole to prevent siphoning and the student may confuse suction and discharge piping design features.

D. Incorrect. Plausible because there are no drain lines in the spent fuel pit, but the pump discharge uses no check valves.

Technical References:	NOS05SFP000-10, Spent Fuel Cooling System.
Proposed References to be provided:	None
Learning Objective:	ELOs 2,3,4,14 & 15.
Question Source:	Modified Bank – 2015 Indian Point 2 NRC, Q59
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.7

K/A Match: The K/A is matched because the question requires knowledge of the spent fuel cooling system's design and the use of an anti-siphon device.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	2	
	K/A #	055000K3.01 Knowledge of the effect that a loss or malfunction of the CARS will have on the following: Main condenser.	
Importance:		2.5	

Question: #63

Given:

- Unit 2 is at 100% Power.
- The Plant Operator (PO) is swapping Condenser Vacuum Pumps in accordance with S2.OP-SO.AR-0001, Condenser Air Removal System Operation.
- The PO has started 24 Vacuum Pump successfully and has just initiated a stop on 22 Vacuum Pump.
- The 22AR25, Air Ejector Suction Isolation Valve, remains OPEN.

Which ONE of the following describes the status of main condenser vacuum and what procedural action the crew will take to mitigate the event?

A. Condenser backpressure is rising. The PO restarts 22 Vacuum Pump.

B. Condenser backpressure is lowering. The PO restarts 22 Vacuum Pump.

C. Condenser backpressure is rising. The Secondary Field Operator ensures the 22AR27, Air Ejector Bypass Valve, is opened.

D. Condenser backpressure is lowering. The Secondary Field Operator ensures the 22AR27, Air Ejector Bypass Valve, is opened.

Answer: A

Explanation / Justification

A. Correct. The operating procedural caution states the following; “Failure of applicable AIR INJECTOR SUCTION ISOLATION VALVE (AR25) to close when a Condenser Vacuum Pump is stopped will result in loss of condenser vacuum. Contingency plans to attempt Vacuum Pump restart OR IMMEDIATE manual closure of the applicable AR23/AR25 valve should be considered whenever it is desired to maintain condenser vacuum when a Condenser Vacuum Pump is stopped.

B. Incorrect. The first part is plausible as the candidate may confuse vacuum with backpressure, as vacuum will be lowering. The second part is correct.
C. Incorrect. The first part is correct. The second part is plausible because the candidate remembers that field operation is necessary and may believe that if the air ejector is bypassed with the vacuum pump stopped that any condenser vacuum loss will stop.
D. Incorrect. The first part is plausible as the candidate may confuse vacuum with backpressure, as vacuum will be lowering. The second part is plausible because the candidate remembers that field operation is necessary and may believe that if the air ejector is bypassed with the vacuum pump stopped that any condenser vacuum loss will stop.

Technical References:	NOS05CAR000-07, Condenser Air Removal and Priming System. S2.OP-SO.AR-0001(Z), Condenser Air Removal System Operation.
Proposed References to be provided:	None
Learning Objective:	ELO 11
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.7 / 45.6

K/A Match: The K/A is matched because a malfunction has occurred with CARS (22AR25 remaining open) and backpressure rising is the effect of that malfunction on the Main Condenser. The candidate is also required to determine what mitigating actions are required to stabilize the condenser vacuum.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	2	
	K/A #	075000K2.02 Ability to (a) predict the impacts of the following malfunctions or operations on the circulating water system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of circulating water pumps.	
Importance:		2.5	

Question: #64

Given:

- Unit 2 are at 100% Power.
- 21A Circulator is out of service (C/T) for Waterbox cleaning.
- 23B Circulator is out of service (C/T) for Traveling Screen replacement.
- A Liquid Waste release is in progress from 21 CVCS Monitor Tank to the 21 SW Header.

The following sequence of events occurs:

- 21B Circulator trips.
- The crew enters S2.OP-AB.CW-0001, Circulating Water System Malfunction.
- Field operator makes an error in throttling hotwell isolation valves resulting in 21A and 21B Hotwell levels at 30 inches.
- 21 Condensate Pump amps are oscillating.

Based on the above conditions, which one of the following describes the next required actions and the **MAXIMUM** power level allowed in accordance with station procedures?

Note: S2.OP-AB.CN-0001, Main Feedwater / Condensate System Abnormality
S2.OP-AB.LOAD-0001, Rapid Load Reduction

A. Stop 21 Condensate Pump and reduce reactor power to ≤ 85% in accordance with S2.OP-AB.CN-0001.

B. Stop 21 Condensate Pump and reduce reactor power to ≤ 83% in accordance with S2.OP-AB.LOAD-0001, to prevent flashing in Condensate System.

C. Terminate the liquid release, stop 21 Condensate Pump, and reduce reactor power to ≤ 85% in accordance with S2.OP-AB.CN-0001.

D. Terminate the liquid release, stop 21 Condensate Pump, and reduce reactor power to ≤ 83% in accordance with S2.OP-AB.LOAD-0001, to prevent flashing in Condensate System.

Answer: B

Explanation / Justification

A. Incorrect. Plausible but incorrect because although reduction in reactor power to a maximum of 85% is stated in AB-CN-0001, AB.CW-0001 would require a reduction to a maximum of 83%.
B. Correct. Step 3.10 states; "Initiate a load reduction to less than or equal to 83% Reactor Power, IAW S2.OP-AB.LOAD-0001(Q), Rapid Load Reduction to prevent flashing in Condensate System."
C. Incorrect. Plausible as the candidate may believe that the liquid release path is to the 21A&B Circulating Pump discharge. Incorrect the liquid release via 21 CCW HX is directed to the Unit 1 Circulating Water (11A&B) Pump discharge. Remainder is incorrect for the same reasons as A above.
D. Incorrect. Plausible as the candidate may believe that the liquid release path is to the 21A&B Circulating Pump discharge. Incorrect the liquid release via 21 CCW HX is directed to the Unit 1 Circulating Water (11A&B) Pump discharge. The second part is correct.

Technical References:	S2.OP-AB.CW-0001(Q), Circulating Water System Malfunction.
Proposed References to be provided:	None
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.5 / 43.5 / 45.3 / 45.13

K/A Match: The K/A is matched because the candidate is required to predict the impact of the loss of circulating water pumps on some initial plant conditions and then using the abnormal procedure to mitigate those malfunctions. Malfunction being the loss of 21A & B Circulators in the same condenser shell.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	2	
	Group #	2	
	K/A #	086000A1.05 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with Fire protection System operating the controls including: FPS lineups.	
Importance:		2.9	

Question: #65

Given:

- Unit 2 is at 100% Power.

The following sequence of events occurs:

- OHA A-15, FIRE PMP 1/2 RUN in alarm
- OHA A-23, FIRE PUMP 1/2 TRBL in alarm.
- BOTH Fire Pumps are running.
- NO other Fire Protection System alarms are present.
- Fire protection reports NO fire system actuations.
- Fire main header pressure is 135 psig and stable.

Which ONE of the following describes the cause for the above conditions?

A. Fire Protection Jockey Pump tripped.

B. Major Fire Protection System pipe rupture.

C. Loss of Normal AC power to BOTH Fire Pump Battery Chargers.

D. A momentary (1 second) drop in Fire Protection header pressure to 70 psig.

Answer: C

Explanation / Justification

A. Incorrect. Plausible because the Jockey Pump normally maintains fire protection header pressure between 110-120 psig and the candidate may believe that the trip of the jockey pump is an automatic start signal for the fire pumps.
B. Incorrect. Plausible in that since the fire pumps start at <85# and <70# with a time delay that a large pipe rupture could have caused system pressure to lower to the start setpoints, but that the pumps were presently able to maintain 135# based on the size of the leak.
C. Correct. The diesel driven fire pumps are normally aligned in standby and normally start on low header pressure signals of <85# and time delayed <75# respectively. But the system configuration also includes an independent battery that will automatically start the fire pumps during a loss of normal AC power.
D. Incorrect. Plausible in that since the fire pumps start at <85# and <70# with a time delay that a large pipe rupture could have caused system pressure to lower to the start setpoints. Incorrect as the start for the #2 Fire Pump includes a time delay and therefore a momentary (1 sec) pressure drop would not have started both pumps.

Technical References:	NOS05FIRPRO-09, Fire protection System. S2.OP-AB.FP-0001(Q), Fire Protection System Malfunction.
Proposed References to be provided:	None
Learning Objective:	ELO 7
Question Source:	Bank – Salem Vision Database
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.5 / 45.5

K/A Match: The K/A is matched because the diesel driven fire pumps are normally aligned in standby and normally start on low header pressure signals of <85# and time delayed <75# respectively. But the system configuration also includes an independent battery that will automatically start the fire pumps during a loss of normal AC power. The candidate needs to know the normal alignment of the fire pumps and what would start them.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	3	
	Group #	1 (COO)	
	K/A #	G2.1.1 Knowledge of conduct of operations requirements.	
Importance:		3.8	

Question: #66

During shift turnover, the on-coming RO notices an OHA window with reflash capability (multiple inputs) with a single strand of red tape diagonally across the annunciator window.

In accordance with OP-AA-102-103-1001, Operator Burdens Program, which ONE of the following describes the status of the annunciator window?

A. Reflash alarm function is defeated and NO new alarms will be annunciated.

B. One or more inputs into this annunciator window are inoperable or unreliable.

C. All inputs into this annunciator window are inoperable or unreliable.

D. Operator flagging that Maintenance is performing functional testing which will result in a valid alarm on this window.

Answer: B

Explanation / Justification

A. Incorrect. Reflash capability is still enabled.
B. Correct. IAW OP-AA-102-103-1001 step 4.2.1.3 a single strand of red tape diagonally across a multiple input annunciator window means one or more inputs into the window are inoperable.
C. Incorrect. IAW OP-AA-102-103-1001 step 4.2.1.4, if entire window is inoperable then two pieces of red tape placed diagonally across the window in a shape of an “X”.
D. Incorrect. Red tape is not used to identify maintenance testing in progress.

Technical References:	OP-AA-102-103-1001, Operator Burdens Program.
Proposed References to be provided:	None
Learning Objective:	N/A

Question Source:	Bank, Salem 2016 NRC Exam, Q66
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.10 / 45.13

K/A Match: The K/A is matched because the candidate is required to know the administrative requirements for identifying inoperable annunciator (OHA) windows in accordance with OP-AA-102-103-1001, Operator Burdens Program.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	3	
	Group #	1 (COO)	
	K/A #	G2.1.3 Knowledge of shift or short-term relief turnover practices.	
Importance:		3.7	

Question: #67

Which ONE of the following describes Reactor Operator pre and post-shift relief actions that should be implemented by the oncoming operator in accordance with OP-AA-112-101, Shift Turnover and Relief?

A. PRIOR to relief, read the Control Room logs through the last previous date on shift, or the preceding four (4) days logs, whichever is less.

   POST relief, confer with the Control Room Supervisor to determine the scope of planned shift activities and their responsibilities for that shift.

B. PRIOR to relief, read the Control Room logs through the last previous date on shift, or the preceding four (4) days logs, whichever is less.

   POST relief, tour the main control board back panels.

C. PRIOR to relief, read the Control Room logs through the last previous date on shift, or the preceding seven (7) days logs, whichever is less.

   POST relief, tour the main control board back panels.

D. PRIOR to relief, read the Control Room logs through the last previous date on shift, or the preceding seven (7) days logs, whichever is less.

   POST relief, confer with the Control Room Supervisor to determine the scope of planned shift activities and their responsibilities for that shift.

Answer: A

Explanation / Justification

A. Correct. IAW OP-AA-112-101, Shift Turnover and Relief, (step 4.8.3) prior to relief, the logs should be reviewed through the last previous date on shift or the proceeding four days, whichever is less and (step 4.8.4) after relief, the operator is to confer with the CRS to determine the planned activities & responsibilities for that shift.

B. Incorrect. Plausible because the first part is correct, and the candidate may believe the back panels are walked down after taking the watch. Incorrect as touring the main control room back panel area is required prior to relief.
C. Incorrect. Plausible because reading the logs is required prior to relief, but back to 7 days is incorrect. Plausible because the candidate may believe the back panels are walked down after taking the watch. Incorrect as touring the main control room back panel area is required prior to relief.
D. Incorrect. Plausible because reading the logs is required prior to relief, but back to 7 days is incorrect. The second part is correct.

Technical References:	OP-AA-112-101, Shift Turnover and Relief.
Proposed References to be provided:	None
Learning Objective:	N/A
Question Source:	Modified Bank – Hope Creek 2105 NRC Exam – Q66
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.10 / 45.13

K/A Match: The K/A is matched because the question requires knowledge of shift turnover practices.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	3	
	Group #	1 (COO)	
	K/A #	G2.1.37 Knowledge of procedures, guidelines, or limitations associated with reactivity management.	

Importance: 4.3

Question: #68

During non-transient conditions, what is the **MINIMUM** information that the reactor operator shall state just prior to manually manipulating control rods in accordance with OP-AP-300-1001, PWR Control Rod Movement Requirements?

A. The selected control bank initial position, target control rod position, and the direction of movement.

B. The initial T_{AVG}, target control rod position, the final expected $T_{AVG.}$

C. The initial $T_{AVG,}$ target $T_{AVG,}$ rod direction, and the expected number of steps required to achieve the target T_{AVG}.

D. The initial NIS indicated Power Level, target control rod position, and the final expected NIS Power Level.

Answer: A

Explanation / Justification

A. Correct. IAW OP-AP-300-1001, PWR Control Rod Movement Requirements, step 4.4.3; "The RO shall STATE the selected control rod bank initial position, target control rod position and the direction of movement."
B. Incorrect. Plausible because using simple reactivity rules of thumb (time in life reactivity plan), the candidate may believe the minimum information required is initial and expected final RCS temperature and target control rod position. Plausible because during initial reactor startup, T_{AVG} is recorded every 15 minutes.
C. Incorrect. Plausible because using simple reactivity rules of thumb (time in life reactivity plan), the candidate may believe the minimum information required is initial and expected final RCS temperature for a specific amount of rod movement (steps). Plausible because during initial reactor startup, T_{AVG} is recorded every 15 minutes.
D. Incorrect. Plausible because the candidate could believe that only initial, final power level, and target rod position are required. During a reactor startup, power level indication would be monitored.

Technical References:	OP-AP-300-1001, PWR Control Rod Movement Requirements.
Proposed References to be provided:	None
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.1 / 43.6 / 45.6

K/A Match: The K/A is matched because the question requires knowledge of reactivity management procedures for expectations for manual control rod movements during non-transient conditions.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	3	
	Group #	2 (EC)	
	K/A #	G2.2.14 Knowledge of the process for controlling equipment configuration or status.	
Importance:		3.9	

Question: #69

A one (1) hour or less Technical Specification Action Statement (TSAS) requires a component to be positioned to the CLOSED position.

In accordance with OP-AA-108-101-1002, Component Configuration Control, the component will be positioned by ______(1)_________ and then the INDEPENDENT VERIFICATION (IV) will be performed _____(2)_______.

A. (1) Abnormal Component Position Sheet (ACPS)
(2) As soon as practicable after the TSAS was entered

B. (1) Tagout
(2) Within the one (1) hour action time

C. (1) Abnormal Component Position Sheet (ACPS)
(2) Within the one (1) hour action time

D. (1) Tagout
(2) As soon as practicable after the TSAS was entered

Answer: C

Explanation / Justification

A. Incorrect. The first part is correct. The second part is plausible because if the TSAS was greater than 1 hour, OP-AA-108-101-1002 states that a tagout may be applied as soon as practicable after the TSAS was entered. The candidate may confuse the use of a tagout for greater than 1 hour TSAS with the requirements for less than 1 hour TSAS.
B. Incorrect. The first part is plausible because if the TSAS was greater than 1 hour, OP-AA-108-101-1002 states that a tagout may be applied as soon as practicable after the TSAS was entered. The candidate may confuse the use of a tagout for greater than 1 hour TSAS with the requirements for less than 1 hour TSAS. The second part is correct.
C. Correct. The procedure states that for 1 hour or less TSAS, an Abnormal Component Position Sheet (ACPS) will be used to position the component and the component position

will be IV-ed within 1 hour of entering the TSAS. (See OP-AA-108-101-1002, step 5.1.4.1.A.

D. Incorrect. Plausible because if the TSAS was greater than 1 hour, OP-AA-108-101-1002 states that a tagout may be applied as soon as practicable after the TSAS was entered. The candidate may confuse the use of a tagout for greater than 1 hour TSAS with the requirements for less than 1 hour TSAS.

Technical References:	NOS05MISCAP-08, Configuration Control & Related Procedures. OP-AA-108-101-1002, Component Configuration Control.
Proposed References to be provided:	None
Learning Objective:	ELOs 6 & 8
Question Source:	Modified – Salem Vision Database
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.10 / 43.3 / 45.13

K/A Match: The K/A is matched because the question requires knowledge of Configuration Control & Independent Verification for 1 hour or less TSAS required component positionng IAW OP-AA-108-101-1002, Component Configuration Control. Independent Verification (IV) is part of the process for controlling equipment (valves) configuration control or status.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	3	
	Group #	2 (EC)	
	K/A #	G2.2.13 Knowledge of tagging and clearance procedures.	
Importance:		4.1	

Question: #70

Given:

- Unit 2 is in MODE 5 during a scheduled maintenance outage.
- A Red Blocking Tag (RBT) is hung on a 460V breaker racking mechanism.
- The 460V Bus associated with the breaker is energized.
- The breaker is tagged in the “Disconnect” (DI) position.

Which ONE of the following describes the required tagging sequence when removing the breaker from its cubicle to facilitate maintenance?

[**REFERENCE PROVIDED**]

A. The RBT will be removed from the breaker but kept active and maintained in the physical possession of Operations while the breaker is out of the cubicle.

B. The RBT will remain on the breaker racking mechanism, the breaker removed from the cubicle and an additional RBT installed on the cubicle door.

C. The RBT will remain on the breaker racking mechanism, the breaker removed from the cubicle and a White Caution Tag installed on the cubicle door and red danger rope will be hung across the cubicle opening.

D. The RBT will be removed from the breaker racking mechanism, the breaker removed from the cubicle, a red danger rope, tape or FME device will be hung across the cubicle opening and the same RBT installed on the rope.

Answer: D

Explanation / Justification

A. Incorrect. Plausible because the candidate may focus on the fact that maintenance cannot be conducted on a tagged component. They may think of the evolution as a temporary release of the tags. Incorrect as the associated bus is still energized and a safety boundary still needs to be established and controlled IAW OP-AA-109-115, Safety Tagging Operations. (See Attachment 2, section 11.4, Breaker Tagging)
B. Incorrect. Plausible because the candidate believes the additional RBT on the cubicle door is an acceptable safety boundary IAW the safety tagging program. Incorrect as the breaker cannot be worked on or removed with a RBT still attached.
C. Incorrect. Plausible because the candidate may believe that the addition of a White Caution Tag is an acceptable method of configuration control and that the safety boundary is met with the red danger rope across the cubicle opening. Incorrect, the RBT must be removed from the breaker and a RBT must be utilized and attached to the red danger rope.
D. Correct. IAW OP-AA-109-115, Safety Tagging Operations. (See Attachment 2, section 11.4, Breaker Tagging); "If the bus is energized, and the breaker is being removed, then a red danger rope, tape or FME device will be hung (inside the cabinet) across the opening with a warning sign posted stating the bus is energized. The tag is transferred to the red rope or tape.

Technical References:	OP-AA-109-115, Safety Tagging Operations.
Proposed References to be provided:	**OP-AA-109-115, Safety Tagging Operations, Attachment 2**
Learning Objective:	N/A
Question Source:	Bank, Vision Database
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.10 / 45.13

K/A Match: The K/A is matched because the candidate is required to know the administrative requirements for safety tag relocation when maintenance requires the removal of a tagged open breaker from an energized bus. These are local operator actions associated with the activity.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	3	
	Group #	2 (EC)	
	K/A #	G2.2.12	
		Knowledge of surveillance procedures.	
Importance:		3.7	

Question: #71

When performing a Surveillance procedure, the operator encounters a step which has a dollar sign ($) under the line where the operator initials completion of that step.

What is the significance of the dollar sign ($)?

A. It identifies an item required to meet Salem UFSAR acceptance criteria, which if not satisfactorily completed should be brought to the attention of the SM/CRS upon completion of the surveillance.

B. It identifies an item required to meet Technical Specification acceptance criteria, which if not satisfactorily completed should be brought to the immediate attention of the SM/CRS.

C. It identifies a step which requires Independent Verification of its completion PRIOR to continuing to the next step.

D. It identifies a step which requires direct oversight by an assigned Reactivity Management SRO.

Answer: B

Explanation / Justification

A. Incorrect. Plausible because the candidate could believe that the $ identifies design or UFSAR acceptance criteria which could affect operability.
B. Correct. All surveillance procedure precautions and limitations contain a step that states; “Steps identified with a dollar sign ($) are those items required to meet Technical Specification acceptance criteria. Such steps, if not satisfactorily completed, may have reportability requirements and are to be brought to the immediate attention of the SM/CRS.”
C. Incorrect. Plausible because the candidate could believe that the $ identifies a hold point requiring an Independent Verification prior to continuing to the next step.
D. Incorrect. Plausible because the candidate could believe that the $ identifies a hold point requiring Reactivity Management SRO oversight.

Technical References:	All Surveillance Procedures – Precaution & Limitations.
Proposed References to be provided:	None
Learning Objective:	N/A
Question Source:	Bank – Salem 2012 NRC Exam, Q68
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.10 / 45.13

K/A Match: The K/A is matched because the question requires knowledge of surveillance procedures, in particular the standard P&L regarding the use of the $.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	3	
	Group #	3 (RC)	
	K/A #	G2.3.14 Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.	
Importance:		3.4	

Question: #72

Which ONE of the following evolutions performed by Operations Department personnel, in accordance with station procedures, will require Radiation Protection support due to potential radiation/contamination hazards?

A. Placing 22 Hydrogen Recombiner in service after a LOCA event.

B. Performing a 21 Waste Gas Decay Tank release.

C. Performing a Containment pressure relief.

D. Rotating a spectacle flange to support a direct release of 21 CVCS Monitor Tank to the Circulating Water System.

Answer: D

Explanation / Justification

A. Incorrect. Plausible because the candidate may believe that Radiation Protection assistance would be required to place a containment system in service. Incorrect, the controls are in the control room area (equipment room).
B. Incorrect. Plausible because the candidate may believe that Radiation Protection assistance would be required to discharge a Gas Decay Tank (Radioactive Gas) to the plant vent.
C. Incorrect. Plausible because the candidate may believe that Radiation Protection assistance would be required to perform a pressure relief of Containment (radioactive effluent flow path) to the plant vent.
D. Correct. Directly releasing a Monitor Tank directly to Circ Water requires rotation of a potentially contaminated spectacle flange outside the RCA.

Technical References: S2.OP-SO.WL-0001(Q), Release of Radioactive Liquid Waste from 21 CVCS Monitor Tank.

Proposed References to be provided:	None
Learning Objective:	N/A
Question Source:	Bank – Salem 2010 NRC Exam, Q73
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.12 / 43.4 / 45.10

K/A Match: The K/A is matched because the question requires knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	3	
	Group #	3 (RC)	
	K/A #	G2.3.4 Knowledge of radiation exposure limits under normal or emergency conditions.	

Importance: 3.2

Question: #73

Which ONE of the following is the **LOWEST** Emergency Classification that results in an automatic extension of annual dose (TEDE) limits for Emergency Response Organization (ERO) Personnel that have an NRC Form-4 on file and what is the dose limit extended to?

A. SITE AREA EMERGENCY, 5000 mrem.

B. SITE AREA EMERGENCY, 4500 mrem.

C. ALERT, 5000 mrem.

D. ALERT, 4500 mrem.

Answer: D

Explanation / Justification

A. Incorrect. Plausible because the candidate could believe that the automatic dose extension first occurs at the Site Area Emergency classification and that the limit is extended to 5000 mrem which is the NRC yearly TEDE Limit.
B. Incorrect. Plausible because the candidate could believe that the automatic dose extension first occurs at the Site Area Emergency classification and the second part is correct.
C. Incorrect. The first part is correct. Plausible because the candidate may believe that the limit is extended to 5000 mrem which is the NRC yearly TEDE Limit.
D. Correct. IAW NC.EP-EP.ZZ-0304(Q), Operational Support Center (OSC) Radiation Protection Response, step 5.0 NOTE; "An individual's yearly dose limit is automatically raised to 4500 mRem upon the declaration of an ALERT or higher classification."

Technical References:	NC.EP-EP.ZZ-0304(Q), Operational Support Center (OSC) Radiation Protection Response.
Proposed References to be provided:	None
Learning Objective:	N/A
Question Source:	Bank – Salem 2016 NRC Exam, Q71
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.12 / 43.4 / 45.10

K/A Match: The K/A is matched because the question requires knowledge of TEDE exposure limits during an emergency.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	3	
	Group #	4 (EP)	
	K/A #	G2.4.17	
		Knowledge of EOP terms and definitions.	
Importance:		3.9	

Question: #74

In accordance with OP-AA-101-111-1003, Use of Procedures, Salem EOPs' Continuous Action Steps are either surrounded by a shaded box or contain which of the following continuous action verbs?

1. ADJUST
2. CONTROL
3. MAINTAIN
4. MODIFY
5. MONITOR
6. VERIFY

A. 1, 2, 4 ONLY.

B. 2, 3, 5 ONLY.

C. 3, 4, 6 ONLY.

D. 1, 5, 6 ONLY.

Answer: B

Explanation / Justification

A. Incorrect. Plausible because Control is one of the continuous action verbs per the procedure and the candidate may believe that Adjust and Modify are included in the procedure also.
B. Correct. IAW OP-AA-101-111-1003, Use of Procedures, step 4.2.9, Continuous action verbs are CONTROL, MAINTAIN, and MONITOR.
C. Incorrect. Plausible because Maintain is one of the continuous action verbs per the procedure and the candidate may believe that Modify and Verify are included in the procedure also.
D. Incorrect. Plausible because Monitor is one of the continuous action verbs per the procedure and the candidate may believe that Adjust and Verify are included in the procedure also.

Technical References:	OP-AA-101-111-1003, Use of Procedures.
Proposed References to be provided:	None
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.10 / 45.13

K/A Match: The K/A is matched because the question requires knowledge of EOP terms and definitions. The Procedures use guide describes three continuous actions verbs, CONTROL, MAINTAIN, and MONITOR.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #	3	
	Group #	4 (EP)	
	K/A #	G2.4.25	
		Knowledge of fire protection procedures.	

Importance: 3.3

Question: #75

Given:

- Unit 2 is operating at 100 % Power.
- OHA A-7, FIRE PROT FIRE, annunciates.
- Panel 2RP5 is checked and indicates a Fire in Containment.
  - Zone 59 – Air and Water Deluge, Containment El. 100 Panel 335 is lit.
  - Zone 74 – Smoke and Fire Detector, Containment El. 100 Panel 335 is lit.
- The crew enters S2.OP-AB.FIRE-0001, Control Room Fire Response.
- The crew Trips the Reactor, Turbine, and all RCPs.
- 2-EOP-TRIP-1 is entered while continuing with S2.OP-AB.FIRE-0001, Control Room Fire Response.

Which ONE of the following describes the **NEXT** required action for the above conditions in accordance with S2.OP-AB.FIRE-0001?

A. OPEN the 2FP147 from the control room

B. Dispatch an NEO to OPEN the associated deluge valves.

C. Dispatch an NEO to place both PORV BLOCK Valve breaker key switches in EMER CLOSE.

D. Verify OHA A-15, FIRE PUMP 1/2 RUN, is in alarm indicating that a Diesel Fire Pump has started and is supplying fire protection water to the associated deluge valves in containment.

Answer: A

Explanation / Justification

A. Correct. IAW S2.OP-AB.FIRE-0001, Control Room Fire Response, after the fire in containment has been recognized based on 2RP5 indications, the Reactor, Turbine, and all RCPs are tripped. The 2FP147 is then required to be opened from the control room. It does not receive an automatic signal to open.

B. Incorrect. Plausible because the candidate may believe that the associated deluge valves require manual operation. Incorrect as the deluge valves are automatic and in containment.
C. Incorrect. Plausible because the candidate may believe that the spurious operation of the PORVs is possible from a containment fire. Plausible but incorrect because this is the action taken for a fire in the relay room.
D. Incorrect. Plausible because a Fire Pump start will be necessary to provide fire protection water to containment. Incorrect because the 2FP147 does not receive an automatic open signal and therefore the fire pumps would not have started. They will start once the 2FP147 is opened from the control room.

Technical References:	S2.OP-AB.FIRE-0001, Control Room Fire Response.
Proposed References to be provided:	None
Learning Objective:	N/A
Question Source:	Bank, Salem 2011 NRC Exam, Q74
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.10 / 43.5 / 45.13

K/A Match: The K/A is matched because the candidate is required to know the Control Room response to a containment fire IAW S2.OP-AB.FIRE-0001, Control Room Fire Response.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		1
	Group #		1
	K/A #	000011EA2.07 Ability to determine and interpret the following as they apply to a Large Break LOCA: That equipment necessary for functioning of critical pump water seals is operable.	
Importance:		3.4	

Question: #76

Given:

- Unit 2 is at 100% Power.
- 21 Auxiliary Feedwater Pump is cleared and tagged for motor replacement.
- 22 CFCU is cleared and tagged for bearing replacement.
- A Large Break LOCA occurs concurrently with a Loss of Off-Site Power.
- The crew is currently implementing step 17, “CCW Pump Operation Evaluation”, in accordance with 2-EOP-TRIP-1, Reactor Trip or Safety Injection.

Complete the following statement concerning component cooling water (CCW) system operation based on the above conditions:
The CRS will direct implementation of ___(1)___ and the crew will start__(2)__.

A. (1) 2-EOP-APPX-1, Component Cooling Water Restoration
(2) 22 CCW Pump

B. (1) 2-EOP-APPX-1, Component Cooling Water Restoration
(2) 21 CCW Pump

C. (1) S2.OP-SO.CC-0001, Component Cooling System Operation
(2) 22 CCW Pump

D. (1) S2.OP-SO.CC-0001, Component Cooling System Operation
(2) 21 CCW Pump

Answer: B

Explanation / Justification

A. Incorrect. The first part is correct because EOP-TRIP-1 directs implementation of EOP-APPX-1 to start one CCW Pump. The second part is plausible because the candidate may believe that 22 CFCU unavailability provides adequate margin on the 2B EDG to allow the starting of 22 CCW Pump. Placing both HXs in service is also correct.
B. Correct. IAW with the APPX-1 Basis, 21 AFW Pump unavailability provides adequate margin on the 2A EDG, therefore 21 CCW Pump is started (step 2 of AAPX-1). Both CCW HXs are placed in service because at least three SW Pumps are running. During MODE III (Blackout & Accident) the primary or lead SW Pump will start & load on each EDG.
C. Incorrect. The first part is plausible because the candidate may remember that EOP-TRIP-1 directs implementation of S2.OP-SO.CC-0002(Q), 21 and 22 Component Cooling HX Operation. Incorrect as this transition is only if two or more CCW pumps are in service and the HXs are not in Auto. During MODE III SEC loading, no CCW pumps are running. The second part is plausible because if the 21 AFW Pump was not cleared and tagged, various redundant ventilation 460V loads would be swapped for starting the 22 CCW Pump. The candidate may also believe that 22 CFCU unavailability provides adequate margin on the 2B EDG to allow the starting of 22 CCW Pump. The last part is incorrect because both CCW HXs would be placed I/S. Plausible because with only one CCW Pump running, the candidate may believe that only one CCW HX is placed I/S.
D. Incorrect. The first part is plausible because the candidate may remember that EOP-TRIP-1 directs implementation of S2.OP-SO.CC-0002(Q), 21 and 22 Component Cooling HX Operation. Incorrect as this transition is only if two or more CCW pumps are in service and the HXs are not in Auto. During MODE III SEC loading, no CCW pumps are running. The second part is correct. The last part is plausible because the candidate may believe with only one CCW Pump running, only one CCW HX is placed I/S. Incorrect as both HXs are placed I/S.

Technical References:	2-EOP-APPX-1, Component Cooling Water Restoration.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	43.5 / 45.13

K/A Match: The K/A is matched because the candidate is required to know how Component Cooling Water is restored following a MODE III (Loss of Off-Site Power & LBLOCA) in order to provide cooling for ECCS Pump seals during the Recirculation Phases.

SRO Only: This question is SRO only as it requires knowledge of the content & basis of the EOP Appendix for Component Cooling Water Restoration versus just the overall mitigative strategy or purpose.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		1
	Group #		1
	K/A #	000022G2.2.22 Loss of Reactor Coolant Makeup: Knowledge of limiting conditions for operations and safety limits.	

Importance: 4.7

Question: #77

Given:

- Unit 2 is at 100% Power.
- 21 Charging Pump is in service.
- 22 and 23 Charging Pumps are Operable.

Subsequently, the following sequence of events occurs:
- 21 Charging Pump trips due to a breaker malfunction.
- The CRS enters S2.OP-AB.CVC-0001, Loss of Charging, and starts 23 Charging Pump.

Based on the above conditions complete the following statements:

(1) The CRS will enter Technical Specification LCO(s) __(1)__.

(2) Assuming that 21 Charging Pump remains INOPERABLE for the next four (4) days, the CRS will place the Unit in __(2)__.

Note: 3.1.2.2, Reactivity Control Systems – Boration Flow Paths
3.1.2.4, Reactivity Control Systems – Charging Pumps
3.5.2, ECCS Subsystems

A. (1) 3.1.2.2 for not having the required boration flowpath operable, 3.1.2.4 for not having the required Charging Pumps operable, and 3.5.2 for not having the required ECCS subsystems operable.
(2) MODE 3 and borated to at least 1 % delta k/k within 78 hours from the pump trip.

B. (1) 3.1.2.2 for not having the required boration flowpath operable, 3.1.2.4 for not having the required Charging Pumps operable, and 3.5.2 for not having the required ECCS subsystems operable.
(2) MODE 4 within 84 hours from the pump trip.

C. (1) 3.5.2 ONLY for not having the required ECCS subsystems operable.
(2) MODE 4 within 84 hours from the pump trip.

D. (1) 3.5.2 ONLY for not having the required ECCS subsystems operable.
   (2) MODE 3 and borated to at least 1 % delta k/k within 78 hours from the pump trip.

Answer: C

Explanation / Justification

A. Incorrect. The first part is plausible because the candidate may believe that the loss of one charging pump causes entry into both the boration flow path and charging pumps reactivity technical specifications. Incorrect as two boration flow paths still exist and two charging pumps are still operable (23 Charging Pump counts for reactivity addition capability). Tech Spec entry into 3.5.2 (ECCS) is correct. The second part is plausible because this is the action for loss of two boration flow paths.
B. Incorrect. The first part is plausible because the candidate may believe that the loss of one charging pump causes entry into both the boration flow path and charging pumps reactivity technical specifications. Incorrect as two boration flow paths still exist and two charging pumps are still operable (23 Charging Pump counts for reactivity addition capability). Tech Spec entry into 3.5.2 (ECCS) is correct. The second part is correct.
C. Correct. Because the reactivity technical specifications are still met, technical specification 3.5.2 (ECCS) is the only applicable tech spec entry. If the 21 Charging Pump is not restored to operable status within 72 hours, the action is to place the unit in Hot Shutdown within the next 12 hours.
D. Incorrect. The first part is correct. The second part is plausible because this is the action for loss of two boration flow paths.

Technical References:	S2.OP-AB.CVC-0001(Q), Loss of Charging.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Bank – Salem 2015 NRC Exam – SRO Q2
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.5 / 43.2 / 45.2

K/A Match: The K/A is matched because the candidate is required to know the Loss of Charging Abnormal Procedure content and know the Technical Specification requirements for boration flow paths and how the actual surveillance requirements can be met.

SRO Only: This question is SRO only as it requires knowledge of the content & basis of the of the Boration Flow Path and ECCS Technical Specifications. It is also SRO knowledge, because the candidate is required to know how the surveillance requirement is met for boration flow path, etc.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		1
	Group #		1
	K/A #	000026A2.06 Ability to determine and interpret the following as they apply to the Loss of Component Cooling Water: The length of time after the loss of CCW flow to a component before that component may be damaged.	
Importance:		3.1	

Question: #78

Given:

- Unit 2 is at 100% Power.
- 22 Component Cooling Water Pump is cleared and tagged for maintenance.

At 1000:

- Bezel Alarm, SURGE TANK LEVEL HI-LO, is received.
- CCW Surge Tank Level is 35 % and lowering.
- Bezel Alarm, 21 (22) CC HDR PRESSURE LO, is received.
- OHA D-37, RCP BRG CLG HDR TEMP HI, is illuminated
- The crew has entered S2.OP-AB.CC-0001, Component Cooling Abnormality.
- The highest RCP Motor Bearing temperature is 140 °F and rising at 5 °F/minute

At 1005:

- Makeup to the CCW Surge Tank has been initiated and level is being maintained at approximately 40 %.
- OHAs D-20 through D-23; 21-24 RCP BRG CLG WTR FLO LO illuminate.

In accordance with S2.OP-AB.CC-0001, the **EARLIEST** time that the CRS will need to take action to prevent damage to the RCPs will be at ______.

A. 1002

B. 1005

C. 1007

D. 1010

Answer: C

Explanation / Justification

A. Incorrect. Plausible because 2 minutes was previously the time to stop RCPs if both seal injection flow and thermal barrier flow were lost concurrently. Incorrect, as seal injection flow has not been lost.
B. Incorrect. Plausible because the abnormal procedure requires immediately stopping the pumps if CCW Surge Tank Level can not be maintained > 38%. Incorrect in that as of 1005, surge tank level is being maintained > 40% with make up initiated. Candidate may also believe that once the low flow alarms (OHAs D20-23) come in at 1005, the RCPs need to be immediately stopped. Incorrect as it is required 5 minutes after the OHAs come in.
C. Correct. The procedure requires stopping the RCPs if motor bearing temperature reaches 175°F. At 1000 the bearing temperature was 140°F and rising at 5°F/minute, therefore 7 minutes later the trip requirement of 175°F will be met.
D. Incorrect. Plausible as the procedure requires stopping the RCPs if 5 minutes have elapsed since the "RCP BRG CLG WTR FLO LO" alarm(s) actuated.

Technical References:	S2.OP-AB.CC-0001(Q), Component Cooling Abnormality.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	43.5 / 45.13

K/A Match: The K/A is matched because the candidate requires the candidate to know the time allowed by the abnormal procedure to stop RCPs before damage to the motor bearing will occur.

SRO Only: This question is SRO only as it requires specific knowledge of the content & basis of the of the abnormal procedure. The question requires more detailed knowledge of the content of the abnormal operating procedure and attachments, vice just the overall mitigation strategy.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		1
	Group #		1
	K/A #	000038EA2.07 Ability to determine and interpret the following as they apply to a SGTR: Plant conditions, from survey of control room indications.	
Importance:		4.8	

Question: #79

Given:

- The crew is performing 2-EOP-SGTR-1, Steam Generator Tube Rupture.
- Safety Injection has been terminated.
- The crew has just restored normal charging alignment per 2-EOP-SGTR-1, step 30 when RCS subcooling lowers to 0 °F.

In accordance with 2-EOP-SGTR-1, which ONE of the following completes the statement below:
The crew will start ECCS pumps as necessary to restore subcooling and ___________.

A. remain in 2-EOP-SGTR-1, Steam Generator Tube Rupture.

B. go to 2-EOP-SGTR-2, Post SGTR Cooldown.

C. go to 2-EOP-SGTR-3, SGTR with LOCA – Subcooled Recovery.

D. go to 2-EOP-SGTR-4, SGTR with LOCA – Saturated Recovery.

Answer: C

Explanation / Justification

A. Incorrect. Plausible because based on plant conditions, the candidate could incorrectly conclude that remaining in EOP-SGTR-1 is required.
B. Incorrect. Plausible because transitioning to EOP-SGTR-2 is a possible transition from EOP-SGTR-1. However, this is not correct for given plant conditions.
C. Correct. In accordance with 2-EOP-SGTR-1 CAS, “If SI has been terminated and RCS subcooling 0°F, then start ECCS pumps as necessary to restore subcooling and GO TO EOP-SGTR-3” (SGTR with LOCA – Subcooled Recovery).

D. Incorrect. Plausible because the candidate may believe that once subcooling has been lost, a transition to EOP-SGTR-4 (SGTR with LOCA – Saturated Recovery) is required.

Technical References:	2-EOP-SGTR-1, Steam Generator Tube Rupture and Bases.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Bank – Salem ILT 17-01 Audit Exam, SRO Q4
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	43.5 / 45.13

K/A Match: The K/A is matched because the candidate is required to know how to mitigate a SGTR when SI has been terminated and RCS Subcooling (a control room indication) lowers to 0°F.

SRO Only: This question is SRO only because it requires the candidate to assess plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		1
	Group #		1
	K/A #	000055EA2.05 Ability to determine and interpret the following as they apply to a Station Blackout: When battery is approaching fully discharged.	
Importance:		3.7	

Question: #80

Given:

- Unit 2 is at 100% Power.
- A Loss of All AC Power occurs.
- The crew has entered 2-EOP-LOPA-1, Loss of All AC.
- Maintenance has reported that all three EDGs have been extensively damaged and restoration cannot be expected for at least 12 hours.
- The Load Dispatcher has informed the Shift Manager that restoration of Offsite Power cannot be expected for at least 24 hours.

In accordance with 2-EOP-LOPA-1, the CRS must make a decision within __(1)__ if AC power sources will be restored within the appropriate time requirements to support the SBO licensing basis, and then based on this decision the CRS will __(2)__.

A. (1) 1 hour
(2) transition to 2-EOP-LOPA-4, Extended Loss of All AC.

B. (1) 4 hours
(2) transition to 2-EOP-LOPA-4, Extended Loss of All AC.

C. (1) 1 hour
(2) continue performing 2-EOP-LOPA-1, Loss of All AC.

D. (1) 4 hours
(2) continue performing 2-EOP-LOPA-1, Loss of All AC.

Answer: A

Explanation / Justification

A. Correct. Step 29 of EOP-LOPA-1 states; The decision to go to EOP-LOPA-4 must be made within one hour of the Loss of All AC Power."
B. Incorrect. Plausible because step 29.1 of EOP-LOPA-1 states; "If AC Power can not be restored within 4 hours, then go to EOP-LOPA-4." The candidate may believe they have all 4 hours to make the transition. Incorrect as Step 29 of EOP-LOPA-1 states; The decision to go to EOP-LOPA-4 must be made within one hour of the Loss of All AC Power."
C. Incorrect. The first part is correct. The second part is plausible because the candidate may believe that all the required actions are contained in LOPA-1.
D. Incorrect. The first part is plausible because step 29.1 of EOP-LOPA-1 states; "If AC Power cannot be restored within 4 hours, then go to EOP-LOPA-4." The candidate may believe they have all 4 hours to make the transition. The second part is plausible because the candidate may believe that all the required actions are contained in LOPA-1.

Technical References:	2-EOP-LOPA-1, Loss of All AC Power and Bases. 2-EOP-LOPA-4, Extended Loss of All AC Power.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	43.5 / 45.13

K/A Match: The K/A is matched because the candidate is required to know blackout coping strategies that will extend battery life (extend the time to when the batteries are approaching fully discharged).

SRO Only: This question is SRO only because it requires the candidate to assess plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed. SRO Only because if requires knowledge of specific content of both an abnormal operating procedure and an emergency operating procedure, not just the overall mitigation strategy.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		1
	Group #		1
	K/A #	000077G2.1.7 Generator Voltage and Electric Grid Disturbances. Ability to evaluate plant performance and make operational judgements based on operating characteristics, reactor behavior, and instrument interpretation.	
Importance:		4.7	

Question: #81

Given:

- Unit 2 is at 100% Power.
- The voltages on the following 500 KV Lines are as follows:

Orchard (5021)	New Freedom (5024)	Salem-Hope Creek Tie (5037)
492 KV	495 KV	497 KV

Based on the above conditions, complete the following statements:

(1) The CRS will declare the__(1)__ 500 KV line(s) INOPERABLE.

(2) The CRS will direct performing __(2)__ of S2.OP-AB.GRID-0001, Abnormal Grid Disturbances.

Note: ESO = Electric System Operator

A. (1) 5021
(2) Station Load Curtailment in accordance with Attachment 3, Salem 500 KV Switchyard Low Voltage,

B. (1) 5021 and 5024
(2) Station Load Curtailment in accordance with Attachment 3, Salem 500 KV Switchyard Low Voltage,

C. (1) 5021 and 5024
(2) Generator Load Reduction as specified by the ESO in accordance with Attachment 4, 500 KV Grid Instability,

D. (1) 5021
(2) Generator Load Reduction as specified by the ESO in accordance with Attachment 4 500 KV Grid Instability,

Answer: A

Explanation / Justification

A. Correct. S2.OP-AB.GRID-0001(Q), Attachment 3 states if 500 KV Switchyard Voltage is < 493 KV, then declare the associated off-site power source inoperable and then initiate Station Load Curtailment IAW OP-AA-108-107-1001, Electric System Emergency Operations and Electric System Operator Interface.
B. Incorrect. The first part is plausible because the candidate may confuse the voltage threshold for declaring an off-site power source inoperable. The second part is correct.
C. Incorrect. The first part is plausible because the candidate may confuse the voltage threshold for declaring an off-site power source inoperable. The second part is plausible because Attachment 4 of AB.GRID requires a power reduction at 15%/min max for 500 KV Grid instabilities.
D. Incorrect. The first part is correct. The second part is plausible because Attachment 4 of AB.GRID requires a power reduction at 15%/min max for 500 KV Grid instabilities.

Technical References:	S2.OP-AB.GRID-0001(Q), Abnormal Grid and bases.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Modified, Salem 2019 NRC Exam, Q62
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.5 / 43.5 / 45.12 / 45.13

K/A Match: The K/A is matched because the candidate is required to make an operational judgement based on 500 KV Line voltages (instrument interpretation).

SRO Only: This question is SRO only because it requires the candidate to assess plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed. SRO Only because if requires knowledge of specific content of an abnormal operating procedure, not just the overall mitigation strategy.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		1
	Group #		2
	K/A #	000036G2.1.32 Fuel-Handling Accidents. Ability to apply system limits and precautions.	

Importance: 4.0

Question: #82

Given:

- Unit 2 is in MODE 6.
- The Containment Equipment Hatch is closed.
- Core Reload is in progress.
- The transfer cart is in the Fuel Handling Building.
- A fuel assembly in the mast tube is in transit approaching the core.
- Gas bubbles are observed in the vicinity of the fuel assembly last placed in the core.
- The Refueling SRO has ordered all fuel transfers in progress stopped and all non-essential personnel evacuated from the containment.

Based on the above conditions, complete the statement concerning the NEXT action taken in accordance with S2.OP-AB.FUEL-0001, Fuel Handling Incident:

The CRS will direct placing the fuel assembly in the mast tube_________.

A. in the upender and lower the upender to the horizontal position.

B. into the core in any location that takes the least amount of time.

C. into the core in the emergency location X-3.

D. into the core in its designated location or the emergency location P-10, whichever is closer.

Answer: D

Explanation / Justification

A. Incorrect. Plausible because the upender in the horizontal position is a safe position for a fuel assembly IAW AB.FUEL, if P-10 is not available or the assembly is indexed above the upender.

B. Incorrect. Plausible because the candidate may believe that any core location is safe at this point of the fuel reload.
C. Incorrect. Plausible because the candidate may confuse the safe location in the FHB (X-3) with the one in Containment (P-10).
D. Correct. S2.OP-AB.FUEL-0001(Q), Fuel Handling Incident states; “Place the fuel assembly in the mast tube into the core in its designated location or the emergency location P-10 whichever is closer.”

Technical References:	S2.OP-AB.FUEL-0001(Q), Fuel Handling Incident and bases.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.2 / 41.10 / 43.6 / 45.13

K/A Match: The K/A is matched because the candidate is required to know the action required IAW S2.OP-AB.FUEL-0001(Q), Fuel Handling Incident so that system limits and precautions are met (prevent radiological release).

SRO Only: This question is SRO only because it requires the candidate to assess plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed. SRO Only because if requires knowledge of specific content of an abnormal operating procedure, not just the overall mitigation strategy. These fuel handling directions are also exclusive to the Refueling SRO / CRS.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		1
	Group #		2
	K/A #	000067AA2.04 Ability to determine and interpret the following as they apply to the Plant Fire on Site: The fire's extent of potential operational damage to plant equipment.	
Importance:		4.3	

Question: #83

Given:

- Unit 2 is at 100% Power.
- The crew receives confirmation of a fire in the Unit 2 Relay Room.
- The crew enters S2.OP-AB.FIRE-0001, Control Room Fire Response.

In accordance with S2.OP-AB.FIRE-0001, Which ONE of the following completes the statements below?

At 2RP2 Panel, the crew will SELECT "FIRE ____(1)_____ CONTROL AREA".

Based on the location of the fire, the crew ____(2)_____ required to DISPATCH an Operator to align the PORV Block Valve circuits to EMERG CLOSE per S2.OP-AB.FIRE-0001 Attachment 15, "PORV – EMERG CLOSE/NORMAL ALIGNMENT".

	(1)	(2)
A.	INSIDE	is **NOT**
B.	INSIDE	is
C.	OUTSIDE	is **NOT**
D.	OUTSIDE	is

Answer: B

Explanation / Justification

A. Incorrect. The first part is correct. Plausible because the candidate may not remember that the spurious opening of a PORV / Block valve is a concern with a Relay Room Fire. The candidate may remember that the PORVs and Block valves are closed from the control room per the procedure, but not remember the Attachment 15 requirement.
B. Correct. IAW S2.OP-AB.FIRE-0001(Q), Control Room Fire Response, if the fire area is the Relay Room (cooled by normal Control Room Area Air Conditioning) “FIRE INSIDE” will be selected. The procedure then ensures inventory control by closing the PORVs, Block Valves, and implementing Attachment 15 to align the PORV Block Valve circuits to EMERG CLOSE.
C. Incorrect. Plausible because the candidate may not remember that the Relay Room is part of the Control Room Area (cooled by normal Control Room Area Air Conditioning) and believe the proper selection would be “FIRE OUTSIDE”. Plausible because the candidate may not remember that the spurious opening of a PORV / Block valve is a concern with a Relay Room Fire. The candidate may remember that the PORVs and Block valves are closed from the control room per the procedure, but not remember the Attachment 15 requirement.
D. Incorrect. Plausible because the candidate may not remember that the Relay Room is part of the Control Room Area (cooled by normal Control Room Area Air Conditioning) and believe the proper selection would be “FIRE OUTSIDE”. The second part is correct.

Technical References:	S2.OP-AB.FIRE-0001(Q), Control Room Fire Response and bases.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Bank, Salem 17-01 Audit Exam, SRO Q8
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	43.5 / 45.13

K/A Match: The K/A is matched because the candidate is required to know the action required IAW S2.OP-AB.FIRE-0001(Q), Control Room Fire Response to a “Plant Fire on Site” and recognize the fire’s potential operational damage to plant equipment (PORV & PORV Block Valve circuits) due to a fire in the Relay Room.

SRO Only: This question is SRO only because it requires the candidate to assess plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed. SRO Only because if requires knowledge of specific content of an abnormal operating procedure, not just the overall mitigation strategy.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		1
	Group #		2
	K/A #	00WE10EA2.2 Ability to determine and interpret the following as they apply to the (Natural Circulation with Steam Void in Vessel with/without RVLIS): Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments.	
Importance:		3.9	

Question: #84

Given:

- Unit 2 tripped from 100% Power due to a Loss of Off-Site Power.
- It has been determined that a rapid natural circulation cooldown will be performed.

Complete the following statements concerning the procedural limitation in the natural circulation rapid cooldown rates of the RCS with and without RVLIS being available:

Note: 2-EOP-TRIP-5, Natural Circulation Rapid Cooldown without RVLIS
2-EOP-TRIP-6, Natural Circulation Rapid Cooldown with RVLIS

The cooldown rate of the RCS with RVLIS available will be limited to less than __(1)__, and the cooldown rate of the RCS without RVLIS available will be limited to less than __(2)__.

A. (1) 50 °F/hr for the initial cooldown to 500 °F, and then less than 100 °F/hr afterwards
(2) 100 °F/hr for the entire cooldown

B. (1) 50 °F/hr for the entire cooldown
(2) 100 °F/hr for the entire cooldown

C. (1) 100 °F/hr for entire cooldown
(2) 50 °F/hr for the initial cooldown to 500 °F, and then less than 100 °F/hr afterwards

D. (1) 100 °F/hr for the entire cooldown
(2) 50 °F/hr for the entire cooldown

Answer: C

Explanation / Justification

A. Incorrect. Plausible because the candidate may confuse the cooldown limit restrictions for with or without RVLIS.
B. Incorrect. Plausible because the candidate may confuse the cooldown limit restrictions for with or without RVLIS.
C. Correct. EOP-TRIP-5, Rapid Natural Circulation Cooldown without RVLIS restricts the initial cooldown to 500° to a maximum rate of less than 50°F/hr. The subsequent cooldowns in TRIP-5 are at a maximum rate of 100°F/hr. EOP-TRIP-6, Rapid Natural Circulation Cooldown with RVLIS allows a maximum rate of 100°F/hr for the entire cooldown.
D. Incorrect. Plausible because the candidate may confuse the cooldown limit restrictions for with or without RVLIS.

Technical References:	2-EOP-TRIP-5, Natural Circulation Rapid Cooldown without RVLIS and bases. 2-EOP-TRIP-6, Natural Circulation Rapid Cooldown with RVLIS.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Salem Vision Database
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	43.5 / 45.13

K/A Match: The K/A is matched because the candidate is required to know the procedural actions, including the specific cooldown rate restrictions (Tech Spec & EOP limitations) in both EOP-TRIP-5 & 6.

SRO Only: This question is SRO only because it requires the candidate to assess plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed. SRO Only because if requires knowledge of specific content of an abnormal operating procedure (specific cooldown limitations), not just the overall mitigation strategy.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		1
	Group #		2
	K/A #	00WE08EA2.2 Ability to determine and interpret the following as they apply to the (Pressurizer Thermal Shock): Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments.	
Importance:		4.1	

Question: #85

Given:

- Unit 2 is in MODE 3.
- RCS Temperature is 547°F
- RCS Pressure is 2235 psig.

Subsequently a LOCA occurs and the crew has **transitioned** from 2-EOP-TRIP-1, Reactor Trip or Safety Injection;

- RCS Pressure is 125 psig.
- RCS CETs read 380°F.
- RCS Cold Leg temperatures are 250°F.
- The RCS has cooled down > 100°F in the last 30 minutes.
- 22 RHR Pump failed to start.
- 21 RHR Pump is running providing 1150 gpm cold leg injection flow.

Based on the above conditions, complete the following statement;

Entry into 2-EOP-FRTS-1, RESPONSE TO IMMINENT PRESSURIZED THERMAL SHOCK CONDITIONS is …

A. made but NO actions are implemented before returning to procedure in effect.

B. NOT required since RCS pressure is below 350 psig.

C. made and a RCS temperature soak for a ONE hour period will be completed.

D. NOT required since S2.OP-AB.LOCA-0001, SHUTDOWN LOCA, will address any thermal shock concerns.

Answer: A

Explanation / Justification

E. Correct. 2-EOP-FRTS-1 is entered due to a PURPLE path on the CFSTs (RCS Cooldown > 100°F/hr, RCS T-colds > 230°F but < 280°F). The RCS Pressure Status step (1) then determines that RCS pressure is < 300 psig and that RHR flow is at least 300 gpm, directing a return to procedure in effect.

F. Incorrect. Plausible because the candidate may believe that because RCS pressure is less than 350 psig a transition to 2-EOP-FRTS-1 is not required. Incorrect as although the first step in FRTS reviews RCS pressure < 300 psig and RHR flow ≥ 300 gpm, entry into the procedure is still required due to the PURPLE path on the CFSTs.

G. Incorrect. Plausible because the candidate may remember 2-EOP-FRTS-1 requires a one-hour soak if the RCS cooldown has exceeded 100°F / hr. Incorrect as step 1 directs a return to the procedure in effect.

H. Incorrect. Plausible because the candidate may believe that since the plant started in MODE 3 that AB.LOCA-0001 would be the appropriate mitigating procedure. Incorrect as AB.LOCA is used during MODE 4 or MODE 3 with the accumulators isolated and neither of those conditions existed in the stem. The EOP network is appropriately entered in MODE 3, at normal operating pressure.

Technical References:	2-EOP-FRTS-1, Response to Imminent Pressurized Thermal Shock Conditions and Bases.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Bank – Salem Vision Database
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	43.5 / 45.13

K/A Match: The K/A is matched because the candidate is required to know the procedural actions (and limitations) in 2-EOP-FRTS-1, Response to Imminent Pressurized Thermal Shock Conditions and their basis. This includes entry conditions based on the CFSTs.

SRO Only: This question is SRO only because it requires the candidate to assess plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed. SRO Only because if requires knowledge of specific content of an abnormal operating procedure, not just the overall mitigation strategy. Requires knowledge of specific steps and decision parameters.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		2
	Group #		1
	K/A #	003G2.4.34 Reactor Coolant Pump – Knowledge of RO tasks performed outside the main control room during an emergency and the resultant operational effects.	
Importance:		4.1	

Question: #86

Given:

- A Control Room Evacuation has been initiated on Unit 2 in accordance with S2.OP-AB.CR-0001, Control Room Evacuation.

In accordance with S2.OP-AB.CR-0001, which ONE of the following describes the procedural actions taken outside the control room to maintain seal injection flows to each Reactor Coolant Pump?

Note: 2CV71, Charging Header Pressure Control Valve
2CV73, Seal Injection Pressure Control Bypass Valve
2CV55, Charging Flow Control Valve

A. Take local control of 2CV71 and 2CV55.

B. Take local control of 2CV71 and 23 Charging Pump speed controller.

C. Manually adjust 2CV73 and take local control of 23 Charging Pump speed controller.

D. Manually adjust 2CV73 and take local control of 2CV55.

Answer: D

Explanation / Justification

A. Incorrect. Plausible because certain fire protection response procedures direct controlling the CV-71 valve with a hand sender. Incorrect as AB.CR-0001 directs evacuation due to either a security event or control room atmosphere issues, not a fire. Also AB.CR-0001 directs local control of seal injection by isolating CV-71 (closing CV-70) and opening CV-73 (the CV-71 bypass) and manually adjusting the manual bypass valve. The second part is correct.

B. Incorrect. Plausible because certain fire protection response procedures direct controlling the CV-71 valve with a hand sender. The second part is also plausible as the potential exists to locally control the scoop tube for 23 Charging Pump and attempt to control flow. Incorrect as seal injection is controlled by CV-73 and a centrifugal charging pump IAW the abnormal procedure. 23 Charging pump is actually tripped by the procedure, once a centrifugal pump has been verified to be running.

C. Incorrect. The first part is correct. The second is plausible as the potential exists to locally control the scoop tube for 23 Charging Pump and attempt to control flow. Incorrect as seal injection is controlled by CV-73 and a centrifugal charging pump IAW the abnormal procedure. 23 Charging pump is actually tripped by the procedure, once a centrifugal pump has been verified to be running.

D. Correct. The procedural actions in S2.OP-AB.CR-0001(Q) direct local control of seal injection by isolating CV-71 (closing CV-70) and opening CV-73 (the CV-71 bypass) and manually adjusting the manual bypass valve. Total charging flow is then controlled locally at the charging flow control valve local controller in panel 216 using a centrifugal charging pump.

Technical References:	S2.OP-AB.CR-0001(Q), Control Room Evacuation and Bases.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Bank – Salem Vision Database
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.10 / 43.5 / 45.13

K/A Match: The K/A is matched because the candidate is required to know the procedural actions outside the control room IAW S2.OP-AB.CR-0001(Q), Control Room Evacuation for controlling RCP seal injection flow (resultant operational effects).

SRO Only: This question is SRO Only because if requires knowledge of specific content of an abnormal operating procedure, not just the overall mitigation strategy. Requires knowledge of specific steps and attachments.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		2
	Group #		1
	K/A #	006G2.4.47 Emergency Core Cooling – Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.	

Importance: 4.2

Question: #87

Given:

- Unit 2 was initially at 100% Power.

At T+0:

- A Large Break LOCA occurs.
- Automatic Rx Trip, Safety Injection, and Containment Spray have actuated.
- The CRS has transitioned to 2-EOP-LOCA-3, Transfer to Cold Leg Recirculation, from 2-EOP-TRIP-1, Reactor Trip or Safety Injection, based on RWST levels reaching 15.2 feet.
- RO reports following status of 2-EOP-LOCA-3 actions:
  - Containment Sump Levels are > 62 %
  - 21 and 22 SJ44 (Containment Sump Valves) are open.
  - 21 and 22 RHR Pumps are running.
  - 2SJ69 (Common Suction) is stroking closed.

At T+16 minutes:

- The 2SJ69 valve is closed and the following indications are reported by the Reactor Operator:
  - 21 and 22 RHR Pump amps are oscillating.
  - 21 and 22 RHR Pump flows are oscillating.
  - 21 and 22 RHR Pump discharge pressures are oscillating.

Note: 2-EOP-APPX-7, Containment Sump Blockage Guideline
2-EOP-LOCA-5, Loss of Emergency Recirculation

Based on the above conditions, what procedure will the CRS enter NEXT to address this event and what is the MINIMUM ECCS Flow Rate required for decay heat removal at T+16 minutes?

[REFERENCES PROVIDED]

A. 2-EOP-APPX-7; 500 gpm.

B. 2-EOP-LOCA-5; 500 gpm.

C. 2-EOP-APPX-7; 550 gpm.

D. 2-EOP-LOCA-5; 550 gpm.

Answer: C

Explanation / Justification

A. Incorrect. The first part is correct. The second part is plausible because the candidate may incorrectly read the log scale for time on the provided Figure A.
B. Incorrect. The first part is plausible because EOP-LOCA-5 would be the transition if the loss of recirculation was due to only mechanical or electrical component failures resulting in the inability to establish cold leg recirculation. The second part is plausible because the candidate may incorrectly read the log scale for time on the provided Figure A.
C. Correct. The correct transition is to EOP-APPX-7, Containment Sump Blockage Guideline because of the cavitation indications which would result from sump blockage. When approximately 16 minutes time elapsed is read from Figure A, the minimum ECCS Flow would be approximately 550 gpm.
D. Incorrect. The first part is plausible because EOP-LOCA-5 would be the transition if the loss of recirculation was due to only mechanical or electrical component failures resulting in the inability to establish cold leg recirculation. The second part is correct.

Technical References:	2-EOP-LOCA-3, Transfer to Cold Leg Recirculation and Bases. 2-EOP-LOCA-5, Loss of Emergency Recirculation and Bases. 2-EOP-APPX-7, Containment Sump Blockage Guideline and Bases.
Proposed References to be provided:	Figure A; Minimum ECCS Flow Versus Time After Trip (same figure in both LOCA-5 & APPX-7)
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.10 / 43.5 / 45.12

K/A Match: The K/A is matched because the candidate is required to know the procedural transition if cavitation indications exist and based on that diagnosis recognize that APPX-7 would then ensure that a minimum ECCS Flow was established using the stem conditions and Figure A (given).

SRO Only: This question is SRO only because it requires the candidate to assess plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed. It also requires knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		2
	Group #		1
	K/A #	013A2.04 Ability to (a) predict the impacts of the following malfunctions or operations on the ESFAS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations; Loss of instrument bus.	
Importance:		4.2	

Question: #88

Given:

- Unit 2 is at 100% Power.
- A Loss of 2B Vital Instrument Bus has occurred.
- No operator action has been taken.

Complete the following statements concerning an impact on Engineered Safety Feature Actuation System (ESFAS) instrumentation due to the loss of the Vital Instrument Bus.

(1) Prior to any operator action taken, the current Containment Pressure channel logic (coincidence) for the remaining channels to cause a Phase B actuation is __(1)__.

(2) In accordance with Technical Specification 3.3.2.1, *ESFAS Instrumentation*, the CRS will direct maintenance to remove the inoperable channel from service by placing the Containment Pressure HI-HI Bistable in the __(2)__ condition.

A. (1) 2/3
(2) Tripped

B. (1) 2/3
(2) Bypassed

C. (1) 1/3
(2) Tripped

D. (1) 1/3
(2) Bypassed

Answer: B

Explanation / Justification

A. Incorrect. The first part is correct. The second part is plausible as the candidate may believe the one bi-stable for Hi-Hi Containment Pressure has deenergized with the loss of the 2B Vital Instrument Bus. Incorrect as Containment Spray bi-stables are energized to actuate. Technical Specifications do not place the Containment Spray bi-stables in the tripped condition, they are bypassed to reduce the possibility of a spurious actuation of Containment Spray.
B. Correct. Containment Spray bi-stables are energized to actuate. The loss of the 2B Vital Instrument Bus will result in the Hi-Hi Containment Pressure bi-stable associated with 2B Vital Instrument Bus remaining in the deenergized state, therefore the logic will go from 2/4 to 2/3. Technical Specifications do not place the Containment Spray bi-stables in the tripped condition, they are bypassed to reduce the possibility of a spurious actuation of Containment Spray.
C. Incorrect. The first part is plausible because the candidate may remember that the High Containment Pressure SI logic is 2/3 channels and may believe the Hi-Hi Containment Pressure Containment Spray logic is 2/3 as well. Incorrect as the Hi-Hi logic is 2/4 channels. The second part is plausible in that most ESF actuation bi-stables are deenergized to trip and tech specs require those bi-stables to be placed in the tripped condition. Incorrect as Containment Spray bi-stables are energized to actuate. Technical Specifications do not place the Containment Spray bi-stables in the tripped condition, they are bypassed to reduce the possibility of a spurious actuation of Containment Spray.
D. Incorrect. The first part is plausible because the candidate may remember that the High Containment Pressure SI logic is 2/3 channels and may believe the Hi-Hi Containment Pressure Containment Spray logic is 2/3 as well. Incorrect as the Hi-Hi logic is 2/4 channels. The second part is correct.

Technical References:	S2.OP-AB.115-0002(Q), Loss of 2B 115V Vital Instrument Bus and Bases. ESFAS Instrumentation Technical Specification 3.3.2.1 and Bases.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Bank – Catawba 2017 NRC Exam – Q87
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.5 / 43.5 / 45.3 / 45.13

K/A Match: The K/A is matched because the candidate is required to know the effects of the loss of the 2B 115V Vital Instrument Bus as it relates to the Emergency Safeguards Features Actuation System and what procedural / tech spec actions are required based on the failure.

SRO Only: This question is SRO only because it requires the candidate to assess plant conditions (normal, abnormal, or emergency) and then selection of a procedure or technical specification action required. Technical Specification actions are below the line SRO knowledge items.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		2
	Group #		1
	K/A #	022A2.04 Ability to (a) predict the impacts of the following malfunctions or operations on the CCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of service water.	

Importance: 3.2

Question: #89

Given:

- Unit 2 is in MODE 4.
- Personnel performing work in Containment notify the Control Room of a large Service Water Cooler leak on 22 CFCU.
- The crew has entered S2.OP-AB.SW-0001, Loss of Service Water Header Pressure.

In accordance with S2.OP-AB.SW-0001, complete the following statements concerning isolating a service water leak on a CFCU:

(1) The CRS will direct stopping 22 CFCU and isolating the SW leak by closing the ____(1)___.

(2) The basis for this action is to___(2)___.

A. (1) SW58 (Inlet Water Valve) first and then the SW72 (Outlet Water Valve).
(2) allow closing the SW54 (CFCU SW Inlet) and SW76 (CFCU SW Outlet) in the field with a lower differential pressure across the valves.

B. (1) SW72 (Outlet Water Valve) first and then the SW58 (Inlet Water Valve).
(2) allow closing the SW54 (CFCU SW Inlet) and SW76 (CFCU SW Outlet) in the field with a lower differential pressure across the valves.

C. (1) SW58 (Inlet Water Valve) first and then the SW72 (Outlet Water Valve).
(2) minimize the possibility of water hammer following restoration.

D. (1) SW72 (Outlet Water Valve) first and then the SW58 (Inlet Water Valve).
(2) minimize the possibility of water hammer following restoration.

Answer: D

Explanation / Justification

A. Incorrect. Plausible because the candidate may believe that the inlet valve would be closed first to allow the CFCU to drain. The candidate may also believe this action will result in a lower differential across the manual valves located in the field on 78’ elevation.
B. Incorrect. The first part is correct. The second part is plausible because the candidate may also believe this action will result in a lower differential across the manual valves located in the field on 78’ elevation.
C. Incorrect. Plausible because the candidate may believe that the inlet valve would be closed first to allow the CFCU to drain. The second part is correct.
D. Correct. S2.OP-AB.SW-0001(Q), Loss of Service Water Header Pressure, Attachment 5 directs the closure order of SW72 (Outlet) first to minimize water hammer potential.

Technical References:	S2.OP-AB.SW-0001(Q), Loss of Service Water Header Pressure and Bases.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.5 / 43.5 / 45.3 / 45.13

K/A Match: The K/A is matched because the candidate is expected to know that isolation instructions are provided in attachment 5 of the abnormal procedure (use procedures) and they are also required to know the specific procedural actions for isolating a leaking CFCU. Included in the isolation specifics is any impact that isolation has on design / technical specifications (water hammer / thermal relief).

SRO Only: This question is SRO only because it requires the candidate to assess plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed. SRO Only because if requires knowledge of specific content of an abnormal operating procedure (valve closure sequence & precautions), not just the overall mitigation strategy. Requires knowledge of specific steps and decision parameters. The question also requires the knowledge of specific design precautions (water hammer & thermal relief).

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		2
	Group #		1
	K/A #	073A2.02 Ability to (a) predict the impacts of the following malfunctions or operations on the PRM system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Detector Failure.	
Importance:		3.2	

Question: #90

Given:

- Unit 2 is at 100% Power.
- 21 CVCS Monitor Tank is in a recirculation lineup in accordance with S2.OP-SO.WL-0001, Release of Radioactive Liquid Waste from 21 CVCS Monitor Tank, in preparation for Chemistry Sampling and future release authorization by the Control Room Supervisor.

Complete the following statements concerning the expected response to the instrument failure and additional actions required in accordance with S2.OP-SO.WL-0001 to continue the liquid radioactive release based on the instrument failure.

(1) The 2R18 experiences a detector failure causing the monitor to fail LOW. The 2WL51, Liquid Release Stop Valve, __(1)__ automatically close.

(2) To continue the release, the CRS will verify 2FR1064, Radwaste Overboard Discharge Flow Recorder, is Operable __(2)__ perform two independent samples, independent release calculations, and independent discharge valve lineups.

A. (1) will NOT
(2) AND

B. (1) will
(2) OR

C. (1) will NOT
(2) OR

D. (1) will
(2) AND

Answer: A

Explanation / Justification

A. Correct. The R18 failing low will not cause the WL51 to close. S2.OP-SO.WL-0001(Q), Release of Radioactive Liquid Waste From 21 CVCS Monitor Tank ensures that if 2R18 is inoperable, then 2FR1064 must remain operable. (see steps 2.3, 3.4, and 3.5) Although the ODCM 3.3.3.8 allows flow rate to be estimated if the 2FR1064 is inoperable, the release procedure prevents both from being inoperable at the same time. ODCM 3.3.3.8 action b states; "exert best efforts to return the instrument to OPERABLE status within 30 days and, if unsuccessful, explain in the next radioactive effluents release report why the inoperability was not corrected in a timely manner."
B. Incorrect. The first part is plausible because the candidate may remember that a high alarm on R18 will automatically close WL51. Incorrect as the R18 failed low. The second part is plausible because the candidate may remember that per the ODCM, 2FR1064 can be inoperable if flow rate is estimated at least once per 4 hours during actual releases. Incorrect as the release procedure specifically requires that if the R18 is inoperable, then the 2FR1064 must be OPERABLE. The second part is correct.
C. Incorrect. The first part is correct. The second part is plausible because the candidate may remember that per the ODCM, 2FR1064 can be inoperable if flow rate is estimated at least once per 4 hours during actual releases. Incorrect as the release procedure specifically requires that if the R18 is inoperable, then the 2FR1064 must be OPERABLE.
D. Incorrect. The first part is plausible because the candidate may remember that a high alarm on R18 will automatically close WL51. Incorrect as the R18 failed low. The second part is correct.

Technical References:	ODCM LCO 3.3.3.8 and Bases. S2.OP-SO.WL-0001
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.5 / 43.5 / 45.3 / 45.13

K/A Match: The K/A is matched because the candidate is required to know the impact of a Process Rad Monitor detector failure and the procedural and ODCM actions required to mitigate the consequences.

SRO Only: The question is SRO Only because it requires the candidate to have knowledge of TS / ODCM specific actions. The question also requires specific knowledge of operability requirements identified in the release procedure.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		2
	Group #		2
	K/A #	011A2.04	
		Ability to (a) predict the impacts of the following malfunctions or operations on the PZR LCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of one, two or three charging pumps.	
Importance:		3.7	

Question: #91

Given:

- Unit 2 is in MODE 1 at approximately 8 % Power. Power ascension in progress.
- 23 Charging Pump is cleared and tagged for maintenance.
- 22 Charging Pump is in service.

Subsequently;

- 2C 4KV Bus de-energizes due to a differential fault on the bus.
- The crew starts 21 Charging Pump, but it trips on overcurrent.

Complete the following statement concerning the procedural action required to be taken.
The CRS will initiate ___________.

Note: S2.OP-AB.4KV-0003, Loss of 2C 4KV Vital Bus
S2.OP-AB.CVC-0001, Loss of Charging
2-EOP-TRIP-1, Reactor Trip or Safety Injection

A. S2.OP-AB.4KV-0003 to re-energize the 2C bus from the 2C Emergency Diesel Generator, then start 22 Charging Pump.

B. S2.OP-AB.CVC-0001, to trip the Rx, confirm the Rx trip, initiate SI, and then enter 2-EOP-TRIP-1.

C. S2.OP-AB.4KV-0003, to trip the reactor and then enter 2-EOP-TRIP-1

D. S2.OP-AB.CVC-0001, and direct Unit 1 to start 13 Charging Pump using Unit 1 RWST.

Answer: D

Explanation / Justification

A. Incorrect. Plausible because the S2.OP-AB.4KV-0003(Q) does verify that the 2C Bus is energized from the 2C EDG and then starts and stops 2C Vital Bus Loads as necessary. Incorrect as the bus is not energized from the EDG due to the bus differential fault.
B. Incorrect. Plausible because Tripping the Reactor and initiating Safety Injection is a possible action in S2.OP-AB.CVC-0001(Q) due to PZR Level not being able to be maintained. The candidate may believe that letdown is still in service and that PZR level is lowering in an uncontrolled manner.
C. Incorrect. Plausible because Tripping the Reactor is a possible CAS action in S2.OP-AB.4KV-0003(Q). The candidate may believe that it is a conservative action due to the 2C bus being deenergized and no pressurizer level control.
D. Correct. With no Unit 2 Charging Pumps available, step 3.50 of S2.OP-AB.CVC-0001(Q), Loss of Charging states; "COORDINATE with Unit 1 to place 13 Charging Pump in service using U/1 RWST."

Technical References:	S2.OP-AB.CVC-0001(Q), Loss of Charging and Bases. S2.OP-AB.4KV-0003(Q), Loss of 2C 4KV Vital Bus and Bases.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Modified Bank – ILOT 16-01 Audit Exam, Q53
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.5 / 43.5 / 45.3 / 45.13

K/A Match: The K/A is matched because the candidate is required to know the effects of the malfunction (loss of all charging pumps) on Pressurizer Level (letdown isolated, level very slowly lowering due to seal leakoff flows) and then the specific procedural actions to mitigate the malfunction's effects.

SRO Only: The question is SRO Only because it requires an assessment of plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed. This requires specific procedural knowledge beyond general mitigation strategy.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		2
	Group #		2
	K/A #	028G2.1.20 Hydrogen Recombiner and Purge Control - Ability to interpret and execute procedure steps.	
Importance:		4.6	

Question: #92

Given:

- The Unit 2 crew is performing 2-EOP-LOCA-1, Loss of Reactor Coolant, Step 24, "Containment Hydrogen Concentration."
- Containment Hydrogen Concentration is 2.1 %.

In accordance with 2-EOP-LOCA-1, which of the following describes the required procedural action(s)?

A. Start ONLY one Hydrogen Recombiner.

B. Start BOTH Hydrogen Recombiners.

C. Continue in 2-EOP-LOCA-1 until Containment Hydrogen concentration reaches 4.0%.

D. Consult TSC for additional recovery actions and continue in 2-EOP-LOCA-1.

Answer: A

Explanation / Justification

A. Correct. IAW 2-EOP-LOCA-1, if hydrogen concentration is between 0.5% and 4.0%, then only one hydrogen recombiner is started.
B. Incorrect. Plausible because the operating procedure would start two recombiners if hydrogen concentration was 2.0% and rising. Candidate may also believe that the EOP starts both recombiners.
C. Incorrect. Plausible because 4.0% is a decision parameter used in EOP-LOCA-1, step 24. Incorrect because concentration less than 4.0% results in the procedure directing the start of one recombiner.
D. Incorrect. Plausible because consulting the TSC would have been the correct answer if hydrogen concentration was ≥ 4.0%.

Technical References:	2-EOP-LOCA-1, Loss of Reactor Coolant and Bases. S2.OP-SO.CAN-0001(Q), Hydrogen Recombiner Operation.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Bank – ILOT 17-01 SRO NRC Exam – Q16
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.10 / 43.5 / 45.12

K/A Match: The K/A is matched because the candidate is required to know procedural actions for containment hydrogen concentration.

SRO Only: The question is SRO Only because it requires the assessment of plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or which to proceed (concurrent use of S2.OP-SO.CAN-0001 and LOCA-1). The candidate needs to know specific guidance (hydrogen concentration ranges per LOCA-1) to answer the question, not just overall mitigation strategy.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		2
	Group #		2
	K/A #	056A2.04 Ability to (a) predict the impacts of the following malfunctions or operations on the Condensate System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of condensate pumps.	
Importance:		2.8	

Question: #93

Given:

- Unit 2 is at 100% Power.
- All Condensate Pumps are in service.
- All Heater Drain Pumps are in service.
- The Condensate Polisher is in service.

Subsequently, 21 Condensate Pumps trips.

Complete the following statement regarding the required actions the CRS will direct in accordance with S2.OP-AB.CN-0001(Q), Main Feedwater / Condensate System Abnormality;

The CRS will direct the opening of the 21-23CN108, Polisher Bypass Valves if SGFP Suction Pressure is less than ___(1)___ and reduce Reactor Power to a MAXIMUM of ___(2)___.

A. (1) 265 psig
   (2) 75%

B. (1) 320 psig
   (2) 75%

C. (1) 320 psig
   (2) 85%

D. (1) 265 psig
   (2) 85%

Answer: C

Explanation / Justification

A. Incorrect. The first part is plausible because the CN47 will control in automatic to maintain a minimum of greater than 265 psig SGFP suction pressure. Incorrect as S2.OP-AB.CN-0001(Q), Main Feedwater/ Condensate System Abnormality directs their opening if SGFP suction pressure is less than 320 psig. The second part is plausible as 75% is the power level where the third condensate pump is started in accordance with IOP-4 during a power accession.
B. Incorrect. The first part is correct. The second part is plausible as 75% is the power level where the third condensate pump is started in accordance with IOP-4 during a power accession.
C. Correct. S2.OP-AB.CN-0001(Q), Main Feedwater/ Condensate System Abnormality directs the opening of 21-23CN108, Polisher Bypass Valves if SGFP suction pressure is less than 320 psig. S2.OP-AB.CN-0001(Q), Attachment 2 directs a power reduction to 85% or less.
D. Incorrect. The first part is plausible because the CN47 will control in automatic to maintain a minimum of greater than 265 psig SGFP suction pressure. Incorrect as S2.OP-AB.CN-0001(Q), Main Feedwater/ Condensate System Abnormality directs their opening if SGFP suction pressure is less than 320 psig. The second part is correct.

Technical References:	S2.OP-AB.CN-0001(Q), Main Feedwater/ Condensate System Abnormality and Bases.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.5 / 43.5 / 45.3 / 45.13

K/A Match: The K/A is matched because the candidate is required to know the impacts on the condensate system from a condensate pump trip (any auto actions, system response) and any procedurally directed mitigating actions (valve manipulations / load reductions).

SRO Only: The question is SRO Only because it requires an assessment of plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed. This requires specific procedural knowledge beyond general mitigation strategy. It also required knowledge of when to implement attachments and coordinate with procedural steps.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		3
	Group #		COO
	K/A #	G2.1.40 Knowledge of refueling administrative requirements.	
Importance:		3.9	

Question: #94

Select from the choices below that contains **ONLY** actions directed to be performed in accordance with S2.OP-IO.ZZ-0007, Cold Shutdown to Refueling, **BEFORE** Reactor Head De-tensioning would be initiated for a refueling outage starting on November 1st.

1. The Reactor shall be subcritical for at least 168 hours.
2. Verify each valve that isolates unborated water sources is secured in the closed position.
3. Any two of the Source Range and/or Gamma-Metrics neutron monitors are Operable.
4. Continuous communications between the control room and refuel floor is established.

A. 1, 2, and 3 Only.

B. 1, 2, 3, and 4.

C. 2 and 3 Only.

D. 1 and 4 Only.

Answer: C

Explanation / Justification

A. Incorrect. Plausible because 2 and 3 are correct. Plausible because the candidate knows that Tech Spec 3.9.3 requires the reactor to be subcritical for at least 168 hours for a refueling starting between May 16th and Oct 14th. Incorrect as the date is outside that range in November and only 80 hours subcritical is required for the period between Oct 15th and May 15th. Also, incorrect because that spec is for movement of irradiated fuel, not de-tensioning.

B. Incorrect. Plausible because the candidate may also remember that IOP-7 requires direct communications between the Control Room and personnel at the refueling station. Incorrect as this is a requirement, 1 hour prior to the start of CORE ALTERATIONS, not de-tensioning.
C. Correct. In order to enter MODE 6 (de-tension the first Rx Head Stud), at least two source range neutron detectors are required to be operable (source or Gamma-Metrics), and per Technical Specification 3.9.2.1 and IOP-7, Attachment 1, the completion of S2.OP-ST.ZZ-0007(Q), Refueling Operations/Unborated Water Source Isolation Valves is required.
D. Incorrect. Number 1 is plausible because the candidate knows that Tech Spec 3.9.3 requires the reactor to be subcritical for at least 168 hours for a refueling starting between May 16th and Oct 14th. Incorrect as the date is outside that range in November and only 80 hours subcritical is required for the period between Oct 15th and May 15th. Also, incorrect because that spec is for movement of irradiated fuel, not de-tensioning. Number 4 is plausible because the candidate may also remember that IOP-7 requires direct communications between the Control Room and personnel at the refueling station. Incorrect as this is a requirement, 1 hour prior to the start of CORE ALTERATIONS, not de-tensioning.

Technical References:	S2.OP-IO.ZZ-0007(Q), Cold Shutdown to Refueling, Technical Specifications 3.9.2.1 (Unborated Water Source Isolation Valves) and 3.9.2.2 (Instrumentation).
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Modified – Salem 2015 NRC SRO Exam, Q20
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.10 / 43.5 / 45.13

K/A Match: The K/A is matched because the candidate is required to know the administrative requirements for entering MODE 6, REFUELING.

SRO Only: The question is SRO Only because it requires knowledge of administrative requirements associated with refueling activities.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		3
	Group #		COO
	K/A #	G2.1.34 Knowledge of primary and secondary plant chemistry limits.	
Importance:		3.5	

Question: #95

Given:

- Unit 2 is at 100% Power.
- Chemistry has removed the Condensate Polisher due to emergent issue and is NOT available for service.

Subsequently, the following alarms and indications are received in the Control Room:

- Bezel alarm CONDENSATE PUMP DISCH SODIUM HI.
- Bezel alarm HOTWELL OUTLET CONDUCTIVITY HI.
- Bezel alarm CONDENSATE PUMP DISCH CONDUCTIVITY HI.
- Condensate Pump Discharge sodium is 15 ppb.
- 21A Hotwell Cation Conductivity is 0.5 μS/cm and rising.
- Chemistry has validated a tube leak exists in the 21A Waterbox.

Assume the Chemistry parameters above continue over the next hour.
Which ONE of the following describes the actions required in accordance with S2.OP-AB.CHEM-0001, Abnormal Secondary Plant Chemistry?

[**REFERENCE PROVIDED**]

A. Maximize SGBD flow, Emergency Trip 21A Circulator, and reduce power to ≤ 50 % power within 24 hours.

B. Reduce SGBD flow to minimum, Emergency Trip 21A Circulator, and commence a plant shutdown as quickly as possible.

C. Adjust SGBD Flow per Chemistry, continue to monitor secondary chemistry, 21A Circulator can remain in service.

D. Stop 21A Circulator, transfer SGBD to 22 Condenser, reduce power to ≤ 83 %, and adjust SGBD Flow per Chemistry.

Answer: B

Explanation / Justification

A. Incorrect. Plausible because the candidate may believe that raising SGBD will lower impurities. The second action is correct. Reducing load to < 50% is plausible as this would is directed by the procedure if Action Level 2 Limits are met.
B. Correct. With the Condensate Polisher unavailable, a large Condenser Tube Leak, and Condensate Pump discharge sodium levels ≥ 2 ppb, then actions IAW Attachment 3 are applicable. When polishers are bypassed and sodium is > 2 ppb, Steam Generator chemistry can significantly degrade, and immediate actions are required to commence a plant shutdown as quickly as possible.
C. Incorrect. Plausible because the candidate may believe that maximizing blowdown will help improve the chemistry. Remaining action is plausible if the polisher is still available and the candidate missed the information about the abnormal reading being present for 1 hour.
D. Incorrect. Plausible because these actions could be performed if after stopping the Circulator, SGBD sodium increased to Action Level 1 values.

Technical References:	S2.OP-AB.CHEM-0001(Q), Abnormal Secondary Plant Chemistry and Bases.
Proposed References to be provided:	**S2.OP-AB.CHEM-0001(Q)**
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.10 / 43.5 / 45.12

K/A Match: The K/A is matched because the candidate is required to know the required abnormal procedure action for high secondary chemistry sodium levels.

SRO Only: The question is SRO Only because it requires assessment of plant conditions (normal, abnormal, or emergency) and then selection of a procedure or section of a procedure to mitigate or recover, or with which to proceed. Knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		3
	Group #		EC
	K/A #	G2.2.7 Knowledge of the process for conducting special or infrequent tests.	
Importance:		3.6	

Question: #96

Given:

- Unit 2 is in MODE 5.
- A surveillance test is planned that involves a significant risk to Decay Heat Removal, if the test is not performed correctly a loss of Decay Heat Removal could occur.
- A Special Test or Evolution Coordinator has been assigned to determine if there is a need to implement special administrative and management controls in accordance with OP-AA-108-110, Evaluation of Special Tests or Evolutions.

Based on the above information, complete the following statements concerning special test or evolution conducted in accordance with OP-AA-108-110.

(1) The procedure or evolution is classified as a special test or evolution when the activity is complex __(1)__ infrequently performed.

(2) The __(2)__ approves IMPLEMENTATION of a special test or evolution.

A. (1) AND
(2) Operations Shift Management

B. (1) OR
(2) Operations Shift Management

C. (1) AND
(2) Responsible Senior Line Manager

D. (1) OR
(2) Responsible Senior Line Manager

Answer: B

Explanation / Justification

A. Incorrect. Plausible because both questions are asked IAW Attachment 2 of OP-AA-108-110. Incorrect as only one question needs to be answered yes to identify the surveillance test as a “Special Test or Evolution”. The second part of the answer is correct.
B. Correct. Both questions are asked IAW Attachment 2 of OP-AA-108-110 and only one needs to be answered yes identify the surveillance test as a “Special Test or Evolution”. Step 3.4.1 of OP-AA-108-110 states; “Operations Shift Management approves implementation of the special test or evolution.”
C. Incorrect. Plausible because both questions are asked IAW Attachment 2 of OP-AA-108-110. Incorrect as only one question needs to be answered yes to identify the surveillance test as a “Special Test or Evolution”. Plausible because the Senior Line Manager (SLM) ensures activities are screened, management involvement and oversight and appoints a Special Test or Evolution Coordinator. The candidate may believe the SLM also approves implementation.
D. Incorrect. Plausible because the first part of the answer is correct. Plausible because the Senior Line Manager (SLM) ensures activities are screened, management involvement and oversight and appoints a Special Test or Evolution Coordinator. The candidate may believe the SLM also approves implementation.

Technical References:	OP-AA-108-110, Evaluation of Special Tests or Evolutions.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.10 / 43.3 / 45.13

K/A Match: The K/A is matched because the candidate is required to know the process for conducting special or infrequent tests (screening for and implementation approval).

SRO Only: The question is SRO Only because it requires assessment of plant conditions and tasks (tests) for risk, complexity and frequency. This and activity (test) implementation approval are SRO Only tasks.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		3
	Group #		EC
	K/A #	G2.2.21	
		Knowledge of the pre- and post-maintenance operability requirements.	

Importance: 4.1

Question: #97

Given:

- Unit 1 is at 100% Power.
- 12 Charging Pump is scheduled to be cleared and tagged for Preventative Maintenance.
- The Preventative Maintenance Tasks are expected to take 24 hours to complete.

Complete the following statements concerning the implementation of OP-AA-108-116, Protected Equipment Program.

(1) The __(1)__ has overall authority of the protected equipment program.

(2) Prior to tagging 12 Charging Pump, redundant equipment must be protected when it's unavailability or manipulation could cause ___(2)__.

A. (1) Shift Manager
(2) entry into Tech Spec 3.0.3 or the unit to be in Hot Shutdown in 12 hours or less.

B. (1) Work Control Supervisor
(2) entry into Tech Spec 3.0.3 or the unit to be in Hot Shutdown in 12 hours or less.

C. (1) Work Control Supervisor
(2) overall online risk assessment to change to Orange.

D. (1) Shift Manager
(2) overall online risk assessment to change to Orange.

Answer: A

Explanation / Justification

A. Correct. The Shift Manager has overall authority of the protected equipment program. Step 4.2.1 of OP-AA-108-116 states; "Prior to removal of SSCs from service, protect redundant equipment if plant configuration is such that a single piece of redundant equipment unavailability or manipulation would cause: An entry into Tech Spec 3.0.3 …" In this case the loss of 11 Charging Pump would result in a 3.0.3 entry.
B. Incorrect. The first part is plausible because the Work Control Supervisor is responsible for facilitating the tagging of equipment and ensuring protected equipment is walked down each shift. The second part is correct.
C. Incorrect. The first part is plausible because the Work Control Supervisor is responsible for facilitating the tagging of equipment and ensuring protected equipment is walked down each shift. The second part is plausible if the candidate believes that if manipulations would cause an overall increase in online risk assessment, then equipment must be protected. Incorrect as step 4.2.1 of OP-AA-108-116 specifically states; "if manipulations would cause an overall online risk assessment change to RED risk", not ORANGE.
D. Incorrect. The first part is correct. The second part is plausible if the candidate believes that if manipulations would cause an overall increase in online risk assessment, then equipment must be protected. Incorrect as step 4.2.1 of OP-AA-108-116 specifically states; "if manipulations would cause an overall online risk assessment change to RED risk", not ORANGE.

Technical References:	OP-AA-108-116, Protected Equipment Program.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	New
Question Cognitive Level:	Comprehension
10CFR Part 55 Content:	41.10 / 43.2

K/A Match: The K/A is matched because the candidate is required to know pre-maintenance responsibilities ensuring operability of redundant equipment.

SRO Only: The question is SRO Only because it involves an exclusive SRO task, one that the Shift Manager has overall authority for. The Shift Manager has final authority in determining systems and equipment to be protected.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		3
	Group #		RC
	K/A #	G2.3.11 Ability to control radiation releases.	

Importance: 4.3

Question: #98

Given:

- Unit 1 is shutdown during a refueling outage.
- A normal release of 14 Waste Gas Decay Tank to the plant vent is scheduled to be performed on day shift in accordance with S1.OP-SO.WG-0011, Discharge of 14 Gas Decay Tank (WGDT).

When reviewing the schedule, which of the following activities is procedurally allowed to be scheduled during the period 14 WGDT is being released?

A. Aligning Unit 2 Vent Header to Unit 1 Waste Gas Compressor suction.

B. Transfer of gas between 12 and 13 WGDTs.

C. Release of 11 WGDT.

D. Initiation of Unit 1 VCT Purge.

Answer: D

Explanation / Justification

A. Incorrect. Plausible because the candidate may believe that waste gas can be transferred between the units just like liquid waste.
B. Incorrect. Plausible because the candidate may believe that transfers between other tanks are possible. Incorrect as the discharge procedure, S1.OP-SO.WG-0011 specifically states on P&L 3.3; “DO NOT transfer Waste Gas from one GDT to another during the GDT Release.”
C. Incorrect. Plausible because the candidate may believe that the release of more than one GDT at a time is allowed. Incorrect as the discharge procedure, S1.OP-SO.WG-0011 specifically states on P&L 3.2; “DO NOT release more than one GDT at a time.”
D. Correct. S1.OP-SO.WG-0011 does not prohibit the purging of the VCT while a GDT release is in progress. S1.OP-SO.WG-0005(Q), VCT Purge to the Plant Vent specifically allows it (step 1 of the VCT Purge Radioactive Gaseous Release Form).

Technical References:	S1.OP-SO.WG-0011(Q), Discharge of 14 Gas Decay Tank to Plant Vent and S1.OP-SO.WG-0005(Q), VCT Purge to the Plant Vent.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Bank – Salem 2016 NRC Exam – Q98
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.11 / 43.4 / 45.10

K/A Match: The K/A is matched because the candidate is required to know administrative requirements controlling the release of gaseous waste to the environment.

SRO Only: The question is SRO Only because it requires assessment of plant conditions and tasks (releases) and the determination of administrative requirements controlling the release of gaseous waste to the environment. The SRO is responsible for approving gaseous releases.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		3
	Group #		EP
	K/A #	G2.4.37	
		Knowledge of the lines of authority during implementation of the emergency plan.	

Importance: 4.1

Question: #99

An event has occurred on Salem Unit 1:

- The TSC is ACTIVATED.
- The EOF is MANNED and **NOT** ACTIVATED.

In accordance with NC.EP-EP.ZZ-0102, Emergency Coordinator Response, which ONE of the following describes the individual responsible for escalating an emergency event level from a Site Area Emergency (SAE) to a General Emergency (GE)?

A. The Shift Manager.

B. The Emergency Duty Officer.

C. The Emergency Response Manager.

D. The Site Vice President.

Answer: B

Explanation / Justification

A. Incorrect. Plausible because if the TSC was not activated, the Shift Manager would be responsible. Plausible because the Shift Manager is responsible for making all emergency status change announcements in the control room. Incorrect as the TSC is activated.
B. Correct. With the TSC activated, the Emergency Coordinator responsibilities shift to the EDO.
C. Incorrect. Plausible because if both the TSC and EOF were activated, the Emergency Response Manager would be the Emergency Coordinator. Incorrect as the EOP is not activated.
D. Incorrect. Plausible because the candidate may remember that the Site Vice President may be assigned to an Emergency Plan Position, including the Emergency Response Manager. Incorrect as the position is filled with a number of senior management individuals. The authority is based on the individual's E-Plan position, not his management title.

Technical References:	NC.EP-EP.ZZ-0102(Q), Emergency Coordinator Response.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Bank – Hope Creek 2015 NRC Exam – Q97
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.10 / 45.13

K/A Match: The K/A is matched because the candidate is required to know the lines of authority for the implementation of the emergency plan. The transfer of responsibility by facility.

SRO Only: The question is SRO Only because it involves an exclusive SRO task, the Shift Manager's role in the Emergency Plan implementation and the transfer of that responsibility when various emergency facilities activate.

Exam Outline Cross Reference:	Level:	RO	SRO
	Tier #		3
	Group #		EP
	K/A #	G2.4.14 Knowledge of general guidelines for EOP usage.	

Importance: 4.5

Question: #100

Unit 2 was initially operating at 100% Power when the following sequence of events occurs;

- The reactor trips.
- A valid demand for Safety Injection occurs.
- The crew enters 2-EOP-TRIP-1, Reactor Trip or Safety Injection.

Subsequently, the following occurs;

- 23 AFW Pump tripped on overspeed and cannot be reset due to trip throttle valve damage.
- 21 AFW Pump is tagged out for impeller replacement.
- 22 AFW Pump has tripped on motor overcurrent.
- All Steam Generator NR Levels are < 9%.
- All Steam Generator Pressures are stable.

Which ONE of the following indicates the proper procedural usage of the Emergency Operating Procedures (EOPs)?

Note: 2-EOP-FRHS-1, Loss of Secondary Heat Sink
CFST, Critical Safety Function Status Trees

A. Immediately transition to 2-EOP-FRHS-1.

B. Complete all immediate actions of 2-EOP-TRIP-1, then transition to 2-EOP-FRHS-1.

C. Continue to perform 2-EOP-TRIP-1 until directed to transition to 2-EOP-FRHS-1.

D. Continue to perform 2-EOP-TRIP-1 until CFST monitoring is directed, then transition to 2-EOP-FRHS-1.

Answer: C

Explanation / Justification

A. Incorrect. Plausible because the candidate may believe that CFSTs are applicable as soon as EOP-TRIP-1 is initiated.
B. Incorrect. Plausible because OP-AA-101-111-1003, Use of Procedures states; “continuous required actions apply as soon as the immediate actions are verified.” Incorrect as the TRIP-1 procedure CAS statements do not include a transition to FRHS-1.
C. Correct. Step 20 of EOP-TRIP-1 specifically directs the implementation of EOP-FRHS-1 when aux feed flow cannot be established.
D. Incorrect. Plausible because OP-AA-101-111-1003, Use of Procedures states; “the functional restoration transitions apply only after EOP-TRIP-1 specifically directs the operator to begin monitoring the Critical Function Status Trees.” This is step 30 of EOP-TRIP-1. Incorrect as both FRSM and FRHS both have specific CFST transitions before step 30.

Technical References:	OP-AA-101-111-1003, Use of Procedures. 2-EOP-TRIP-1, Reactor Trip or Safety Injection and bases.
Proposed References to be provided:	None.
Learning Objective:	N/A
Question Source:	Bank – Salem Vision Database.
Question Cognitive Level:	Fundamental
10CFR Part 55 Content:	41.10 / 45.13

K/A Match: The K/A is matched because the candidate is required to know general guidelines for EOP usage, including CFST transitions from EOP-TRIP-1, Reactor Trip or Safety Injection. (Section 4.2.5 of OP-AA-101-111-1003, Use of Procedures)

SRO Only: The question is SRO Only because it requires knowledge of EOP usage guidelines, specifically CFST transitions rom EOP-TRIP-1. The SRO coordinates implementation of the EOPs, is responsible for the correct implementation of EOPs, and interpreting EOP intent.