**Question 1**
**007EK3.01**
**Reactor Trip - Stabilization - Recovery**
**Knowledge of the reasons for the following as the apply to a reactor trip:**
**Actions contained in EOP for reactor trip**

Which ONE of the following describes an action and the reason for that action, in accordance with EP/1/A/5000/E-0 (Reactor Trip or Safety Injection)?

**A. Verify all area monitor EMF Trip 1 lights dark.**
**Used to diagnose a LOCA outside of containment**

B. Isolate the ruptured S/G.
Prevent exceeding offsite dose limits.

C. Verify Monitor Light Panel Sp Lights lit.
Ensure ECCS flow path is properly aligned.

D. Trip all NCPs.
To reduce heat input into the NC system.

## QUESTION 1

### Distractor Analysis

A. **CORRECT.** E-0 step 42 directs the operator to verify auxiliary building radiation (per area monitor EMFs) to diagnose a LOCA outside containment. This is explained in the Background Document for E-0, step 42.

B. Incorrect. Isolation of a ruptured S/G is required for the purpose of limiting offsite dose, but this action is performed in E-3.

C. Incorrect. E-0 does contain an action for verifying Monitor Light Panel Sp lights, but the reason is for containment isolation vs. ECCS flowpath.

D. Incorrect. E-0 does contain an action for tripping all NCPs, but the reason is limiting mass loss through the break vs. heat input.

**References:**
- EP/1/A/5000/E-0 (Reactor Trip or Safety Injection), Rev. 042, step 42
- EBG/1/5000/E-0 (Background Document for E-0), Rev. 027, steps 10, 42, Encl. 1, step 1
- EBG/1/5000/E-3 (Background Document for E-3), Rev. 023, step 4

**KA Match:**
The applicant is required to recall actions contained within the procedure addressing a reactor trip and the reason for that action.

**Cognitive Level:** **Low**

**Source of Question:** **Bank 801**

**Question 2**
**008AK2.03**
**Pressurizer Vapor Space Accident (Relief Valve Stuck Open)**
**Knowledge of the interrelations between the Pressurizer Vapor Space Accident and the following: Controllers and positioners**

Given the following sequence of events:

- Unit 1 is at 100% power.
- 1NC-35B (PZR PORV Isol) is in the "CLOSE" position due to a seat leak on 1NC-36B (PZR PORV).

**Subsequently:**

- A pressure transient resulted in an NC system pressure increase.
- 1NC-34A (PZR PORV) opened but did not re-close.
- NC pressure is 2200 psig and decreasing.
- 1NC-34A is manually isolated using 1NC-33A (PZR PORV Isol).

(1) What is the current MCB switch position for 1NC-33A?

(2) Which Selected Pressurizer Pressure channel is designed to provide a BLOCK signal to 1NC-34A on decreasing pressure?

A. (1) CLOSE
(2) Selected Pressurizer Pressure 1 (SPP-1)

B. (1) OVERRIDE
(2) Selected Pressurizer Pressure 1 (SPP-1)

C. (1) CLOSE
(2) Selected Pressurizer Pressure 2 (SPP-2)

**D. (1) OVERRIDE**
**(2) Selected Pressurizer Pressure 2 (SPP-2)**

**QUESTION 2**

**Distractor Analysis**

A. Incorrect. First part is plausible if the applicant is does not recognize the significance of one PORV isolation valve being previously closed, or has not mastered knowledge of the interlock associated with the PORV isolation valves. Second part is plausible if the applicant believes that 1NC-34A receives a block signal from SPP-1, instead of SPP-2.

B. Incorrect. First part is correct. Second part is plausible if the applicant believes that 1NC-34A receives a block signal from SPP-1.

C. Incorrect. First part is plausible if the applicant is does not recognize that one PORV isolation valve has previously been closed, or fails to recall the interlock associated with the associated isolation valves. Second part is correct.

D. **CORRECT.** The Pressurizer PORV isolation valves are interlocked to ensure that no more than one isolation valve is closed at a time. This interlock can be bypassed by placing the switch in "Override". SPP-2 supplies a block signal to 1NC-34A on lowering pressurizer pressure.

**References:**
- OP-CN-PS-IPE Lesson Plan for Pressurizer Pressure Control, Rev. 101, Section 2.2, 2.3, and 2.8

**KA Match:**
When given conditions of a stuck open PZR relief valve, the applicant is required to demonstrate knowledge of switch position (based on system interlocks) and controller inputs to particular valve controls.

**Cognitive Level:** **High**
The applicant is required to analyze given conditions, recall interlocks and system inputs, and apply this knowledge to predict an outcome (expected control switch position).

**Source of Question:** **Bank 4732**

**Question 3**
**009EK1.02**
**Small Break LOCA**
**Knowledge of the operational implications of the following concepts as they apply to the small break LOCA: Use of steam tables**

Given the following Unit 1 conditions:

**Initial:**

- The Unit is at 100% power.

**Current:**

- A small break LOCA has occurred.
- EP/1/A/5000/E-1 (Loss of Reactor or Secondary Coolant) has been entered.
- Neither train of ICCM is available.
- Current NC pressure is 665 psig.
- Core exit thermocouple temperatures are 488°F
- T-Colds are 487.7°F

(1) In accordance with E-1, the value of subcooling is _____________ .

(2) Based on current conditions, steam header pressure is ___________ .

**Reference Provided**

A. (1) - 8° F
(2) 608 psig

**B. (1) - 8° F**
**(2) 593 psig**

C. (1) + 12° F
(2) 608 psig

D. (1) + 12° F
(2) 593 psig

**QUESTION 3**

**Distractor Analysis**

A. Incorrect. First part is correct. Second part is plausible because the saturation pressure for 488°F is 610 psia. The applicant must convert psia to psig.

B. **CORRECT.** Using Databook Figure 58 the applicant should determine that saturation temperature for 665 psig is ~ 480°F. Therefore, -8°F subcooling is correct. The second part is determined by use of steam tables and obtaining the saturation pressure associated with core exit temperature and then converting psia to psig.

C. Incorrect. The first part is plausible because it is the correct value of saturation. E-1 requires subcooling to be determined based on ICCM (per core exit thermocouples). ICCM includes a 20°F conservatism and requires use of Databook Figure 58 if ICCM is not available. Second part is plausible because the saturation pressure for 488°F is 610 psia. The applicant must convert psia to psig.

D. Incorrect. The first part is plausible because it is the correct value of saturation. E-1 requires subcooling based on ICCM (per core exit thermocouples). ICCM includes a 20°F conservatism and requires use of Databook Figure 58 if not available. The second part is correct.

**References:**

- Revised Data Book Figure 58 (Reactor Coolant Saturation Cure, Narrow Range), Rev. 2
- Steam Tables
- OP-CN-PS-CCM, Lesson Plan for Inadequate Core Cooling Monitor, Rev. 100, Section 2.10
- EP/1/A/5000/E-1, Loss of Reactor or Secondary Coolant, Rev. 28, step 2

**Provide to Applicant:**

- Revised Data Book Figure 58 (Reactor Coolant Saturation Cure, Narrow Range)

**KA Match:**
The applicant is required to demonstrate proper use of steam tables, and appropriate conversions, and also demonstrate knowledge of when steam tables may not used per the procedure requirements of a small break LOCA, for determining the correct value of subcooling (operational implication).

**Cognitive Level:** **High**
The applicant is required to analyze supplied information, determine the correct application to use (i.e. graph vs. steam tables), and then chart data separately to arrive at the correct answer.

**Source of Question:** **Bank 1621**

**Question 4**
**011EG2.1.7**
**Large Break LOCA**
**Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior and instrument interpretation.**

Given the following Unit 1 conditions:

- The Unit was initially at 100% power.
- A double-ended break of Loop 1A Cold Leg occurred.
- 1ETB has de-energized due to an overcurrent actuation.
- EP/1/A/5000/E-1 (Loss of Reactor or Secondary Coolant) was implemented.
- The crew has performed the appropriate steps of EP/1/A/5000/ES-1.4 (Transfer to Hot Leg Recirculation).

For the above conditions, and in accordance with ES-1.4;

(1) Is hot leg recirculation flow <u>sufficient</u>?

(2) Which 1MC-11 control panel indication is used to verify whether hot leg recirculation has been established?

A. (1) YES
(2) ND flow to Hot Legs B and C

B. (1) NO
(2) ND flow to Hot legs B and C

**C. (1) YES**
**(2) NI Pump discharge flow**

D. (1) NO
(2) NI Pump discharge flow

**QUESTION 4**

**Distractor Analysis**

A. Incorrect. ES-1.4, Step 7 does check ND flow. However, Step 2 of ES-1.4 requires aligning NI flow to hot leg recirc, including verification of flow through an NI pump (Step 3). Once you have an NI pump running, you leave ES-1.4, and return to procedure in effect, per Step 4.

   Second part: ND flow to Hot Legs B and C is one of the indications in ES-1.4, but would only be used IF the ND pumps were used. One NI pump is available and successfully aligned; therefore, ND is not needed.

B. Incorrect. Plausible, since only one train of a safety related pump is available during a LOCA. But, the only pump needed for adequate hot leg recirc. is ONE NI pump (NO ND pumps are needed). The control panel indication used to determine if hot leg recirc. is occurring is plausible if the applicant believes the ND pumps are needed.

C. **CORRECT**. Per ES-1.4 (Transfer to Hot Leg Recirculation), Step 3, only one train of NI is needed for adequate hot leg recirc. NO trains of ND are needed. ND is used ONLY if attempts to align NI pump discharge to the hot legs were NOT successful. NI train flow is listed as the indication to be used for verifying hot leg recirculation flow. The NI Pump discharge flow indication on 1MC-11, along with the successful alignment of the NI pump to the hot legs provides this information.

D. Incorrect. Plausible, since only one train of safety related pumps is available during a LOCA. However, the only pump needed for adequate hot leg recirc. is ONE NI pump (NO ND pumps are needed). Second part is correct.

**K/A Match**

The applicant is presented with conditions involving a LBLOCA and required to evaluate the loss of one train of safeguards power.

The applicant must make a decision (based on the operating characteristics of the plant that have resulted from the loss of one train of safeguards power) on how to interpret the indication for whether hot leg recirculation has been established. The "reactor behavior" aspect of this K/A is addressed by the fact that the applicant must understand the function of hot leg recirc in context of the core and ensuring no blockages in the flow channels between the fuel rods, and then what components are needed in order to satisfy that function.

**Cognitive Level:** **High**

Involves analysis of a given situation, applying system knowledge, including electrical, and safety injection system, then evaluating and making judgments on the adequacy of hot leg recirculation flow.

**Source of Question:** **Bank - 2010 NRC Exam Q4**

**References:**

- EP/1/A/5000/ES-1.4 (Transfer to Hot Leg Recirculation), Rev. 006, Steps 3 and 7

**Question 5**
**022AK3.06**
**Loss of Reactor Coolant Makeup**
**Knowledge of the reasons for the following responses as they apply to the Loss of Reactor Coolant Makeup: RCP thermal barrier cooling**

(1) The Thermal Barrier Heat Exchanger is the ______(1)______ cooling source for NC Pump seals.

(2) Thermal Barrier Heat Exchanger cooling ______(2)______ be available following a Hi-Hi Containment pressure signal.

A. (1) primary
(2) will NOT

B. (1) primary
(2) will

**C. (1) backup**
**(2) will NOT**

D. (1) backup
(2) will

## QUESTION 5

### Distractor Analysis

A. Incorrect. First part is plausible because this is an aligned source of cooling during normal operation, but seal injection flow is the primary means of pump seal cooling. Second part is correct.

B. Incorrect. First part is plausible because this is an aligned source of cooling during normal operation, but seal injection flow is the primary means of pump seal cooling. Second part is plausible because flow will continue following a Hi Containment pressure signal (not Hi Hi).

C. **CORRECT.** Per the NCP lesson plan “The primary design purpose of the thermal barrier heat exchanger is to provide backup cooling in the event injection flow is lost.” The component cooling water reactor building isolations close on Hi-Hi Containment pressure, isolating cooling water flow to the thermal barrier heat exchanger.

D. Incorrect. First part is correct. Second part is plausible because flow will continue following a Hi Containment pressure signal (not Hi Hi).

**References:**
- OP-CN-PS-NCP (Reactor Coolant Pump Lesson Plan), Rev. 100, Section 2.3.1
- OP-CN-PSS-KC (Component Cooling Water System Lesson Plan), Rev. 100, Section 9.4

**KA Match:**
The applicant is required to demonstrate knowledge of the use of thermal barrier cooling upon a loss of seal injection and also recall a condition which isolates this cooling medium. The "reasons" aspect is met as follows: the question tests knowledge of what is the function (or reason for) a thermal barrier cooling component - the heat exchanger - it is the backup, not the primary, source of cooling for the RCP seals. Another way that the "reason" aspect is tested is as follows: given the loss of reactor coolant makeup (which is evaluated in both parts of the question, by testing knowledge of the backup source upon a loss of the normal source; i.e., reactor coolant makeup - charging), what is the function of the thermal barrier heat exchanger.

**Cognitive Level:** **High**
Applicant must apply knowledge of system design (thermal barrier cooling) and RCP seals to arrive at the correct answer, including assessment of containment conditions and its effect on thermal barrier cooling.

**Source of Question:** **New**

**Question 6**
**025AK2.05**
**Loss of Residual Heat Removal System (RHRS)**
**Knowledge of the interrelations between the Loss of Residual Heat Removal System and the following: Reactor building sump**

In accordance with AP/1/A/5500/019, (Loss of Residual Heat Removal System), Enclosure 10, "Long Term Core Cooling Parameters":

(1) For the Containment Sump Recirculation Criteria, if the ONLY sump level annunciators lit are 1AD-20, B/2, and 1AD-21, B/2 (CONT. SUMP LEVEL > 2.5 FT), then the containment sump level requirement ____(2)____ met.

(2) The operator is directed to stop all pumps taking suction from the FWST if level decreases to a maximum value of ____(2)____.

**A. (1) is**
**(2) 5%**

B. (1) is
(2) 10%

C. (1) is not
(2) 5%

D. (1) is not
(2) 10%

**QUESTION 6**

**Distractor Analysis**

A. **CORRECT.** AP/19, Enclosure 10, Step 2, requires at least one of the listed annunciators to be lit in order to satisfy recirculation criteria. Step 3 directs operators to stop all pumps taking suction from the FWST is level is less than 5%.

B. Incorrect. First part is correct. Second part is plausible because this value is a criterion for containment sump recirculation.

C. Incorrect. First part is plausible if the applicant misapplies the requirement for aligning the containment spray system for recirculation (3.3 ft) per EP/1A/5000/ES-1.3. Second part is correct.

D. Incorrect. First part is plausible if the applicant misapplies the requirement for aligning the containment spray system for recirculation (3.3 ft) per EP/1A/5000/ES-1.3. Second part is plausible because this value is a criterion for containment sump recirculation.

**References:**

- AP/1/A/5500/019, (Loss of Residual Heat Removal System):, Enclosure 10, (Long Term Core Cooling Parameters), Rev. 58
- EP/1/A/5000/ES-1.3 (Transfer to Cold Leg Recirculation), Rev. 29, Enclosure 2, Step 4

**KA Match:**

The applicant is required to demonstrate knowledge of the required reactor building sump level in order to support recirculation, and specific pump operation, while performing steps associated with a loss of residual heat removal.

**Cognitive Level:** **Low**

**Source of Question:** **New**

**Question 7**
**027AA1.02**
**Pressurizer Pressure Control System (PZR PCS) Malfunction**
**Ability to operate and / or monitor the following as they apply to the Pressurizer Pressure Control Malfunction: SCR-controlled heaters in manual mode**

Unit 1 was at 100%. Given the following conditions and sequence of events:

- A plant transient results in a cooldown of the NC system causing the "Backup Heaters" to energize and the "C" PZR heaters to be full "ON".
- Pressurizer Pressure Channel 1 fails offscale high.

**Subsequently:**

- Pressurizer Pressure Channel 2 fails offscale low.
- The following annunciators are received simultaneously with the second pressure channel failure:
  - 1AD-2 / E8 (DCS Trouble)
  - 1AD-2 / F8 (DCS Alternate Action)
- The OATC notifies the rest of the crew that there is an Alternate Action on Pressurizer Pressure Select 1 and Select 2.

Assuming NO operator actions:

(1) The Pressurizer Pressure Master will ___________(1)___________ .

(2) "C" Pressurizer heaters will __________(2)____________ .

A. (1) swap to Manual
(2) de-energize

**B. (1) swap to Manual**
**(2) remain energized**

C. (1) remain in Automatic
(2) de-energize

D. (1) remain in Automatic
(2) remain energized

**QUESTION 7**

**Distractor Analysis**

A. Incorrect. The first part is correct. The second part is plausible because backup heaters de-energize on DCS alternate action, but “C” heaters will maintain current output.

B. **CORRECT.** An alternate action of Pressurizer Pressure Control causes the Pressurizer Pressure Master to swap to Manual mode, maintaining the “last good value”. The “C” (variable) heaters remain energized at current output, but other heaters will de-energize.

C. Incorrect. The first part is plausible because an alternate action will cause the Pressurizer Pressure Master to maintain the last good value. An could misinterpret this as remaining in automatic (since a set value is maintained). The second part is plausible because backup heaters will de-energize on DCS alternate action, but “C” heaters will maintain current output.

D. Incorrect. The first part plausibility is described in "C" above. The second part is correct.

**References:**
- OP-CN-PS-IPE, Pressurizer Pressure Control Lesson Plan, Rev. 101, Section 5.4

**KA Match:**
Given a malfunction of the PZR PCS, the applicant is required to describe the operation of the SCR controlled heaters along with the operation of the master controller.

**Cognitive Level:** **High**
The applicant is required to analyze given data and apply system and operational knowledge to predict an outcome.

**Source of Question:** **Bank 4362**

**Question 8**
**029EA1.09**
**Anticipated Transient Without Scram (ATWS)**
**Ability to operate and monitor the following as they apply to a ATWS: Manual rod control**

Given the following conditions:

- Unit 1 was at 72% power and increasing following a refueling outage.
- The main turbine tripped due to low condenser vacuum.
- DRPI indicates Control Bank "D" at 178 steps and inserting.

(1) One of the required Immediate Actions is to ________________ .

(2) Following completion of this action, DRPI indication will then be changing approximately every ____________.

A. (1) Verify Control Rods IN "AUTO" AND STEPPING IN
(2) 5.0 Seconds

B. (1) Verify Control Rods IN "AUTO" AND STEPPING IN
(2) 7.5 Seconds

C. (1) Insert Control Rods in MANUAL
(2) 5.0 Seconds

**D. (1) Insert Control Rods in MANUAL**
**(2) 7.5 Seconds**

**QUESTION 8**

**Distractor Analysis**

A. Incorrect. First part is plausible is the applicant misdiagnoses the ATWS. This is an immediate action of AP/1/A/5500/02 (Turbine Trip) and would be correct if power was below 69% when the turbine tripped. Second part is plausible if the applicant believes that control rods should be inserting at 72 steps per minute. i.e. 72 steps/min x 1 min/60 seconds = 1.2 steps/sec. (72 steps/minute would be the speed if the rods were moving in automatic.) DRPI indication changes approximately every 6 steps, which will occur every 5 seconds.

B. Incorrect. First part is plausible if the applicant does not recognize an ATWS has occurred. This is an immediate action of AP/1/A/5500/02 (Turbine Trip) and would be correct if power was below 69% when the turbine tripped. Second part is correct.

C. Incorrect. First part is correct. Second part is plausible if the applicant believes that control rods should be inserting at 72 steps per minute. i.e. 72 steps/min x 1 min/60 seconds = 1.2 steps/sec. (72 steps/minute would be the speed if the rods were moving in automatic.) DRPI indication changes approximately every 6 steps, which will occur every 5 seconds.

D. **CORRECT.** Since reactor power is greater than 69%, a turbine trip should have resulted in a reactor trip. EP/1/A/5000/FR-S.1 directs the operator to insert rods (manually), in Step 1, (Immediate Action). Manual rod speed is 48 steps per minute. 48 steps/min x 1 min/60 sec = 0.8 steps/sec. DRPI changes approximately every 6 steps, which will occur every 7.5 seconds.

**References:**

- AP/1/A/5500/002 Turbine Generator Trip, Rev. 032, step 3
- EP/1/A/5000/FR-S.1 (Response to Nuclear Power Generation/ATWS), Rev. 021, Step 1
- OP-CN-IC-IRE (Rod Control System Lesson Plan), Rev. 102, Section 15

**KA Match:**

The applicant is required to recognize that the listed conditions represent an ATWS and then apply the proper procedural response. Additionally, the applicant must recall the correct rod speed for manual insertion (48 steps/min vs. 72 steps/min) along with interval of DRPI height indications and perform a calculation to determine the rate of change (i.e., monitoring).

**Cognitive Level:** **High**

The applicant is required to analyze given information, recall a setpoint, and apply procedural knowledge as well as perform calculations for rod speed, based on application of system response (rod speed in auto vs. in manual).

**Source of Question:** **New**

**Question 9**
**038EK3.08**
**Steam Generator Tube Rupture (SGTR)**
**Knowledge of the reasons for the following responses as the apply to the SGTR: Criteria for securing RCP**

Given the following:

- Unit 1 has experienced a S/G Tube Rupture.
- The crew has transitioned to EP/1/A/5000/E-3 (Steam Generator Tube Rupture) and is preparing to initiate a cooldown.

(1) Concerning this cooldown, this procedure will specify _________________.

(2) NC pump trip criteria, based on NC subcooling, ______________ apply after starting a controlled cooldown.

**A. (1) maximum rate while attempting to avoid a Main Steam Isolation**
**(2) does NOT**

B. (1) maximum rate while attempting to avoid a Main Steam Isolation
(2) does

C. (1) as close as possible without exceeding 100°F per hour
(2) does NOT

D. (1) as close as possible without exceeding 100°F per hour
(2) does

**QUESTION 9**

**Distractor Analysis**

A. **CORRECT.** EP/1/A/5000/E-3 step 10.f directs a cooldown at maximum rate while attempting to avoid a main steam isolation. A note prior to step 10 states "NC pump trip criteria based on NC subcooling does not apply after starting a controlled cooldown."

B. Incorrect. First part is correct. Second part is plausible because this procedure is usually entered from EP/1/A/5000/E-0 which does require NCP trip on loss of subcooling.

C. Incorrect. First part is plausible because it is the maximum cooldown rate specified in many emergency procedures, (e.g., ES-1.2, ECA-1.1, ECA-1.3, ECA-3.2). Second part is correct.

D. Incorrect. First part is plausible because this is the maximum cooldown rate specified in many emergency procedures, (e.g., ES-1.2, ECA-1.1, ECA-1.3, ECA-3.2). Second part is plausible because this procedure is usually entered from EP/1/A/5000/E-0, which does require NCP trip upon loss of subcooling.

**References:**

- EP/1/A/5000/E-3 (Steam Generator Tube Rupture), Rev. 043, note prior to step 10 and step 10.f
- EP/1/A/5000/E-0 (Reactor Trip or Safety Injection), Rev. 042, Encl. 1, Step 1
- EP/1/A/5000/ES-1.2 (Post LOCA Cooldown and Depressurization), Rev. 033, step 11.g

**KA Match:**
Given a SGTR, the applicant is required to apply a note from the applicable procedure concerning guidance for securing a RCP during the required cooldown. This question tests knowledge of this guidance, which differs from the criteria for RCP operation prior to initiating the cooldown. The applicant is also tested on the cooldown rate specified during SGTR recovery. The "reasons" aspect of this KA is met because of the procedure requirement being the reason for the criteria.

**Cognitive Level:** **Low**

**Source of Question:** **New**

**Question 10**
**054AK1.02**
**Loss of Main Feedwater**
**Knowledge of the operational implications of the following concepts as they apply to Loss of Main Feedwater (MFW): Effects of feedwater introduction on dry S/G**

Given the following conditions on Unit 1:

- The unit has experienced a feedwater line break of the 1A S/G inside containment and a total loss of feedwater.
- EP/1/A/5000/FR-H.1 (Response to Loss of Secondary Heat Sink) has been entered and feed and bleed of the NC system was initiated.
- Shortly after opening the PZR PORVs, the Turbine Driven CA pump is returned to service and a source of feedwater is available.
- CETs are stable.
- All S/G WR levels are indicating 8%.

(1) In accordance with FR-H.1, Enclosure 6 (S/G CA Flow Restoration), CA flow is required to be restored to ________(1)________ at a rate not to exceed 100 gpm.

(2) The restoration of flow criteria is important in order to minimize _________(2)_________ .

A. (1) ALL intact S/Gs
(2) additional NC cooldown causing thermal stress to the reactor vessel

B. (1) ALL intact S/Gs
(2) the thermal stress to prevent failure of S/G components

C. (1) only ONE intact S/G
(2) additional NC cooldown causing thermal stress to the reactor vessel

**D. (1) only ONE intact S/G**
**(2) the thermal stress to prevent failure of S/G components**

**QUESTION 10**

**Distractor Analysis**

A. Incorrect. First part is plausible because H.1 would require feeding all S/Gs if CETs continued to increase. The second part is plausible because overcooling the NC system is the basis for limiting flow rates when initiating feed to other S/Gs. It is incorrect, however, as explained in the Background Document for FR-H.1, Step 7.

B. Incorrect. First part is plausible because H.1 would require feeding all S/Gs if CETs continued to increase. Second part is correct.

C. Incorrect. First part is correct. The second part is plausible because overcooling the NC system is the basis for limiting flow rates when initiating feed to other S/Gs.

D. **CORRECT.** A "dry" S/G is defined as a S/G with less than 12% level. FR-H.1 directs that flow be established to one intact S/G at less than or equal to 100 gpm. There is a note prior to this step concerning the risk of thermal shock to the S/G and an explanation in the Background Document for FR-H.5 (Response to S/G Low Level) which describes that "Initiating feed flow to a dry S/G causes thermal stresses and raises the risk of S/G failure, especially on the S/G shell. The risk is greatest at higher S/G temperatures."

**References:**

- EP/1/A/5000/FR-H.1 (Response to Loss of Secondary Heat Sink), Encl. 6, (S/G CA Flow Restoration), Steps 1 and 3, and Note prior to Step 1, Rev. 041
- EBG/1/5000/FR-H.5 (Response to Steam Generator Low Level), Step 5, Rev. 002
- EBG/1/5000/FR-H.1, Step 7, Rev. 004

**KA Match:**

K/A is matched because a loss of feedwater has occurred and the question is testing knowledge related to how many S/G's will initially be fed (operational implication) and what concern is being addressed by this strategy (effects of feedwater introduction on dry S/G). Understand that this is a procedure basis question provided to RO candidates but believe it corresponds to overall procedure strategy, and not specific content of steps.

**Cognitive Level:** **High**

Requires application of knowledge of a definition (dry S/G) to determine a procedure flowpath and requirement.

**Source of Question:** **Bank 2747**

**Question 11**
**055EG2.2.42**
**Station Blackout**
**Ability to recognize system parameters that are entry-level conditions for Technical Specifications**

Given the following:

- Unit 1 is in Mode 4.
- 1ETA experienced a blackout due to Transformer 1ATC failure.
- 1A D/G started and subsequently tripped on Generator Differential.

What TS LCO entries are required based on these events?

A. 3.8.1 (AC Sources – Operating) ONLY

B. **3.8.1 (AC Sources – Operating) AND 3.8.9 (Distribution Systems – Operating)**

C. 3.8.2 (AC Sources – Shutdown) ONLY

D. 3.8.2 (AC Sources – Shutdown) AND 3.8.10 (Distribution Systems – Shutdown)

**QUESTION 11**

**Distractor Analysis**

A. Incorrect. Plausible because T.S. 3.8.1 entry is required due to both a loss of offsite power and the 1A D/G. T.S. 3.8.9 entry is also required when an essential bus is completely de-energized. Plausible to not think that T.S. 3.8.9 entry is required if there is misapplication of "Distribution" vs. "Sources" for the conditions in the stem.

B. **CORRECT.** Both of the listed T.S. are applicable in Modes 1-4. T.S. 3.8.1 entry would be required due to both a loss of offsite power and the 1A D/G power supply. T.S. 3.8.9 is also required to be entered due to a complete loss of power to the essential bus.

C. Incorrect. Plausible if the applicant believes that T.S. 3.8.2 applies in Mode 4 and confuses the term "Shutdown" and "Operating" in context of Tech Spec. entry, or believes that that a complete loss of power does not require a separate T.S. action, or believes that it is not applicable in this mode.

D. Incorrect. Plausible if the applicant misapplies the term "Shutdown" vs. "Operating" and misapplies the entry conditions for T.S. 3.8.2 and 3.8.10.

**References:**

- T.S. 3.8.1 (AC Sources – Operating), Amendment Nos. 253/248
- T.S. 3.8.2 (AC Sources – Shutdown), Amendment Nos. 173/165
- T.S. 3.8.9 (Distribution Systems – Operating), Amendment Nos. 173/165
- T.S. 3.8.10 (Distribution Systems – Shutdown), Amendment Nos. 207/201

**KA Match:**

The applicant is required to determine which Tech Spec applies when given a station blackout in a shutdown mode which is also complicated by a D/G failure.

**Cognitive Level:** **High**

May at first appear to be low cog, but it is high cognitive level, because it requires analysis of loss of power conditions, and a subsequent failure of a component, and application of that conclusion to arrive at the correct answer.

**Source of Question:** **New**

**Question 12**
**056AA1.26**
**Loss of Offsite Power**
**Ability to operate and / or monitor the following as they apply to the Loss of Offsite Power: Circuit breakers**

Given the following:

- A loss of offsite power occurred on Unit 1.
- Both essential busses are powered by their D/Gs.

Subsequently:

- "A" train safety injection occurred on Unit 1 due to a LOCA.
- "B" train safety injection did not actuate automatically or manually.
- No other operator actions have occurred.

(1) Breaker "FTA B/O ALT FDR FRM ETA" will be __________ .

(2) Breaker "FTB B/O ALT FDR FRM ETB" will be __________ .

A. (1) open
(2) open

**B. (1) open**
**(2) closed**

C. (1) closed
(2) open

D. (1) closed
(2) closed

**QUESTION 12**

**Distractor Analysis**

A. Incorrect. First part is correct. The second part is plausible if the applicant assumes that the failure of safety injection prevents alternate power supply to the blackout bus.

B. **CORRECT.** Each blackout bus (FTA, FTB) will normally be powered (from the associated essential bus) during a loss of offsite power. A Safety Injection signal prevents operation of the alternate blackout power supply breaker in order to preserve power to essential components.

C. Incorrect. First part is plausible if the applicant believes that a Safety Injection signal does not affect the tie breaker between the essential and blackout bus. The second part is plausible if the applicant assumes that the failure of safety injection prevents alternate power supply to the blackout bus.

D. Incorrect. First part is plausible if the applicant believes that a Safety Injection signal does not affect the tie breaker between the essential and blackout bus. Second part is correct.

**References:**

- OP-CN-DG-EQB D/G Load Sequencer Lesson Plan, Rev. 100, pg. 12

**KA Match:**
For a loss of offsite power, the applicant is required to determine and monitor the operation/position of alternate blackout power supply breakers when given a loss of offsite power combined with a safety injection and another condition without a safety injection signal.

**Cognitive Level:** **High**
The applicant is required to analyze given information and apply system and operational knowledge to predict an outcome.

**Source of Question:** **New**

**Question 13**
**057AA2.18**
**Loss of Vital AC Electrical Instrument Bus**
**Ability to determine and interpret the following as they apply to the Loss of Vital AC Instrument Bus: The indicator, valve, breaker, or damper position which will occur on a loss of power**

Given the following:

- Unit 1 is at 100% power.
- Annunciator 1AD-11/ G4 (120VAC ESS PWR CHANNEL D TRBL) is LIT.
- All Channel 4 Instruments have failed low.

Which of the following status lights will be LIT as a result of this failure?

1. 1C S/G Steamline Lo Pressure
2. 1D S/G Steamline Lo Pressure
3. Containment Hi Pressure

A. 1 and 2

B. 1 and 3

**C. 2 and 3**

D. 1, 2 and 3

**QUESTION 13**

**Distractor Analysis**

A. Incorrect. Plausible to believe that 1C S/G Steamline Lo Pressure would be LIT if applicant reasons that since 1D S/G Steamline pressure instruments are powered from similar channels as 1D, and that since an alarm is in for Channel D trouble, then 1C would also be LIT.

B. Incorrect. Plausible as described in "A" above.

C. **CORRECT.** 1C S/G steamline pressure instruments are powered from channels 1-3, 1D S/G steamline pressure instruments are powered from channels 1,2, & 4, and containment hi pressure instruments are powered from channels 2-4. Therefore, a loss of channel 4 would affect only 1D S/G low steamline and containment hi pressure status lights.

D. Incorrect. Plausible as described in "A" above.

**References:**

- OP/1/B/6100/010D (ARP for 1AD-3), Rev. 028, pg. 5 & 6
- OP-CN-ECCS-ISE ESFAS Lesson Plan, Rev. 100, Pg. 20

**KA Match:**
Given a loss of Channel 4 Vital Instrument bus, the applicant is required to determine control room indications (status lights) based on the loss of power.

**Cognitive Level:** **High**
Requires application of detailed system design knowledge, analysis of a failure and its effect, in order to predict an outcome.

**Source of Question:** **New**

**Question 14**
**058AK1.01**
**Loss of DC Power**
**Knowledge of the operational implications of the following concepts as they apply to Loss of DC Power: Battery charger equipment and instrumentation**

Given the following conditions:

- Unit 1 NC system temperature is at 335°F and decreasing for a refueling outage.
- Vital charger 1ECC fails.
- 1EMXA is unavailable to power spare charger 1ECS.

(1) What other MCC can provide an alternate supply to 1ECS?

(2) Does OP/1/A/6350/008 (125VDC/120VAC Vital Instrument and Control Power System) allow alignment of the alternate supply to 1ECS based on current Unit 1 conditions?

A. (1) 1EMXC
(2) Yes

B. (1) 1EMXC
(2) No

C. (1) 1EMXJ
(2) Yes

**D. (1) 1EMXJ**
**(2) No**

**QUESTION 14**

**Distractor Analysis**

A. Incorrect. Plausible that 1EMXC can be used to power the spare charger (1ECS) since it is an A train power supply. With 1EMXC available as an alternate source, it is plausible that this alignment is acceptable with an "A" train source replacing an "A" train source.

B. Incorrect. It is plausible 1EMXC can be used to power the spare charger (1ECS) since it is an A train power supply. 2nd part is correct.

C. Incorrect. First part is correct. Because this is a shutdown mode (4), it is plausible that the cross train power supply alignment to the spare charger is allowed.

D. **CORRECT.** 1EMXJ is the only available power supply to the spare charger (1ECS) with 1EMXA unavailable. This alignment (i.e. "B" train power supply 1EMXJ feeding 1ECS (Standby Charger) while 1ECS is being used to replace an "A" train charger (1ECC) can only be performed in No Mode. Alternate alignment to 1ECS is only allowed in NO MODE to prevent tying "A" and "B" train together in modes when vital power is required OPERABLE.

**References:**

- OP-CN-EL-EPL (125 VDC/120 VAC Vital Instrumentation and Control Power lesson plan), Rev. 100, Section 2.1
- OP/1/A/6350/008 (125VDC/120VAC Vital instrument and Control Power System), Rev. 070, Limits and Precautions 2.4

**KA Match:**
Testing a loss of DC power (1ECC fails) and battery charger equipment (how alternate power is supplied via the spare charger when the normal supply is not available, and when this is procedurally allowed). The implication is that power cannot be aligned and is lost.

**Cognitive Level:** **High**
Although power supply availability is direct memorization, evaluation of current mode (per listed temperature) and determination of prohibited alignments requires more than one mental step.

**Source of Question:** **Bank 1613**

**Question 15**
**WE04EK2.2**
**LOCA Outside Containment**
**Knowledge of the interrelations between the (LOCA Outside Containment) and the following:**
**Facility's heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility.**

Given the following Unit 2 conditions:

- The crew has entered EP/2/A/5000/ECA-1.2, (LOCA Outside Containment) from EP/2/A/5000/E-0, (Reactor Trip or Safety Injection) based upon high radiation levels in the Auxiliary Building.
- After closing 2NI-173A (ND Hdr 2A to Cold Legs C&D), the following conditions exist:
    - NC pressure is approximately 1500 psig and slowly increasing.
    - Pressurizer level is 19% and slowly increasing
    - FWST level is decreasing at a slightly higher rate.

Which ONE of the following completes the statements below?

(1) The LOCA __(1)__ isolated.

(2) The required actions for mitigating any adverse parameter trend are to ____________(2)____________.

**A. (1) IS**
**(2) stop the 2A ND Pump and close 2FW-27A (ND Pump 2A Suct from FWST).**

B. (1) IS
(2) leave the 2A ND Pump running and aligned through 2ND-32A (Train 2A Hot Leg Inj Isol) and 2ND-65B (Train 2B Hot Leg Inj Isol).

C. (1) IS NOT
(2) re-open 2NI-173A, and close 2NI-178B (ND Hdr 2B to Cold Legs A&B).

D. (1) IS NOT
(2) leave 2NI-173A closed and close 2NI-178B.

**QUESTION 15**

**<u>Distractor Analysis</u>**

A. **CORRECT**. ECA-1.2, "LOCA Outside Containment" lists NC pressure increasing as indication that the LOCA has been isolated. For the conditions in the stem, even though the LOCA has been isolated, the level in the FWST is still lowering, indicating that the leak is somewhere on the A Train ND piping between NI-173A (RHR Header 2A to Cold Legs C&D) and the FWST. One consideration during a LOCA outside of containment is to maintain FWST inventory (since there is no inventory entering the containment sump). The EP Background Document for ECA-1.2 states that operators need to take actions to isolate any potential leak paths and loss of inventory from the FWST. The Annunciator Response Procedure for FWST low level directs operators to attempt isolating a piping break or leak which is causing a loss of inventory in the FWST. Stopping the associated (2A) ND Pump when closing the suction valve from the FWST is done to preserve the ND Pump from running with no suction

B. <u>Incorrect.</u> Plausible, since selection of the LOCA status is correct. The applicant has recognized that a Safety Injection Signal has caused an automatic start of both ND Pumps, and may believe that SI pumps should not be shutoff. The flowpath of injecting through ND-32A and ND-65B is indeed "open" from Train A to Train B, and may result in some flow to the NC System through the Cold Legs, depending on flow and pressure from B Train. However, the applicant has failed to recognize the importance of the FWST level continuing to lower, indicating a leak, or pipe break, which will be isolated by isolating A Train from the FWST, since it has been confirmed that the leak was on Train A of ND. The applicant should have recognized this when analyzing the conditions in the stem for NC pressure slowly rising after closing NI-173A.

C. <u>Incorrect.</u> This incorrect answer is plausible for two reasons:

1.) Since the FWST level continues to lower, the applicant could conclude that there is still a LOCA which has not been isolated.
2.) The applicant misinterprets guidance in the EP Background Document for ECA-1.2 which states that for some breaks SI flow may cause an increase in RCS pressure, independent of break isolation. However, the conditions given make it clear that SI flow is not a factor in raising RCS pressure, since it is stated that NC pressure begins rising only after a valve is closed (the one which isolates the LOCA).

With this incorrect conclusion, it is plausible that you would continue on with the actions of ECA-1.2, and isolate the other train of ND (Train B) by closing NI-178B to see if that stops the LOCA.

D. <u>Incorrect.</u> See explanation for Answer C for plausibility of the misconception that the leak has been isolated. The second part of the answer is plausible, since NI-173A will remain closed. Moving on in the procedure to isolate another potential leakage path is plausible, if you have already concluded that the leak has not yet been isolated. The applicant has misunderstood the actions of ECA-1.2 by believing that as you isolate potential leakage paths, you leave them closed and go on to the next potential leakage path.

**References:**
- EP/2/A/5000/ECA-1.2 LOCA Outside Containment, Rev. 003, step 3
- OP-CN-PS-ND Residual Heat Removal System Lesson Plan, rev. 100, Figure 14.1

**KA Match:**
This question tests the applicant's knowledge of: 1.) components of emergency systems: the applicant must understand how the components of the RHR and Safety Injection system interface with each other (valves, tanks, and pumps), and the implications of these relationships in assessing whether the leak has been isolated; 2.) capacity of emergency systems: the FWST has a certain capacity to hold water; it is still losing water, and the applicant must determine how the emergency systems are to be operated to address and mitigate this condition; and 3.) function of emergency systems: this aspect is largely addressed by the components aspect of the K/A, and the applicant is tested on the function of the FWST by knowing where in the system this tank is located, and how it interfaces with other components of the emergency systems.

**Cognitive Level:** **High**
Requires evaluating a set of plant conditions, application of system knowledge, including piping layout, and interfaces between components in the system. The question then requires the applicant to determine the significance of a pressure increase and a level decrease in the context of a LOCA, and after a valve closure which was intended to isolate the leak. The applicant must determine, from this information, if the leak has been isolated, and if there is still a problem, and what should be done.

**Source of Question:** **Bank 2010 NRC Exam Q16**

**Question 16**
**WE05EG2.4.18**
**Inadequate Heat Transfer - Loss of Secondary Heat Sink – Knowledge of the specific bases for EOPs**

Given the following Unit 1 conditions:

- The crew is responding to a loss of all feedwater event from an initial 100% power.
- The crew is implementing EP/1/A/5000/FR-H.1 (Response to Loss of Secondary Heat Sink).
- NCS pressure is 2335 psig.
- Incore thermocouples indicate 545ºF.

In accordance with Step 23 of FR-H.1, "Establish NC System bleed path as follows:"

(1) The operator will select "OPEN" on ___(1)___ PZR PORV(s).

(2) The reason for this requirement is _______________(2)_______________

Which ONE of the following completes the above statements?

A. (1) one
(2) protect the S/G tubes from creep failure

B. (1) one
(2) to ensure adequate flow for decay heat removal

C. (1) two
(2) protect the S/G tubes from creep failure

**D. (1) two**
**(2) to ensure adequate flow for decay heat removal**

**QUESTION 16**

**Distractor Analysis**

A. Incorrect. First part is plausible if the applicant assumes that one PZR PORV will depressurize the RCS sufficiently for minimum injection flow. Second part is plausible because creep failure is the basis for opening a S/G PORV if two PZR PORVs cannot be opened.

B. Incorrect. First part is plausible if the applicant assumes that one PZR PORV will depressurize the RCS sufficiently for minimum injection flow. Second part is correct.

C. Incorrect. First part is correct. Second part is plausible because creep failure is the basis for opening a S/G PORV if two PZR PORVs cannot be opened.

D. **CORRECT.** Step 23 of H.1 directs the crew to open two of the available 3 PZR PORVs for the purpose of lowering pressure for injection flow to remove decay heat.

**References:**
- EP/1/A/5000/FR-H.1 Response to Loss of Secondary Heat Sink, Rev. 041, steps 23.b
- EBG/1/A/5000/FR-H.1 Background document for H.1, Rev. 004, steps 23 & 24

**KA Match:**
Given a loss of secondary heat sink, the applicant is required to state the requirement of a specific step and the associated basis. Note: EOP basis information is typically referred to as SRO only guidance. Per telecom with chief examiner on 1/23/14, it was agreed that it would be possible to meet this KA (on an RO level) if the particular basis also deals with the overall mitigative strategy of the procedure. Ensuring adequate flow for decay heat removal is an overall mitigating strategy aspect, during a loss of secondary heat sink.

**Cognitive Level:** **Low**

**Source of Question:** **Bank 1231- Modified**

**Question 17**
**WE11EA2.1**
**Loss of Emergency Coolant Recirculation**
**Ability to determine and interpret the following as they apply to the (Loss of Emergency Coolant Recirculation):**
**Facility conditions and selection of appropriate procedures during abnormal and emergency operations**

Given the following:

- A large break LOCA has occurred on Unit 1.
- EP/1/A/5000/ES-1.3 (Transfer to Cold Leg Recirculation) has been entered due to low FWST level.
- All attempts to open containment sump isolation valves, in accordance with step 4 of ES-1.3, have been unsuccessful.

(1) Which procedure will the crew transition to?

(2) How will the crew respond to CSF Status Trees?

A. (1) EP/1/A/5000/ECA-1.3 (Containment Sump Blockage)
(2) Implement CSFs as required.

**B. (1) EP/1/A/5000/ECA-1.1 (Loss of Emergency Coolant Recirculation)**
**(2) Implement CSFs as required.**

C. (1) EP/1/A/5000/ECA-1.3 (Containment Sump Blockage)
(2) Monitor CSFs for information only.

D. (1) EP/1/A/5000/ECA-1.1 (Loss of Emergency Coolant Recirculation)
(2) Monitor CSFs for information only.

**QUESTION 17**

**Distractor Analysis**

A. Incorrect. First part is plausible because this procedure may be entered from ES-1.3, but would be due to sump blockage vs. closed sump isolations. Second part is correct.

B. **CORRECT.** Step 4 of ES-1.3 directs a transition to ECA-1.1 if containment sump suction valves are closed. There is no requirement to monitor CSF Status trees for information only.

C. Incorrect. First part is plausible because this procedure may be entered from ES-1.3, but would be due to sump blockage vs. closed sump isolations. Second part is plausible if the applicant misapplies that CSFs are not entered when performing steps of ES-1.3 or ECA-1.3.

D. Incorrect. First part is correct. Second part is plausible as described in "C" above.

**References:**
- EP/1/A/5000/ES-1.3 Transfer to Cold Leg Recirculation, Rev. 029, step 4
- EP/1/A/5000/ECA-1.1 Loss of Emergency Coolant Recirculation, Rev. 040, Step 1
- EP/1/A/5000/ECA-1.3 Containment Sump Blockage, Rev. 11, Step 1

**KA Match:**
The applicant is required to demonstrate proper procedure selection when given a set of conditions related to a loss of emergency sump recirculation. The applicant is also required to recall requirements for application of critical safety function procedures under these conditions, i.e., interpretation of the selection.

**Cognitive Level:** **Low**

**Source of Question:** **New**

**Question 18**
**WE12EA2.2**
**Uncontrolled Depressurization of all Steam Generators**
**Ability to determine and interpret the following as they apply to the (Uncontrolled Depressurization of all Steam Generators):**
**Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments**

Given the following Unit 1 conditions:

- Following a Unit trip from 100% power, the crew entered EP/1/A/5000/ECA-2.1 (Uncontrolled Depressurization of All Steam Generators).
- Attempts to close any MSIV using its individual valve control board pushbutton have failed.

- 1AD-03, C/5 “SM ISOL TRN A” - LIT
- 1AD-03, D/5 “SM ISOL TRN B” – LIT
- 1AD-03, E/5 “SM ISOL VLVS NOT FULLY OPEN” - DARK

(1) In accordance with ECA-2.1, ___________ will be dispatched to isolate air to MSIVs?

(2) If an MSIV can be closed, what plant parameter is monitored to determine when this procedure can be exited?

**A. (1) Maintenance**
**(2) S/G pressure**

B. (1) Maintenance
(2) NC loop T-hots

C. (1) Auxiliary Operators
(2) NC loop T-hots

D. (1) Auxiliary Operators
(2) S/G pressure

**QUESTION 18**

**Distractor Analysis**

A. **CORRECT.** Step 2 of ECA-2.1 directs maintenance to isolate air to each MSIV which cannot be closed from the control room. See ECA-2.1, Enclosure 1, Step 3 for exit criteria.

B. Incorrect. First part is correct. Second part is plausible because this procedure monitors NC Loop T-hots in order to determine SI flow requirement.

C. Incorrect. First part is plausible since most field operations directed by EOPs are performed by AOs. Second part is plausible because this procedure monitors NC Loop T-hots in order to determine SI flow requirement.

D. Incorrect. First part is plausible since many field operations directed by EOPs are performed by AOs. Second part is correct.

**References:**

- EP/1/A/5000/ECA-2.1 Uncontrolled Depressurization of All Steam Generators, Rev. 036, step 2 & 23, and Enclosure 1 Step 3

**KA Match:**

The applicant is required to demonstrate knowledge of specific plant component operation, and indications monitored, in order to adhere to the procedure for uncontrolled depressurization of all steam generators.

**Cognitive Level:** **Low**

**Source of Question:** **Bank 524**

**Question 19**
**005AG2.4.31**
**Inoperable/Stuck Control Rod**
**Knowledge of annunciators alarms, indications or response procedures**

Given the following Unit 1 conditions:

- The Unit is at 100% power.
- While performing the RCCA movement test, control bank D rod H-8 slips into the core to 198 steps withdrawn.
- All other Bank D control rods are at 216 steps withdrawn as indicated on DRPI and step demand counters.
- 1AD-2, D/10 (RPI Urgent Failure) is LIT.
- The crew is performing AP/1/A/5500/014 (Control Rod Misalignment) and currently referring to OP/1/A/6150/008 (Rod Control).

(1) What is the maximum time allowed to complete the Required Action of Technical Specification 3.1.4 (Rod Group Alignment Limits)?

(2) To correct the above condition, which rod, or rods, will be repositioned in accordance with OP/1/A/6150/008 (Rod Control)?

A. (1) 30 minutes
(2) Rod H-8

B. (1) 30 minutes
(2) All rods in the affected bank except H-8

**C. (1) 1 hour**
**(2) Rod H-8**

D. (1) 1 hour
(2) All rods in the affected bank except H-8

**QUESTION 19**

**Distractor Analysis**

A. Incorrect. First part is plausible because T.S. 3.2.3 (AFD) contains a 30 minute completion time. Second part is correct.

B. Incorrect. First part is plausible because T.S. 3.2.3 (AFD) contains a 30 minute completion time. Second part is plausible since this would result in all rods in that bank being in alignment, but it is not the prescribed method, per procedure.

C. **CORRECT.** T.S. 3.1.4 Condition B requires the control rod to be realigned within one hour or other actions to be completed (which are also one hour completion times). The realignment procedure directs all unaffected lift coils to be disconnected and the misaligned rod to be moved into alignment with the bank.

D. Incorrect. First part is correct. Second part is plausible since this would result in all rods in that bank being in alignment, but it is not the prescribed method, per procedure.

**References:**

- T.S. 3.1.4 (Rod Group Alignment Limits), Amendment Nos. 173/165
- T.S. 3.2.3 (Axial Flux Difference), Amendment Nos. 263/259
- OP/1/A/6150/008 (Rod Control), Rev. 062, Encl. 4.6, steps 3.11 – 3.13

**KA Match:**
The applicant is required to demonstrate knowledge of the response procedure for realigning an inoperable/misaligned control rod. Also required to demonstrate knowledge of the associated tech spec.

**Cognitive Level:** **High**
Requires analysis of given conditions, and apply requirements for rod alignment to determine required Tech. Spec. action and completion time. Further, the applicant must then draw a conclusion regarding the nature of the rod misalignment and recall the required action from the procedure on the method for mitigation, based on that conclusion.

**Source of Question:** **Bank 1619**

**Question 20**
**028AG2.2.3**
**Pressurizer (PZR) Level Control Malfunction**
**(multi-unit license) Knowledge of the design, procedural, and operational differences between units**

Given the following conditions:

- Unit 1 is at 50% following a runback.
- Tavg is 3º F > Tref.
- An Alternate Action occurs on Selected Tavg.

(1) What is **Unit 1** current Pressurizer level control setpoint?

(2) If the same conditions (as detailed above) occurred on **Unit 2** , Tavg would be ______(2)______ than the Tavg for Unit 1.

A. (1) 40%
(2) higher

B. (1) 40%
(2) lower

**C. (1) 43%**
**(2) higher**

D. (1) 43%
(2) lower

**QUESTION 20**

**Distractor Analysis**

A. Incorrect. First part is plausible because this is the level control setpoint for 50% power if Tave is matched with Tref. (i.e. additional 3°F is not accounted for). Second part is correct.

Tref at 50% power = [(585.1 – 557) x 0.5] + 557 = 571
(571 – 557)/(585.1 – 557) x (55 – 25) + 25 = **39.9% program level setpoint**

B. Incorrect. First part is plausible because this is the level control setpoint for 50% power if Tave is matched with Tref. (i.e., additional 3°F is not accounted for). Second part is plausible if unit differences are reversed.

C. **CORRECT.** Pressurizer program level range is 25 – 55% and is based on a corresponding Tave range of 557 – 585.1°F (Unit 1) or 557 - 587°F (Unit 2). Therefore:

Unit 1
Tref at 50% power = [(585.1 – 557) x 0.5] + 557 = 571 **plus** 3° temp error = **574 (Tave)**

Unit 2
Tref at 50% power = [(587 – 557) x0.5] + 557 = 572 **plus** 3° temp error = **575 (Tave)**

D. Incorrect. First part is correct. Second part is plausible if unit differences are reversed.

**References:**

- OP-CN-PS-ILE Pressurizer Level Control System, Rev. 100, Section 2.2

**KA Match:**
Given a malfunction of the pressurizer level control system, the applicant is required to calculate current reference level based on knowledge of the design of the system. The applicant must also demonstrate knowledge of the difference between units when given similar failures.

**Cognitive Level:** **High**
The applicant must perform calculations in order to arrive at the correct answer. To arrive at the correct answer, the applicant must compare and contrast unit differences regarding PZR level control programs.

**Source of Question:** **New**

**Question 21**
**032AK1.01**
**Loss of Source Range Nuclear Instrumentation**
**Knowledge of the operational implications of the following concepts as they apply to Loss of Source Range Nuclear Instrumentation:**
**Effects of voltage changes on performance**

Given the following Unit 1 conditions:

- A reactor startup is in progress.
- Intermediate Range power is stable at 10-6 % power on both channels.

**Subsequently:**

Source Range N31 control power fails.

(1) The reactor _____(1)_____ trip.

(2) N31 indication will __________(2)__________ .

**A. (1) will**
**(2) continue to indicate actual counts**

B. (1) will
(2) be lost

C. (1) will not
(2) continue to indicate actual counts

D. (1) will not
(2) be lost

**QUESTION 21**

**Distractor Analysis**

A. **CORRECT.** Loss of control power causes bistables to go to a tripped condition. The source range reactor trip will be active at this power level and will actuate. Indication receives instrument power and will remain available.

B. Incorrect. First part is correct. Second part is plausible if the applicant confuses control power and instrument power, believing that both have similar effects.

C. Incorrect. First part is plausible if the applicant assumes that the source range reactor trip is blocked at this power level, or that one signal is not sufficient to generate a reactor trip. Second part is correct.

D. Incorrect. First part is plausible if the applicant assumes that the source range reactor trip is blocked at this power level, or that one signal is not sufficient to generate a reactor trip. Second part is plausible if the applicant confuses control power and instrument power, believing that both have similar effects.

**References:**

- OP-CN-IC-ENB Excore Nuclear Instrumentation Lesson Plan, Rev. 101, Section 6.1

**KA Match:**
The applicant is required to apply the effects of a loss of voltage to one (of two) power supplies to a source range instrument and determine the operational implications to that particular instrument and the plant. Per previous discussion with the Chief Examiner, the concept of “loss of voltage” meets the intent of the KA concerning voltage changes.

**Cognitive Level:** **High**
Requires analysis of given conditions, including the significance of the given power level, and then application of the significance of a blown fuse in order to predict an outcome.

**Source of Question:** **Bank 88**

**Question 22**
**033AA2.07**
**Loss of Intermediate Range Nuclear Instrumentation**
**Ability to determine and interpret the following as they apply to the Loss of Intermediate Range Nuclear Instrumentation: Confirmation of reactor trip**

Given the following:

Unit 1 was stable at 8% power following reactor startup when the N-35 Intermediate Range Instrument Power supply failed.

(1) The reactor tripped due to a signal generated from _____________.

(2) Following the reactor trip, N-31 _____________ providing accurate indication of Source Range flux.

**A. (1) N-35 ONLY**
**(2) is NOT**

B. (1) N-35 ONLY
(2) is

C. (1) N-31 AND N-35
(2) is

D. (1) N-31 AND N-35
(2) is NOT

**QUESTION 22**

**Distractor Analysis**

A. **CORRECT.** Loss of Instrument Power will cause all associated source range and intermediate range bistables to turn off (acts as if in Trip). The N-31 trip will be blocked at the listed power level. Instrument power supplies meter indication power to both source and intermediate range instruments so the associated source range will not be providing accurate indication.

B. Incorrect. The first part is correct. The second part is plausible if the applicant has an incomplete understanding that the power supply between N-31 and N-35 is shared.

C. Incorrect. First part is plausible because a loss of power to N-35 would also result in a loss of power to N-31 (initiating a reactor trip signal), but the N-31 trip signal would be blocked at 8% power. The second part is plausible if the applicant has an incomplete understanding that the power supply between N-31 and N-35 is shared.

D. Incorrect. First part is plausible because a loss of power to N-35 would also result in a loss of power to N-31 (initiating a reactor trip signal), but the N-31 trip signal would be blocked at 8% power. Second part is correct.

**References:**
- OP-CN-IC-ENB (Excore Nuclear Instrumentation Lesson Plan), Rev. 101, Section 6.1
- OP-CN-IC-IPX, (Reactor Protection System Lesson Plan), Rev. 100, Section 4.3

**KA Match:**
Given a loss of instrument power to intermediate range instrumentation, the applicant is required to demonstrate knowledge of the reactor trip signal generated along with the affects to other nuclear instrumentation. Determining whether Source Range is an accurate indication of flux is a form of monitoring for, and confirming reactor shutdown, and therefore meets the intent of this K/A.

**Cognitive Level:** **High**
Applicant must analyze conditions to determine the significance of the given power level in the context of a power failure and loss of the Intermediate Range N35, to predict an outcome (why the reactor tripped), and then to make a conclusion (analysis) and evaluation of the accuracy of an alternate NI (Source Range).

**Source of Question:** **New**

**Question 23**
**061AA1.01**
**Area Radiation Monitoring (ARM) System Alarms**
**Ability to operate and / or monitor the following as they apply to the Area Radiation Monitoring (ARM) System Alarms: Automatic actuation**

Given the following:

- The refueling crew is lowering an irradiated fuel assembly next to a new fuel assembly in the core for Unit 1.
- The assembly inadvertently drops completely into the core and a notable amount of bubbles are observed.
- The RO notes that source range count rates increased by 0.4 decades and are stabilizing.

Which ONE of the following describes:

(1) the expected alarm;

(2) how this alarm will impact evacuation of containment?

A. (1) 1AD-2, D/3 & D/4 S/R HI FLUX LEVEL AT SHUTDOWN
(2) Causes an automatic actuation of the Containment Evacuation alarm.

B. (1) 1AD-2, D/3 & D/4 S/R HI FLUX LEVEL AT SHUTDOWN
(2) Requires Control Room crew to manually actuate the Containment Evacuation alarm.

**C. (1) 1RAD-3, D/2 1EMF-17 REACTOR BLDG REFUEL BRIDGE**
**(2) Causes an automatic actuation of the Containment Evacuation alarm.**

D. (1) 1RAD-3, D/2 1EMF-17 REACTOR BLDG REFUEL BRIDGE
(2) Requires Control Room crew to manually actuate the Containment Evacuation alarm.

## QUESTION 23

## Distractor Analysis

A. Incorrect. First part is plausible because this alarm condition is an input to the Containment Evacuation alarm, but requires an increase of 0.5 decade. Second part is correct.

B. Incorrect. First part is plausible because this alarm condition is an input to the Containment Evacuation alarm, but requires an increase of 0.5 decade. Second part is plausible if the applicant concludes that manual action will be required, recalling Step 4 of AP/25, which requires the operator to notify personnel via actuation of this alarm.

C. **CORRECT.** In accordance with Annunciator Response Procedure OP/1/B/6100/010Z, 1RAD-3, D/2, 1EMF17 REACTOR BLDG REFUEL BRIDGE, when radiation monitor 1EMF-17 alarms, it sends a signal to automatically actuate the Containment Evacuation alarm, as long as power level is below permissive P-6 (10E-5%). For the given conditions, the applicant must recognize that this radiation monitor would be in alarm.

D. Incorrect. First part is correct. Second part is plausible if the applicant concludes that manual action will be required, recalling Step 4 of AP/25, which requires the operator to notify personnel via actuation of this alarm.

**References:**
- AP/1/A/5500/025 (Damaged Spent Fuel), Case I (Damaged Fuel in Reactor Building), Rev. 016
- OP/1/B/6100/010Z (Annunciator Response Procedure for 1RAD-3),Page 19, Rev. 024

**KA Match:**
Given a fuel handling accident, the applicant is required to determine which area monitor will alarm based on the magnitude of the radiation level change. The applicant is also required to monitor the action for proper function (i.e. automatic vs. manual).

**Cognitive Level:** **High**
The applicant is required to evaluate plant conditions, recall a setpoint, then determine is a set of automatic actions should have occurred.

**Source of Question:** **Bank 4270**

**Question 24**
**067AA1.05**
**Plant Fire on site**
**Ability to operate and / or monitor the following as they apply to the Plant Fire on Site: Plant and control room ventilation systems**

Given the following:

- A plant fire has resulted in smoke intrusion in the Control Room and evacuation in accordance with AP/1/A/5500/017 (Loss of Control Room).
- Preparations to purge the Control Room are being made.

In accordance with AP/17:

(1) The smoke will be purged though the __________ building.

(2) The required alignment of the Control Room Ventilation system ___________ result in an automatic transfer of Spent Fuel Pool Ventilation to Filter Mode.

A. (1) service
(2) will

B. (1) service
(2) will NOT

**C. (1) auxiliary**
**(2) will**

D. (1) auxiliary
(2) will NOT

## QUESTION 24

## Distractor Analysis

A. Incorrect. First part is plausible because the doors normally used for accessing the control room open to the service building. Second part is correct.

B. Incorrect. First part is plausible because the doors normally used for accessing the control room open to the service building. It is not obvious as to why SFP ventilation would go to Filter Mode in relation to an alignment of the CRHVAC. Even if the applicant knows the procedure (AP/17 directs local operation of control room ventilation, which involves placing VC/YC in local), it is not obvious as to why placing VC/YC to local would have any effect on SFP ventilation. See correct answer for the relationship between VC/YC control and SFP ventilation.

C. **CORRECT.** AP/17, Enclosure 8 directs operators to place VC/YC (control room ventilation) in local, and open auxiliary building doors for purge. Spent fuel pool ventilation is automatically aligned to filter mode when VC/YC is placed in local. VC/YC to local would be used also when evacuating the Control Room, and therefore, radiological conditions in the SFP area cannot be monitored from the Control Room; SFP HVAC to filter mode is a conservative automatic action.

D. Incorrect. The first part is correct. Second part plausibility is explained in "B" above.

**References:**

- OP-CN-PSS-VC (Control Room Ventilation System Lesson Plan), Rev. 103, Section 3.2.1
- AP/1/A/5500/017 (Loss of Control Room), Rev. 058, Enclosure 8, Steps 1 and 3

**KA Match:**

The applicant is required to demonstration knowledge of operation of the control room ventilation system (and control room purge flowpath) in accordance with the procedure for control room evacuation due to fire, along with associated impact to another plant ventilation system.

**Cognitive Level:** **High**

Higher cognitive level since applicant is given a set of conditions and then arrives at a conclusion on the effect on the listed equipment. More than one mental step is involved.

**Source of Question:** **New**

**Question 25**
**WE03EK3.4**
**LOCA Cooldown and Depressurization**
**Knowledge of the reasons for the following response as they apply to the (LOCA Cooldown and Depressurization):**
**RO or SRO function within the control room team as appropriate to the assigned position, in such a way that procedures are adhered to and the limitations in the facilities license and amendments are not violated.**

Given the following Unit 1 conditions:

- The Unit experienced a Medium Break LOCA.
- Containment pressure reached a maximum of 2.8 psig.
- The crew is currently performing steps of EP/1/A/5000/ES-1.2 (Post LOCA Cooldown and Depressurization).
- The crew is at Step 14 for initiating NC System depressurization.

(1) When directed to initiate depressurization, the procedure FIRST directs use of ________(1)________ .

(2) The purpose of this step is to ensure the Pressurizer is refilled to a MINIMUM required level of greater than _____(2)_____ .

**A. (1) normal PZR spray valves**
**(2) 25%**

B. (1) normal PZR spray valves
(2) 44%

C. (1) a single PZR PORV
(2) 25%

D. (1) a single PZR PORV
(2) 44%

**QUESTION 25**

**Distractor Analysis**

A. **CORRECT.** Step 14 requires the crew to initiate depressurization by first attempting use of pressurizer spray. This is done for the purpose of refilling the PZR. If spray is unavailable, the RNO directs use of one pressurizer PORV. The minimum required level is 25% for non-Adverse Containment Conditions (< 3.0 psig).

B. Incorrect. First part is correct. 44% is plausible since this is the level required if Adverse Containment Conditions existed.

C. Incorrect. First part is plausible since this is an action contained in this procedure for depressurizing, and would depressurize the RCS, but it is in the RNO, not the AER. Second part is correct.

D. Incorrect. First part plausibility explained in "A" above. 44% is plausible since this is the level required if Adverse Containment Conditions existed.

**References:**

- EP/1/A/5000/ES-1.2 (Post LOCA Cooldown and Depressurization, Rev. 033, steps 14.a and RNO 14.a.1)

**KA Match:**

While performing the procedure for LOCA cooldown and depressurization, the applicant is required to determine the actual method of successful completion of a step which adheres to the procedure requirements and, therefore, facility license requirements. The "reasons" aspect is met in the fact that this is procedure compliance concept, and the procedure is the reason for these required functions/actions of the crew.

**Cognitive Level:** **Low**

**Source of Question:** **New**

**Question 26**
**WE13EK1.2**
**Steam Generator Overpressure**
**Knowledge of the operational implications of the following concepts as they apply to the (Steam Generator Overpressure):**
**Normal, abnormal and emergency operating procedures associated with (Steam Generator Overpressure)**

Given the following Unit 1 conditions:

**Initial Conditions:**

- The Unit was in Mode 3.

**Subsequent Conditions:**

- A steam generator over pressure event occurred.
- The crew entered EP/1/A/5000/FR-H.2 (Response to S/G Overpressure).

**Current Conditions:**

- 1B S/G pressure is 1235 psig.
- 1B S/G NR level is 99%.
- The 1A, 1C and 1D S/G pressures are all 850 psig and 50% NR level.
- All feedwater isolation status lights are DARK.

Which ONE of the following describes the FIRST action to be taken in accordance with this procedure?

A. Open the 1B S/G PORV to immediately reduce pressure in the 1B S/G.

B. Dump steam from the 1B S/G using CA pump #1 to immediately reduce pressure in the 1B S/G.

**C. Manually isolate feedwater to the 1B S/G to prevent additional feedwater from further pressurizing the 1B S/G.**

D. Dump steam from the 1A, 1C and 1D S/Gs to reduce NC system temperature and reduce pressure in the 1B S/G.

**QUESTION 26**

**Distractor Analysis**

A. Incorrect. Plausible since an applicant could reason that the quickest way to relieve pressure on the 1B S/G is to open the S/G PORV. This would only be correct if S/G level was less than 92%.

B. Incorrect. Plausible since dumping steam to the CA (AFW) pump turbine will quickly relieve pressure on the S/G, but is not the correct procedure requirement.

C. **CORRECT.** Step 2 of FR-H.2 requires a verification that Feedwater Isolation status lights are LIT for the affected S/G. If they are not, the operator is directed to manually isolate. The stem conditions warrant a manual isolation, since isolation lights are DARK. This is the first action required.

D. Incorrect. Plausible since cooling down the RCS (NC) will reduce steam temperature in the 1B S/G, which would reduce pressure. This is an action in FR-H.2, but is not the first action required.

**References:**

- EP/1/A/5000/FR-H.2 (Response to Steam Generator Overpressure), Rev. 008, Steps 2 & 3

**KA Match:**
The applicant is required to apply knowledge of procedure entry and exit conditions related to the emergency procedure for Steam Generator overpressure.

**Cognitive Level:** **High**
This question does involve recall of procedure steps, but it is based on analysis of the given conditions. More than one mental step is involved, including the analysis of conditions, and evaluation of the status of the feedwater operation.

**Source of Question:** **Bank 1322**

**Question 27**
**WE16EK2.1**
**High Containment Radiation**
**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.**

An accident on Unit 1 has resulted in the following conditions:

- 1EMF-53A (Containment High Range) indicates 42R/hr.
- 1EMF-53B (Containment High Range) has lost power due to supply breaker trip.

(1) Entry condition for EP/1/A/5000/FR-Z.3 (Response to High Containment Radiation Level) _____(1)_____ met.

(2) VUCDT (Ventilation Unit Condensate Drain Tank) has been isolated by closure of Containment Isolation Valve (s) __________(2)__________ .

Nomenclature: 1WL-867A (VUCDT Cont Isol)
1WL-869B (VUCDT Cont Isol)

A. (1) is
(2) 1WL-867A ONLY

B. (1) is not
(2) 1WL-867AONLY

**C. (1) is**
**(2) 1WL 867A AND 1WL-869B**

D. (1) is not
(2) 1WL 867A AND 1WL-869B

**QUESTION 27**

**Distractor Analysis**

A. Incorrect. The first part is correct. The second part is plausible if the applicant does not realize that a loss of power actuates the automatic action associated with this EMF, i.e., only one valve is plausible because only one EMF has reached Trip 2.

B. Incorrect. The first part is plausible if the applicant could reason that both EMFs must indicate greater than this setpoint. The second part is plausible if the applicant does not realize that a loss of power actuates the automatic action associated with this EMF.

C. **CORRECT.** 1EMF-53A reading of 42R/Hr exceeds the Z.3 entry condition of 35R/Hr. This setpoint also generates a Trip 2 condition which closes 1WL-867A. Loss of power to 1EMF-53B will result in the automatic action of closing 1WL-869B to actuate.

D. Incorrect. First part plausibility described in "B" above. The second part is correct.

**References:**
- EP/1/A/5000/F-0 Critical Safety Function Status Trees, Rev. 009, pg. 9
- OP-CN-WE-EMF Radiation Monitoring Lesson Plan, Rev. 102, Sections 4.1 and 6.23

**KA Match:**
Given high radiation level in containment, the applicant is required to demonstrate knowledge of the automatic features associated with the applicable EMF along with actions related to a power failure. Additionally, the applicant must recall procedural entry requirements for a specified radiation level.

**Cognitive Level:** **High**
The applicant must analyze the given situation, apply system and operational knowledge to predict plant response and procedural entry guidance.

**Source of Question:** **New**

**Question 28**
**003K4.04**
**Reactor Coolant Pump**
**Knowledge of RCPS design feature(s) and/or interlock(s) which provide for the following: Adequate cooling of RCP motor and seals**

Regarding the cooling of the NC Pump motor and seals:

(1) For normal conditions, ____(1)____ cools the air as it exits the **motor**.

(2) Following Phase B actuation, **seal** cooling will be provided by the ________(2)_________ .

Which ONE of the following completes the statements above?

A. (1) RN
(2) normal seal injection

B. (1) RN
(2) thermal barrier heat exchanger

**C. (1) YV**
**(2) normal seal injection**

D. (1) YV
(2) thermal barrier heat exchanger

**QUESTION 28**

**Distractor Analysis**

A. Incorrect. Second part is correct. RN (Nuclear Service Water) is plausible, since it IS a source of cooling water for cooling air flow through the RCP motor, but it is the backup source, and not the primary source.

B. Incorrect. RN is plausible as described in "A" above. Thermal barrier heat exchanger is plausible since it does limit heat transfer between the hot system primary water and seal injection water, as described in Section 2.3.1 of the Lesson Plan for reactor coolant pumps (NCP).

C. **CORRECT.** The air is cooled after it picks up the heat in the motor (primarily stator end turns), and prior to being routed back to the containment atmosphere. Since normal seal injection provides cool seal water via the charging system, a Phase B does not affect this function, since charging is maintained.

D. Incorrect. First part is correct. Thermal barrier heat exchanger is plausible, as described in "B" above.

**References:**

- OP-CN-PSS-NCP Reactor Coolant Pump Lesson Plan, Rev. 100, Section 4.5 and 6.7

**KA Match:**

The KA is matched because the applicant is tested on knowledge of how the air flow through the RCP motor is cooled, and knowledge of an interlock / design feature for how a Phase B affects adequate cooling of the RCP seals.

**Cognitive Level:** **Low**

**Source of Question:** **Bank 2012 NRC Exam Q28**

**Question 29**
**004A4.13**
**Chemical and Volume Control System**
**Ability to manually operate and/or monitor in the control room:**
**VCT level control and pressure control**

Given the following:

- A 1000 gallon dilution is being performed on Unit 1 in accordance with OP/1/A/6150/009 (Boron Concentration Control).

During this addition:

(1) When 1NV-172A (3-Way Divert To VCT-RHT) control switch is placed to "RHT", the valve will ________________(1)________________ .

(2) VCT pressure will be controlled ______(2)______ by use of a Hydrogen supply makeup valve.

A. (1) align to, and then remain in, a position that routes <u>all</u> flow to the RHT
(2) manually

**B. (1) align to, and then remain in, a position that routes <u>all</u> flow to the RHT**
**(2) automatically**

C. (1) route <u>some</u> flow to the RHT while automatically throttling to maintain VCT level
(2) manually

D. (1) route <u>some</u> flow to the RHT while automatically throttling to maintain VCT level
(2) automatically

**QUESTION 29**

**<u>Distractor Analysis</u>**

A. <u>Incorrect.</u> First part is correct. Second part is plausible because:

1. 1NV-466 can be operated manually to decrease hydrogen pressure in the VCT.
2. The setpoint of the automatic control valve for H2 addition to the VCT is changed periodically and done by a manual adjustment of the setpoint.
3. There are numerous applications where a gas valve is operated manually for addition to a specific tank; e.g., adding N2 to the PRT.

B. **CORRECT.** When placed in the RHT position, 1NV-172A fully repositions and passes all flow to the RHT regardless of VCT level. VCT pressure is maintained by an automatic pressure regulator.

C. <u>Incorrect.</u> First part is plausible because this describes the normal operation of the valve when in automatic. Second part plausibility is described in "A" above.

D. <u>Incorrect.</u> First part is plausible because this describes the normal operation of the valve when in automatic. Second part is correct.

**<u>References</u>:**

- OP-CN-PS-NV Chemical and Volume Control Lesson Plan, Rev. 200, Sect. 2.2.1
- OP/1/A/6200/001 (Chemical and Volume Control System), Rev. 148, Encl. 4.21

**<u>KA Match:</u>**

The applicant is required to demonstrate knowledge of how the VCT level and pressure are controlled when performing a reactor coolant system dilution.

**<u>Cognitive Level:</u>** **Low**

**<u>Source of Question:</u>** **New**

**Question 30**
**005A2.02**
**Residual Heat Removal**
**Ability to (a) predict the impacts of the following malfunctions or operations on the RHRS, and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations:**
**Pressure transient protection during cold shutdown**

Given the following:

- Unit 1 is currently in Mode 5.
- Plant cooldown is in progress for refueling outage.
- 1A ND has been placed in service.
- Preps are being made to place 1B ND in service.
- 1A and 1B NC Pumps are in operation.

Subsequently:

- 1ND-3 (1A ND Pump Suction From NC Loop B Header Relief) fails open.
- PZR level and NC pressure are decreasing.

(1) What is the correct procedure entry for this condition?

(2) What is the first action required?

A. (1) AP/1/A/5500/019 (Loss of Residual Heat Removal System)
(2) Secure 1A and 1B NCPs

**B. (1) AP/1/A/5500/019 (Loss of Residual Heat Removal System)**
**(2) Secure 1A ND Pump**

C. (1) AP/1/A/5500/027 (Shutdown LOCA)
(2) Secure 1A and 1B NCPs

D. (1) AP/1/A/5500/027 (Shutdown LOCA)
(2) Secure 1A ND Pump

**QUESTION 30**

**<u>Distractor Analysis</u>**

A. <u>Incorrect.</u> First part is correct. Second part is plausible because this is a required action, but only AFTER the ND pump is secured.

B. **CORRECT.** The listed conditions meet the entry requirements of AP/19 for Loss of RHR, Case II. The first action required is per Step 1 (an Immediate Action), which is to secure operating ND pumps.

C. <u>Incorrect.</u> First part is plausible because this would only be used if in Mode 4. AP/27 is not applicable in Mode 5. Second part is plausible because this is a required action, but only AFTER the ND pump is secured.

D. <u>Incorrect.</u> First part is plausible because this would only be used if in Mode 4. AP/27 is not applicable in Mode 5. Second part is correct.

**<u>References</u>:**
- AP/1/A/5500/027 (Shutdown LOCA), Rev. 038, Section A. (Purpose)
- AP/1/A/5500/019 (Loss of Residual Heat Removal System), Rev. 058, Section B (Symptoms), and Case II, steps 1 and 2

**<u>KA Match:</u>**
Given a condition involving a malfunction of the RHR system due to pressure relief valve failure, the applicant is required to demonstrate knowledge of correct procedure entry and actions required for mitigation.

**<u>Cognitive Level:</u>** **Low**

**<u>Source of Question:</u>** **New**

**Question 31**
**006K6.19**
**Emergency Core Cooling**
**Knowledge of the effect of a loss or malfunction on the following will have on the ECCS: HPI/LPI systems (mode change)**

Unit 2 is making preparations to enter Mode 3 following refueling. In accordance with the following Technical Specifications:

- 3.5.2 (ECCS - Operating)
- 3.5.3 (ECCS - Shutdown)

____(1)____ additional ND pump(s) is/are required in Mode 3 as compared to Mode 4, AND
____(2)____ additional NI pump(s) is/are required in Mode 3 as compared to Mode 4.

A. (1) One
(2) One

**B. (1) One**
**(2) Two**

C. (1) No
(2) One

D. (1) No
(2) Two

**QUESTION 31**

**<u>Distractor Analysis</u>**

A. <u>Incorrect.</u> First part is correct. Second part: plausible to believe that an NI pump is required when in Mode 4, since Tavg is 200ºF - 350ºF, and there is plausibility for a concern for boiling and the need for safety injection and other safety functions in this Mode.

B. **CORRECT.** The conditions in the stem are for Mode 4. In Mode 4 Tech. Spec. 3.5.3 requires only one train of ECCS to be operable. This "train" does not include the NI pump(s) (Intermediate Head).

To meet the requirements of Tech. Spec. 3.5.2 for Mode 3, both trains of ECCS are required to be operable, including both NI pumps.

C. <u>Incorrect</u>. No additional ND pumps is plausible if applicant reasons that BOTH ND pumps are already required (in Mode 4 and potentially on RHR - ND pumps are used for RHR).

Second part: plausible to believe that an NI pump is required when in Mode 4, since Tavg is 200ºF - 350ºF, and there is plausibility for a concern for boiling and the need for safety injection and other safety functions in this Mode.

D. <u>Incorrect.</u> No additional ND pumps is plausible if applicant reasons that BOTH ND pumps are already required (in Mode 4 and potentially on RHR - ND pumps are used for RHR).

Second part is correct.

**<u>References</u>:**
- Tech. Spec. 3.5.2, (ECCS - Operating), Amendment Nos. 253/248
- Tech. Spec. 3.5.3, (ECCS - Shutdown), Amendment Nos. 213/207
- Tech. Spec Basis 3.5.3 (ECCS – Shutdown Basis), Rev. 000, Background

**<u>KA Match:</u>**
Even though the question does not involve a "loss" or malfunction, it meets the intent of the KA because it COULD be a loss or a malfunction that impacts whether mode change can be made, and Tech. Spec. requirements met. This is the real intent of this KA, therefore, the question meets that.

**<u>Cognitive Level:</u>** **Low**

**<u>Source of Question:</u>** **New**

**Question 32**
**007A3.01**
**Pressurizer Relief Tank/Quench Tank System (PRTS)**
**Ability to monitor automatic operation of the PRTS, including:**
**Components which discharge to the PRT**

In describing automatic operation of valves associated with the Pressurizer Relief Tank (PRT):
____________(1)____________ receives a CLOSE signal on a ________(2)________ actuation.

Which ONE of the following completes the above statement?

**A. (1) 1NC-53B (N2 to PRT Cont Isol)**
**(2) Phase A**

B. (1) 1NC-54A (N2 to PRT Cont Isol)
(2) Phase B

C. (1) 1NC-56B (RMW Pump Disch to PRT Cont Isol)
(2) Phase B

D. (1) 1NC-58A (PRT Spray Supply Isol)
(2) Phase A

**QUESTION 32**

**Distractor Analysis**

A. **CORRECT.** Per the Design Basis for the RCS, 1NC-53B (the nitrogen valve to PRT) is a containment isolation and does receive a close signal on a Phase A, as does 1NC-56B, though 56B does NOT receive a Phase B. This information is also in the listed sections of the lesson plan.

B. Incorrect. 1NC-54A is a containment isolation and is therefore plausible to believe that it receives a Phase B signal, which is a level of containment isolation.

C. Incorrect. Plausible, since 1NC-56B does receive a close signal for containment isolation, but it is for a Phase A only.

D. Incorrect. Since 1NC-58A is not required for the ESF function (per the DBD, table for NC58A on page 61 of 200, it is plausible that it would receive an isolation signal for containment isolation on a Phase A.

**References:**

- OP-CN-PS-PRT, Lesson Plan for Pressurizer Relief Tank, Rev. 101, Section 4.2, (Nitrogen Gas System), and Section 4.4, (Reactor Makeup Water System)
- CNS-1553.NC-00-0001, Rev. 35, Design Basis Specification for the Reactor Coolant (NC) System, page 61 of 200, page 59 of 200

**KA Match:**
The KA is matched because the question involves the ability to determine the effect of a control / protective signal on the automatic operation of a component which discharges to the PRT (Nitrogen supply).

**Cognitive Level:** **Low**

**Source of Question:** **Bank 2012 NRC Exam #34**

**Question 33**
**008G2.4.47**
**Component Cooling Water System**
**Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.**

Given the following:

- Unit 1 is in Mode 3 at normal operating pressure/temperature.
- 1RAD-1 A/4 (1EMF-46A Train A KC Hi Rad) has actuated.
- Pressurizer level is stable.
- Charging flow has increased.
- The crew is attempting to identify a NC system leak into the KC system.
- KC Surge Tank levels have changed as follows in the last 40 minutes:
    - KC Surge Tank 1A level has increased from 60% to 63%
    - KC Surge Tank 1B level has increased from 65% to 67%

**Reference Provided**

(1) The current leakage rate into the KC system is ____________ gpm.

(2) The CRS will enter _____________ .

A. (1) 2.5
(2) AP/1/A/5500/010 (Reactor Coolant Leak)

B. (1) 2.5
(2) AP/1/A/5500/027 (Shutdown LOCA)

**C. (1) 5**
**(2) AP/1/A/5500/010 (Reactor Coolant Leak)**

D. (1) 5
(2) AP/1/A/5500/027 (Shutdown LOCA)

## QUESTION 33

## Distractor Analysis

A. Incorrect. First part is plausible if the applicant accounts for the increase of only one surge tank or believes that the supplied reference includes volumes of both tanks combined. Second part is correct.

B. Incorrect. First part is plausible if the applicant accounts for the increase of only one surge tank or believes that the supplied reference includes volumes of both tanks combined. Second part is plausible because AP/27 is applicable in Mode 3 but only if Cold Leg Accumulators are isolated (i.e. <1000 psig). Stem of the question states normal operating pressure.

C. **CORRECT.** The chart provided to the applicant is the same for KC Surge Tank A or B. For A tank: in 40 minutes the level increases from 60% to 63%, a total of 150 gallons. For B tank: in 40 minutes the level increases from 65% to 67%, a total of 50 gallons. Total system in-leakage = 200 gallons over 40 minutes = 5 gpm

These conditions are entry conditions for AP/010 (Reactor Coolant Leak), Case II (NC System Leak) since charging flow is increasing.

D. Incorrect. First part is correct. Second part is plausible because AP/27 is applicable in Mode 3 but only if Cold Leg Accumulators are isolated (i.e. <1000 psig). Stem of the question states normal operating pressure.

**References:**
- AP/1/A/5500/027 (Shutdown LOCA), Rev. 038, Section A (Purpose)
- AP/1/A/5500/010 (Reactor Coolant Leak), Rev. 057, Section A (Purpose)

**Provide to Applicant:**
- KC Surge Tank graph attached (KC Surge Tank Volume vs Level)

**KA Match:**
Given conditions indicating a reactor coolant system leak into the Component Cooling Water system, the applicant is required to determine a trend based on Control Room indication and available reference material along with demonstrate knowledge of procedure entry requirements.

**Cognitive Level:** **High**
The applicant must evaluate multiple data points, apply supplied information to a reference chart, and perform a calculation.

**Source of Question:** **New**

**Question 34**
**008K1.04**
**Component Cooling Water System**
**Knowledge of the physical connections and/or cause-effect relationships between the CCWS and the following systems:**
**RCS, in order to determine source(s) of RCS leakage into the CCWS**

If a NC pump thermal barrier heat exchanger develops a leak, the ….

A. KC surge tank vent to atmosphere will close due to high radiation.

**B. thermal barrier heat exchanger return isolation valve will close due to high flow.**

C. reactor building non-essential header will isolate due to high flow.

D. thermal barrier heat exchanger supply isolation valve will close due to high activity.

**QUESTION 34**

**Distractor Analysis**

A. Incorrect. Plausible because the Component Cooling Water system is monitored for activity, but the listed action is not associated with this monitor. This design is used at many facilities (e.g., McGuire), but is not used at Catawba.

B. **CORRECT.** The Thermal Barrier Hx has an inlet check valve. The outlet valve that auto closes in the event of a thermal barrier rupture. The outlet valve auto closes at 60 gpm after 30 seconds. (The 30 sec. time delay prevents the valve from closing on surge, during a pump start).

This arrangement of an inlet check valve and auto closed outlet valve should isolate any Thermal Barrier HX leak.

C. Incorrect. Plausible because the Reactor Building Non-essential header will isolate on Hi-Hi containment pressure. The Thermal Barrier Heat Exchanger isolates on high flow.

D. Incorrect. Plausible because the Thermal Barrier Heat Exchanger does have an isolation function, but it is due to high flow and completed by closure of the outlet valve.

**References:**
- OP-CN-PSS-KC (Component Cooling Water Lesson Plan), Rev. 100, Sections 2.4, 2.7, and 3.1

**KA Match:**
The applicant is required to demonstrate knowledge of the cause-effect relationship when the boundary between the Reactor Coolant System and Component Cooling Water system is breached.

**Cognitive Level:** **Low**

**Source of Question:** **Bank VISION KC-040-D**

**Question 35**
**010A2.01**
**Pressurizer Pressure Control System**
**Ability to (a) predict the impacts of the following malfunctions or operations on the PZR PCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Heater failures**

Given the following Unit 2 initial conditions:

- Preparations are in progress for Unit startup.
- The Unit is at normal operating pressure and temperature.

**Subsequently:**
- A loss of offsite power occurs.
- 2ETA is now powered from 2A D/G.
- 2ETB is de-energized.
- PZR level is 90% and stable.

In accordance with Tech. Spec. 3.4.9 (Pressurizer):

(1) Action _____(1)_____ required to address Pressurizer level.

(2) Action _____(2)_____ required to address Pressurizer heater capacity.

A. (1) is
(2) is

**B. (1) is not**
**(2) is**

C. (1) is
(2) is not

D. (1) is not
(2) is not

## QUESTION 35

### Distractor Analysis

A. Incorrect. First part is plausible because the listed value of PZR level does exceed the setpoint of the PZR Hi Level annunciator which would require action. The question specifically tests Tech. Spec. required actions. Second part is correct.

B. **CORRECT.** Per Tech. Spec. 3.4.9, an operable pressurizer requires level ≤92% and TWO groups of heaters capable of being powered from an emergency source.

C. Incorrect. First part is plausible because the listed value of PZR level does exceed the setpoint of the PZR Hi Level annunciator which would require action. The question specifically tests Tech. Spec. required actions. Second part is plausible because greater than 150 KW heater capacity is still available. Tech Spec requires TWO groups available.

D. Incorrect. First part is correct. Second part is plausible because greater than 150 KW heater capacity is still available. Tech Spec requires TWO groups available.

**References:**

- Tech. Spec. 3.4.9 (Pressurizer), Amend. Nos. 173/165
- OP/1/B/6100/010G (Annunciator Response for Panel 1AD-6), , B/9 (PZR Hi Level), Rev. 065

**KA Match:**

At first glance, this may not appear to match the KA. But it does match the KA because "predicting the impact" is met by evaluating given conditions and determining the impact on Tech. Spec. related equipment. The second part of the KA is met by testing which of the conditions warrant entry into a procedure/guidance (Tech. Specs.) with the implied use of that guidance to mitigate or control the condition.

**Cognitive Level:** **High**

Requires the applicant to analyze a set of conditions, then apply recall of Tech. Spec. requirements for PZR level (above the line) to determine if action is required. Also requires analysis of conditions involving power losses, applying that to its effect on PZR heaters, including Tech. Spec. implications.

**Source of Question:** **New**

**Question 36**
**012A3.06**
**Reactor Protection System (RPS)**
**Ability to monitor automatic operations of the RPS, including: Trip logic**

Given the following initial conditions:

- Unit 1 is at 45% power.
- 1B CFPT has been tagged for condenser leak repair.

Subsequently:

- 1A CFPT trips due to low oil pressure.

In response to this condition:

(1) The Main Turbine _____________ immediately trip.

(2) The Reactor ____________ immediately (automatically) trip.

A. (1) will
(2) will

**B. (1) will**
**(2) will NOT**

C. (1) will NOT
(2) will

D. (1) will NOT
(2) will NOT

**QUESTION 36**

**Distractor Analysis**

A. Incorrect. Plausible since the reactor will trip due to turbine trip but this will only happen above 69%. First part is correct.

B. **CORRECT.** The main turbine will trip due to AMSAC (ATWS Mitigation System Actuation Circuitry) actuation based on a loss of both main feed pumps. There is no specific reactor trip for this condition, although the reactor would eventually trip on low S/G water level.

C. Incorrect. Plausible if the applicant misapplies the AMSAC trip to the reactor vs. the main turbine.

D. Incorrect. Plausible that the turbine would not immediately trip, since the unit is at a much lower power level, and it would be some time before S/G levels decrease to reactor trip/turbine trip setpoints.

**References:**
- OP-CN-CF-CF (Main Feedwater Lesson Plan), Rev. 101, Section 3.1
- OP-CN-IC-IPX (Reactor Protection System Lesson Plan), Rev. 100, Section 11

**KA Match:**
The applicant is required to apply knowledge of the reactor protection system and (based on automatic operation of other plant equipment) then determine if the RPS will provide an immediate reactor trip signal. This is a form of "trip logic" because of the effects of the given plant conditions on the RPS actuation.

**Cognitive Level:** **High**
This question requires more than one mental step to arrive at the correct answer. First determine turbine trip setpoint/logic and then apply specific operational information to determine reactor trip requirement.

**Source of Question:** **New**

**Question 37**
**012K5.02**
**Reactor Protection System (RPS)**
**Knowledge of the operational implications of the following concepts as they apply to the RPS: Power density**

Given the following;

- Unit 1 is at 43% following a power reduction for Main Turbine work.
- AFD is 1.5% and increasing due to a Xenon transient.

(1) The Reactor Trip Protective feature that will protect the core from exceeding thermal limits due to excessive local power density if $\Delta$I is not corrected is _____________ .

(2) Technical Specification 3.2.3 (Axial Flux Difference) __________ applicable under these conditions.

A. (1) OT$\Delta$T
(2) is NOT

B. (1) OT$\Delta$T
(2) is

**C. (1) OP$\Delta$T**
**(2) is NOT**

D. (1) OP$\Delta$T
(2) is

**QUESTION 37**

**Distractor Analysis**

A. Incorrect. First part is plausible because AFD more positive than the COLR limit decreases OTΔT setpoint but for the purpose of DNBR vs. local power density. Second part is correct.

B. Incorrect. First part is plausible because AFD more positive than the COLR limit decreases OTΔT setpoint but for the purpose of DNBR vs. local power density. Second part is plausible if the applicant misapplies the mode of applicability, and reasons that a specification for Axial Flux Difference would apply at power operations.

C. **CORRECT.** AFD more positive than COLR limit will decrease the OPΔT setpoint and eventually cause a reactor trip. The purpose of this trip is to protect against excessive fuel centerline temperature due to high fuel rod power density. Tech. Spec. 3.2.3 is applicable in Mode 1 greater than 50% power.

D. Incorrect. First part is correct. Second part is plausible if the applicant misapplies the mode of applicability, and reasons that a specification for Axial Flux Difference would apply at power operations.

**References:**
- OP-CN-IC-IPX (Reactor Protection System lesson plan), Rev. 100, Section 4.11 & 4.12
- Tech. Spec. 3.2.3, (Axial Flux Difference), Amendment Nos. 263/259

**KA Match:**
The applicant is required to demonstrate knowledge of the Reactor Protection System trips associated with excessive power density.

**Cognitive Level:** **High**
Applicant must determine the significance of the given power level and AFD and make a conclusion regarding applicability of a Tech. Spec. Multiple mental steps are involved, and therefore this question is at the higher cognitive level.

**Source of Question:** **New**

**Question 38**
**013G2.1.30**
**Engineered Safety Features Actuation System (ESFAS)**
**Ability to locate and operate components, including local controls**

In order to manually start 1A NS Pump, a containment pressure signal equal to ______(1)______ must be inserted at the ________(2)__________.

A. (1) 0.35 psig
   (2) Spray Test Panel (Logic Bay)

B. (1) 0.35 psig
   (2) 1CPCC1 (1ETA) panel

C. (1) 0.90 psig
   (2) Spray Test Panel (Logic Bay)

**D. (1) 0.90 psig**
   **(2) 1CPCC1 (1ETA) panel**

**QUESTION 38**

**Distractor Analysis**

A. Incorrect. First part is plausible because this is the value at which an NS pump will be secured. Second part is plausible because the Spray Test Panel is used for Hi-Hi containment pressure testing, but does not meet the pump start interlock.

B. Incorrect. First part is plausible because this is the value at which an NS pump will be secured. Second part is correct.

C. Incorrect. First part is correct. Second part is plausible because the Spray Test Panel is used for Hi-Hi containment pressure testing, but does not meet the pump start interlock.

D. **CORRECT.** Operation of the Containment Spray Pumps requires a minimum pressure setpoint to be met in order to prevent low containment pressure conditions. This interlock is satisfied when operating the pumps manually, by inserting a signal into a test instrument at the Containment Pressure Control Cabinet.

**References:**
- OP-CN-ECCS-NS, Containment Spray Lesson Plan, Rev. 101, Section 13
- OP/1/A/6200/007 Containment Spray System, Rev. 063, Encl. 4.3, step 3.18
- OP-CN-ECCS-ISE Engineered Safeguards Lesson Plan, Rev. 100, Section 3.1

**KA Match:**
The applicant is required to demonstrate knowledge of location and operation of local controls required meet the interlock for a Containment Spray Pump (ESFAS component).

**Cognitive Level:** **Low**

**Source of Question:** **New**

**Question 39**
**013K2.01**
**Engineered Safety Features Actuation System (ESFAS)**
**Knowledge of bus power supplies to the following:**
**ESFAS/safeguards equipment control**

(1) A P-4 Signal is NOT required for allowing reset of a Safety Injection Signal (Ss) in order to gain control of equipment, if the Ss was initiated ______(1)______.

(2) If the 1A D/G load sequencer signal cannot be reset, control power must be removed at _____(2)_____.

A. (1) automatically
   (2) 1EDE

**B. (1) manually**
   **(2) 1EDE**

C. (1) automatically
   (2) 1EADA/1VADA

D. (1) manually
   (2) 1EADA/1VADA

**QUESTION 39**

**<u>Distractor Analysis</u>**

A. <u>Incorrect.</u> First part is plausible because a P-4 signal is required for reset if Ss is actuated automatically. Second part is correct.

B. **CORRECT**. For a manual Ss (only), a P-4 is not required to allow reset of the safety injection signal. E-0, Step 29.b. RNO directs operators to open 1EDE-F01F if the load sequencer cannot be reset.

C. <u>Incorrect.</u> First part is plausible because a P-4 signal is required for reset if Ss is actuated automatically. Second part is plausible because 1EADA and 1VADA are the two sources of power which are auctioneered to supply 1EDE. But, E-0 directs that the sequencer control power ONLY be opened. Isolating both 1EADA and 1VADA would de-energize all of 1EDE which could complicate further recover efforts.

D. <u>Incorrect.</u> First part is correct. Second part plausibility as described in "C" above.

**<u>References</u>:**
- OP-CN-ECCS-ISE (ESFAS) Lesson Plan, Rev. 100, Section 5.1 (Ss Reset)
- EP/1/A/5000/E-0 (Reactor Trip or Safety Injection), Rev. 042, Step 29.b (RNO)
- EPL-CN-EL-EPL Lesson Plan for Vital Instrument and Control Power, Rev. 100, Figure 4

**<u>KA Match:</u>**
The applicant is required to demonstrate knowledge of how ESFAS equipment is controlled when given a specific example of actuation type. The applicant is also required to know the applicable **<u>supply of control power</u>** in order to re-gain control when system reset is unsuccessful.

**<u>Cognitive Level:</u>** **High**
Requires the applicant to recall system knowledge (function of P-4) and analyze the effect of P-4 on SI reset, based on how the SI was initiated (manually vs. auto). Applicant then uses this analysis to arrive at a conclusion regarding the load sequencer operation.

**<u>Source of Question:</u>** **New**

**Question 40**
**022G2.4.34**
**Containment Cooling System**
**Knowledge of RO tasks performed outside the main control room during an emergency and the resultant operational effects**

During the performance of AP/1/A/5500/017, (Loss of Control Room), the operators are performing Enclosure 3 (Turbine Bldg Operator Actions).

In accordance with this procedure:

(1) Locally (at both CPCS control cabinets) verify that containment pressure does not exceed a maximum of _____(1)_____ .

(2) Local monitoring of containment pressure once per hour __________ meet the requirement of AP/17.

A. (1) 0.3 psig
(2) does NOT

**B. (1) 0.3 psig**
**(2) does**

C. (1) 3 psig
(2) does NOT

D. (1) 3 psig
(2) does

**QUESTION 40**

**Distractor Analysis**

A. Incorrect. First part is correct. Second part is plausible because (outside of the Control Room) there would be no alarm to alert operators of increasing pressure. Applicant could make this selection based on believing that because of no alarm function, that the pressure should be monitored continuously.

B. **CORRECT**_Enclosure 3 of AP/17 (Turbine Building Operator Actions) requires that containment pressure be monitored once per hour and verified to be less than 0.3 psig.

C. Incorrect. First part is plausible because this is the Hi-Hi Containment pressure setpoint. Second part plausibility explained in "A" above.

D. Incorrect. First part is plausible because this is the Hi-Hi Containment pressure setpoint. Second part is correct.

**References:**

- AP/1/A/5500/017 (Loss of Control Room), Rev. 058, Enclosure 3, Step 11

**KA Match:**

The applicant is required to demonstrate knowledge of an action taken outside of the Control Room related to containment conditions during emergency conditions (Loss of Control Room). While this is not specifically an RO task, all ROs are required to be qualified/capable of performing this task.

**Cognitive Level:** **Low**

**Source of Question:** **New**

**Question 41**
**025A2.03**
**Ice Condenser System**
**Ability to (a) predict the impacts of the following malfunctions or operations on the ice condenser system; correct, control, or mitigate the consequences of those malfunctions or operations: Opening of ice condenser doors**

Given the following:

- Unit 2 is in Mode 4.
- 2AD-13 A/7 ICE COND LOWER INLET DOORS OPEN is LIT.
- 2AD-13 A/8 ICE BED RTD LO/HI/HI-HI TEMP is LIT.
- The lower inlet door position display panel indicates that a door is open.
- Ice Bed temperature is confirmed to be 23° F.
- No other alarms related to the ice condenser, NF system or AHUs are lit.

Tech Spec 3.6.12 (Ice Bed) _______(1)_______ required to be entered due to the _______(2)_______ .

A. (1) is
(2) open ice condenser door

B. (1) is
(2) ice bed temperature

C. (1) is NOT
(2) current operating mode

**D. (1) is NOT**
**(2) ice bed temperature**

**QUESTION 41**

**Distractor Analysis**

A. Incorrect. Plausible if the applicant believes that an open ice condenser door (only) renders the ice bed inoperable per this T.S., and since there are Tech. Spec. requirements for ice condenser doors, but it is a different Tech. Spec. (TS 3.6.13).

B. Incorrect. Plausible if the applicant misapplies the given ice bed temperature to the requirements of the Tech. Spec. and since the two numbers are very similar.

C. Incorrect. Plausible that the Ice Bed requirement would not apply in Mode 4, since there is less energy in the RCS to be dissipated by the Ice Condenser system, and reasons that a higher mode is applicable.

D. **CORRECT.** With the given conditions, this T.S. is not required to be entered because ice bed temperature is above that which is required to be operable (27°F – as stated in SR 3.6.12.1). This T.S. is applicable in Modes 1-4.

**References:**
- T.S. 3.6.12 (Ice Bed), Amendment Nos. 263/259
- SR 3.6.12.1, Amendment Nos. 263/259

**KA Match:**
When given a set of plant conditions including open ice condenser doors, the applicant is required to apply the applicable technical specification as a means of control and mitigation of the consequences.

**Cognitive Level:** **High**
Though this is a relatively simple high cognitive level question, it is high cog, since it requires the applicant to analyze given conditions, and determine if a Tech. Spec. entry is required, and why.

**Source of Question:** **New**

**Question 42**
**025K6.01**
**Ice Condenser System**
**Knowledge of the effect of a loss or malfunction of the following will have on the ice condenser system: Upper and lower doors of the ice condenser**

Given the following Unit 1 conditions:

- The unit is at 100% power.
- It has been determined that two Ice Condenser Lower Inlet doors are physically restrained from opening.

(1) In accordance with Tech. Spec. 3.6.13, (Ice Condenser Doors), the Inlet doors must be restored to operable within ___________ .

(2) The value of Containment design pressure is __________ .

**A. (1) 1 hour**
**(2) 15 psig**

B. (1) 1 hour
(2) 3 psig

C. (1) 4 hours
(2) 3 psig

D. (1) 4 hours
(2) 15 psig

**QUESTION 42**

**<u>Distractor Analysis</u>**

A. **CORRECT.** The lower inlet doors inoperable due to being physically restrained must be restored to operable within 1 hour. Containment design pressure is 15 psig.

B. <u>Incorrect.</u> First part is correct. 3 psig is plausible per DBD for Reactor Bldg. Structures, Section 3.2.1.1, Shell Wall that says "The Design Event loads are based on the effects of an OBE and SSE, tornado wind, tornado missiles and tornado depressurization (negative internal pressure of 3 psig if the Equipment Hatch “boot” seal."

C. <u>Incorrect.</u> First part is plausible because other ice condenser door inoperabilities do require a 4 hour completion time. Second part plausibility explained in "A" above.

D. <u>Incorrect.</u> First part is plausible because other ice condenser door inoperabilities do require a 4 hour completion time. Second part is correct.

**<u>References</u>:**
- OP-CN-CNT-CNT (Containment Lesson Plan), Rev. 102, Section 2.8
- Tech. Spec. 3.6.13 (Ice Condenser Doors), Amend Nos. 256/251

**<u>KA Match:</u>**
Given a malfunction of ice condenser inlet doors, the applicant is required to demonstrate the effect through the proper application of technical specification; and to recall containment design pressure, a related parameter of the function of the ice condenser system.

**<u>Cognitive Level:</u>** **Low**

**<u>Source of Question:</u>** **Bank 2913 - Modified**

**Question 43**
**026K2.01**
**Containment Spray System (CSS)**
**Knowledge of bus power supplies to the following: Containment spray pumps**

(1) 1B NS (Containment Spray) Pump is normally powered from _____(1)_____

(2) In accordance with Extensive Damage Mitigation Guidelines, when 1B NS pump is powered from the alternate source, starting of the pump will be from ______(2)_____ .

Which ONE of the following completes the statements above?

A. (1) 1ETB
(2) Unit 1

B. (1) 1EMXB
(2) Unit 2

**C. (1) 1ETB**
**(2) Unit 2**

D. (1) 1EMXB
(2) Unit 1

**QUESTION 43**

**Distractor Analysis**

A. Incorrect. First part is correct. Unit 1 is plausible if applicant reasons that an alternate power supply could be from the same unit, but from a different safety related power source (i.e., opposite train of safety related power). The pumps are physically located closer to the opposite train power supply (of the same unit), vs. opposite unit power supply. We believe this adds significant plausibility to A(2) and D(2).

B. Incorrect. Second part is correct. 1EMXB (a 600V MCC) is plausible since 2 of the EMX MCCs provide power to the CPCS (Containment Pressure Control System), but it is for control power, and not for a pump.

C. **CORRECT.** 1B Containment Spray is powered from the 1ETB safeguards bus.

D. Incorrect. 1EMXB is plausible, as described in "B" above. Second part plausibility as explained in "A" above.

**References:**

- OP-CN-CP-EDM, (Extensive Damage Mitigation) Lesson Plan (excerpt snapshot shown below), Rev. 100

**Objective 19, All**

The method of powering the NS from the opposite unit is literally pulling cable across the floor of the 522 elevation. A cable in the Fire Damage Control Equipment locker/pallets located in Warehouse #2 (Bldg. 7762) will be connected to the incoming leads of the opposite Unit NS Pump and connected to the leads of the NS Pump to be powered. Ops will tag out the equipment and Maintenance will connect the cabling. When this is done the following issues must be considered:

- In this alignment the NS pump will be started from the opposite unit
- The CPCS signal must be met on the opposite unit

**KA Match:**

The KA is matched since it tests knowledge of the power supply for 1B Containment Spray Pump. We have found it extremely difficult to create 3 plausible distractors for a basic power supply question, especially for equipment powered from the safety buses.

To maintain the KA match, and to develop plausible distractors, we therefore expanded this question to a 2x2, the second part of which also meets the KA, since it tests power supply knowledge, but for the alternate source.

**Cognitive Level:** **Low**

**Source of Question:** **New**

**Question 44**
**039A1.03**
**Main and Reheat Steam System (MRSS)**
**Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the MRSS controls including:**
**Primary system temperature indications, and required values, during main steam system warm-up**

Given the following initial conditions:

- Unit 1 is in Mode 3 at normal operating temperature and pressure.
- All Shutdown Banks have been withdrawn.
- Steam dumps are in Automatic with a setpoint of 1092 psig.

**Subsequently:**

- An Auxiliary Operator assigned to warm steam piping downstream of the MSIVs inadvertently OPENS all steamline drains.

(1) If no operator action is taken, the primary system cooldown will stop at an NC system temperature of approximately ________________ .

(2) Tech Spec 3.4.2 (RCS Minimum Temperature for Criticality) mode of applicability conditions _____________ been entered.

A. (1) 553°F
(2) have

B. (1) 553°F
(2) have NOT

C. (1) 516°F
(2) have

**D. (1) 516°F**
**(2) have NOT**

**QUESTION 44**

**Distractor Analysis**

A. Incorrect. First part is plausible if the applicant believes that actuation of P-13 (553°F) will isolate the steam flow (steam dumps) and stop the cooldown. Because of the location of the inadvertently opened steam line drains valves, even if P-13 actuates, the cooldown will continue past that and stop only at the temperature value corresponding to a Main Steam Isolation (on 775 psig).

The second part is plausible if the applicant believes that withdrawn shutdown banks constitute Mode 2 entry which is normally called at control bank withdrawal.

B. Incorrect. First part plausibility described in "A" above. Second part is correct.

C. Incorrect. First part is correct. The second part is plausible if the applicant believes that withdrawn shutdown banks constitute Mode 2 entry which is normally called at control bank withdrawal.

D. **CORRECT.** With the conditions given, the cooldown will not be secured until a Main Steam Isolation occurs at 775 psig. This corresponds to 516°F. T.S. 3.4.2 is applicable in Modes 1 and 2 with Keff $\geq 1.0$ which are not entered until control rods are withdrawn.

**References:**
- OP-CN-ECCS-ISE (ESFAS) Lesson Plan, Rev. 100, Section 5.6
- T.S. 3.4.2 (Minimum Temperature for Criticality), Amendment Nos. 173/165
- Steam Tables

**KA Match:**
The applicant is required to predict the impact of excessive steam flow during a main steam system warm-up, including applicable parameters at which automatic action will prevent exceeding design limits. The applicant is also required to demonstrate knowledge of the technical specification associated with minimum temperature for criticality (another limit).

**Cognitive Level:** **High**
The applicant is required to analyze a situation, apply system and operational knowledge to predict an outcome, and perform a calculation.

**Source of Question:** **New**

**Question 45**
**039K3.04**
**Main and Reheat Steam System (MRSS)**
**Knowledge of the effect that a loss or malfunction of the MRSS will have on the following: MFW pumps**

(1) At 85% turbine load MSR exhaust is _______________ aligned to supply steam to the main feed pumps.

(2) Following a main turbine trip, Main Steam is ______________ aligned to supply steam to the main feed pumps.

A. (1) automatically
(2) automatically

B. (1) automatically
(2) manually

**C. (1) manually**
**(2) automatically**

D. (1) manually
(2) manually

## QUESTION 45

## Distractor Analysis

A. Incorrect. First part is plausible since an applicant could reason that at 85% load, the MSR exhaust pressure reaches a value sufficient to overcome Aux Steam pressure automatically (without manually aligning this steam supply). Second part is correct.

B. Incorrect. First part plausibility is described in "A" above. Second part is plausible because Main Steam is manually aligned following a plant shutdown, but should be available for automatic operation following a turbine trip.

C. **CORRECT.** The controlling procedure for unit operation directs opening the steam supply to the main feed pumps from MSR exhaust at approx. 85%. Main steam is aligned to the main feed pumps via the high pressure control valve during normal operation, which opens on a loss of normal steam supply.

D. Incorrect. First part is correct. Second part is plausible because Main Steam is manually aligned following a plant shutdown, but should be available for automatic operation following a turbine trip.

**References:**

- OP/1/A/6100/003 (Controlling Procedure for Unit Operation), Rev. 123, Enclosure 4.1, Step 3.65
- OP-CN-CF-FPT (Feed Pump Turbine), Rev. 102, Section 2.1

**KA Match:**

The applicant is required to demonstrate knowledge of the alignment of MRSS to the main feed pumps and the effect of a loss of this steam supply.

**Cognitive Level:** **Low**

**Source of Question:** **New**

**Question 46**
**059K1.05**
**Main Feedwater System**
**Knowledge of the physical connections and/or cause-effect relationships between the MFW and the following systems: RCS**

In accordance with OP/1/A/6100/003, (Controlling Procedure for Unit Operation), which ONE of the following will require that the Venturi Fouling Factor be reset to 1.0?

A. An increase in turbine MW output from 50% to 60% at 2 MW/min.

B. One channel of feedwater flow fails low.

**C. A load rejection from 85% to 65% due to a feed pump trip.**

D. Mode 3 entry from Mode 4.

**QUESTION 46**

**Distractor Analysis**

A. Incorrect. Plausible because a 10% “step” load change does require a fouling factor reset.

B. Incorrect. Plausible if the applicant believes that the loss of a feed flow input changes the output of the Venturi Fouling Factor.

C. **CORRECT.** A reset of the Venturi Fouling Factor is required if a ramp load change of greater than 15% power has occurred within a one hour period.

D. Incorrect. Plausible because reset is required prior to Mode 2 entry.

**References:**

- OP/1/A/6100/003 (Controlling Procedure for Unit Operation) Rev. 123, Limit and Precaution 2.9 and Enclosure 4.3, step 3.9
- OP/1/A/6100/001 (Controlling Procedure for Unit Startup), Rev. 232, Enclosure 4.1, Step 3.150 and Enclosure 4.9, Step 1

**KA Match:**
The applicant is required to demonstrate knowledge of the effect of fouling of the main feedwater flow venturi which inputs to reactor thermal power best estimate.

**Cognitive Level:** **High**
In order to arrive at the correct answer, the applicant is required to perform a basic calculation to determine power level change and then compare that value to that which is required to initiate a reset of the fouling factor.

**Source of Question:** **Bank Vision TPBE-004-D**

**Question 47**
**061K5.01**
**Auxiliary/Emergency Feedwater System**
**Knowledge of the operational implications of the following concepts as the(y) apply to the AFW: Relationship between AFW flow and RCS heat transfer**

The following table reflects Steam Generator parameters following a Reactor Trip/Safety Injection.

| S/G | NR Level | Pressure | MSIV |
|---|---|---|---|
| 1A | 8% - decreasing | 230 psig - decreasing | Open |
| 1B | 35% - Stable | 840 psig - decreasing | Closed |
| 1C | 8% - decreasing | 230 psig - decreasing | Open |
| 1D | 0% - Stable | 0 psig - stable | Open |

(1) The first direction to isolate CA flow to 1D S/G is contained in ______________ of EP/1/A/5000/E-0 (Reactor Trip or Safety Injection).

(2) If conditions are met to enter EP/1/S/5000/FR-P.1 (Response to Imminent Pressurized Thermal Shock Condition), direction will be given to provide ____________ flow to 1A and 1C S/Gs.

A. (1) Enclosure 1 (Foldout Page)
(2) 0 gpm

**B. (1) Enclosure 4 (NC Temperature Control)**
**(2) 0 gpm**

C. (1) Enclosure 1 (Foldout Page)
(2) 75 gpm

D. (1) Enclosure 4 (NC Temperature Control)
(2) 75 gpm

**QUESTION 47**

**Distractor Analysis**

A. Incorrect. First part is plausible because Enclosure 1 does contain guidance to isolate a faulted S/G but requires the fault to be limited to one S/G. Second part is correct.

B. **CORRECT.** E-0, Enclosure 4 contains guidance to throttle feed flow to minimize cooldown while maintaining one S/G greater than 29%. FR-P.1 will direct operator to isolate feed flow to faulted S/Gs not needed for temperature control.

C. Incorrect. First part is plausible because Enclosure 1 does contain guidance to isolate a faulted S/G but requires the fault to be limited to one S/G. Second part is plausible because this would be the correct answer if all S/Gs were faulted.

D. Incorrect. First part is correct. Second part is plausible because this would be the correct answer if all S/Gs were faulted.

**References:**

- EP/1/A/5000/E-0 Reactor Trip or Safety Injection, Rev. 042, Enclosure 1, step 5 and Enclosure 4, step 9.g RNO
- EP/1/A/5000/FR-P.1 Response to Imminent Pressurized Thermal Shock Condition, Step 3 RNO g.4) and 5) and Enclosure 2, Rev. 025

**KA Match:**
The applicant is required to apply the supplied information and determine the procedural guidance for isolating/limiting feed flow to a faulted S/G in order to limit RCS cooldown.

**Cognitive Level:** **High**
The applicant is required to recall from memory the requirements for isolation and feed flowrate of two separate procedures and determine how those requirements are applied for multiple vs. all faulted S/Gs.

**Source of Question:** **New**

**Question 48**
**062A4.04**
**AC Electrical Distribution**
**Ability to manually operate and/or monitor in the control room:**
**Local operation of breakers**

Given the following:

- Operators are preparing to perform the 1A D/G surveillance PT.
- The BOP has placed the D/G 1A CTRL LOCATION switch to "LOCAL"

(1) 1ETA-03 (ETA Norm Fdr Frm ATC) __________ be operated from 1MC-11.

(2) In order to prevent a reverse power trip following parallel of the D/G, the operator will depress "Raise" on the __________ .

A. (1) can
(2) speed control

**B. (1) can NOT**
**(2) speed control**

C. (1) can
(2) voltage control

D. (1) can NOT
(2) voltage control

## QUESTION 48

### Distractor Analysis

A. Incorrect. First part is plausible if the applicant reasons that local control only affects control of the D/G output breaker (which is the one used for paralleling). Second part is correct.

B. **CORRECT.** Although the operator needs local control of the D/G output breaker when performing the surveillance, that single Control Room switch also transfers control of the normal and alternate supply breakers to the essential bus.

C. Incorrect. First part is plausible if the applicant believes that local control only affects control of the D/G output breaker (which is the one used for paralleling). Second part is plausible because voltage control adjustment will be required to maintain proper power factor, but will not prevent a reverse power trip.

D. Incorrect. First part is correct. Second part is plausible because voltage control adjustment will be required to maintain proper power factor, but will not prevent a reverse power trip.

**References:**

- OP-CN-DG-DG3 (Emergency Diesel Generator), Rev. 102, Section 6.1 and Figure 15.10

**KA Match:**

The applicant is required to demonstrate knowledge of controls associated with local/manual operation of a breaker related to control room switch position and operations required to prevent a breaker trip following closure.

**Cognitive Level:** **High**

Requires recall of system operational knowledge on D/G controls, and then applying it to the given conditions (after paralleling) to determine how the control is to be operated. There is also an element of other system knowledge relating to a switch that controls operation of 1ETA-03, and determining the effects of placing that control to LOCAL.

**Source of Question:** **New**

**Question 49**
**063K4.02**
**DC Electrical Distribution**
**Knowledge of DC electrical system design feature(s) and/or interlock(s) which provide for the following: Breaker interlocks, permissives, bypasses and cross-ties**

Given the following condition:

- Inverter 1KXIA experienced a total loss of output voltage.

(1) An indication used to aid in determining that the backup power supply has aligned to 1KXPA is ________(1)_______ .

(2) Once 1KXIA has returned to normal operating parameters, how will 1KXPA supply be swapped back to 1KXIA?

A. (1) 1KMAA “In Sync” light is LIT.
(2) Automatically after 60 seconds.

B. (1) 1KMAA “In Sync” light is LIT.
(2) Manually.

**C. (1) 1KXAA “Alternate Source Supplying Load” light is LIT.**
**(2) Automatically after 60 seconds.**

D. (1) 1KXAA “Alternate Source Supplying Load” light is LIT.
(2) Manually.

**QUESTION 49**

**Distractor Analysis**

A. Incorrect. Plausible, since the In Sync light indicates that both sources are energized and in sync, but doesn't indicate which one is aligned to supply 1KXPA. The swap is automatic, unlike vital which has no auto swaps. Part 2 is correct.

B. Incorrect. Plausible, since the In Sync light indicates that both sources are energized and in sync, but doesn't indicate which is aligned to supply 1KXPA. Manual swap back is plausible, since there are electrical components in the plant that require manually swapping back from the alternate source to the normal source. Example: when blackout busses load onto the diesel, to transfer back to the normal source of power, this is a manual operation.

C. **CORRECT.** The operating procedure specifies that the "Alternate Source Supplying Load" light is to be verified ON as part of the 1KXIA Shutdown and Return to Service procedure. Once the transfer switch has auto swapped to the alternate source, a 60 second relay is activated. After 60 seconds, if the transfer was due to a total loss of inverter output voltage, the switch will transfer back to the inverter whenever voltage and frequency have returned to normal.

D. Incorrect. Part 1 is correct. Second part plausibility is explained in "B" above.

**References:**

- OP-CN-EL-EPF, Lesson Plan for 125V DC Aux Control Power, Rev. 103, Section 2.8
- OP/1/B/6350/009, (125 VDC-240/120 VAC Auxiliary Control Power System), Enclosure 4.10, Step 3.3

**KA Match:**

The K/A is matched because stem conditions involve an inverter operation and it requires knowledge of interlocks and cross-ties (from alternate power source) to correctly answer the question.

**Cognitive Level:** **Low**

**Source of Question:** **Bank - 2010 NRC Exam Q51**

**Question 50**
**064K2.01**
**Emergency Diesel Generator**
**Knowledge of bus power supplies to the following: Air compressor**

Regarding the 1A D/G VG air compressor 1A1:

(1) 1A1 VG air compressor is powered from _____(1)_____ .

(2) Following a blackout, compressor 1A1 _______(2)_______ be loaded as part of the first D/G sequencer load group.

**A. (1) 1EMXE**
**(2) will**

B. (1) 1EMXC
(2) will not

C. (1) 1EMXE
(2) will not

D. (1) 1EMXC
(2) will

**QUESTION 50**

**Distractor Analysis**

A. **CORRECT**. 1A1 VG compressor receives power from 1EMXE-F03B. The air compressors are loaded as part of Load Group 1 following a blackout or safety injection.

B. Incorrect. First part is plausible because 1EMXC is a similar train power supply. Second part is plausible because the applicant could reason that the air compressor will not be necessary immediately following D/G start since their function has already been accomplished when the D/G started.

C. Incorrect. First part is correct. Second part plausibility is explained in "B" above.

D. Incorrect. First part is plausible because 1EMXC is a similar train power supply. Second part is correct.

**References:**

- OP-CN-DG-EQB D/G Load Sequencer Lesson Plan, Rev. 100, Section 8.3
- OP/1/A/6350/002 (Diesel Generator Operation), Rev. 158, Enclosure 4.26, step 3.3.3

**KA Match:**

The applicant is required to demonstrate knowledge of the D/G Air Compressor power supply and recall when the compressor will be powered following a sequencer actuation.

**Cognitive Level:** **Low**

**Source of Question:** **New**

**Question 51**
**073K3.01**
**Process Radiation Monitoring System**
**Knowledge of the effect that a loss or malfunction of the PRM system will have on the following: Radioactive effluent releases**

In accordance with SLC 16.11-7 (Radioactive Gaseous Effluent Monitoring Instrumentation), and assuming 1EMF-36 (Unit Vent Monitor) is functional:

(1) Initiation of a VP (Containment Purge) release ___________ require 1EMF-39 (Containment Monitor - Gas) to be functional.

(2) Following initiation of a VP release, 1EMF-39 _____________ required to remain functional in order to continue the release.

A. (1) does NOT
(2) is

B. (1) does NOT
(2) is NOT

C. (1) does
(2) is

**D. (1) does**
**(2) is NOT**

**QUESTION 51**

**Distractor Analysis**

A. Incorrect. Plausible if the applicant misapplies the restriction on EMF monitoring of a VP release and believes that either EMF can be assigned to initiate a release but only EMF-39 can monitor once it has begun.

B. Incorrect. Plausible if the applicant believes that either EMF capable of monitoring a VP release can be used to initiate and monitor the release. It is plausible that EMF-36 (Unit Vent) could be used to monitor the VP release, since VP release do go through the Unit Vent, and therefore, past the radiation monitor for the Unit Vent.

C. Incorrect. First part is correct. Second part is plausible if the applicant believes that only EMF-39 can monitor a VP release, since the release is from containment.

D. **CORRECT.** Per the VP Lesson Plan "Note the statement in both SLCs, regarding VP operation, stating "initiation of the Containment Purge Exhaust System with EMF-39 non-functional is not permissible. The only way EMF-36 can replace EMF-39 is when the VP is already operating."

**References:**
- OP-CN-CNT-VP (Containment Purge System Lesson Plan), Rev. 100, Section 5.4

**KA Match:**
The applicant is required to demonstrate knowledge concerning the loss of a radiation monitor and the associated effect upon initiation and continuation of a containment purge release.

**Cognitive Level:** **Low**

**Source of Question:** **New**

**Question 52**
**076A1.02**
**Service Water System**
**Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the SWS controls including:**
**Reactor and turbine building closed cooling water temperatures**

Given the following Unit 1 conditions:

**At 1000**

- The Unit was at 100% power.
- A Zone A and Zone B lockout occurs.
- While performing steps of EP/1/A/5000/E-0, the CRS has implemented AP/1/A/5500/007, (Loss of Normal Power).

**At 1005**

- Zone A and Zone B lockouts have been cleared and RESET.

**At 1010**

- The CRS has directed that preparations for performance of Case III actions be initiated.
- The crew performs Step 14 of AP/007, Case I, (Loss of Normal Power to an Essential Power Train), and notes that the "YV Operable" light is NOT lit.

Which ONE of the following describes at time 1010;

(1) The status of the "YV Isolated" and the "RN Operable" lights.

(2) What action is required which will maintain containment cooling for these conditions, in accordance with AP/007?

**A. (1) LIT.**
**(2) Ensure at least two (2) RN pumps operating.**

B. (1) LIT.
(2) Return YV to normal operation.

C. (1) DARK.
(2) Ensure at least two (2) RN pumps operating.

D. (1) DARK.
(2) Return YV to normal operation.

**QUESTION 52**

**Distractor Analysis**

A. **CORRECT.** AP/07, Case I "Loss of Normal Power to an Essential Train is implemented. The RNO for Step 14, ensures two RN pumps in service. Per the NOTE just prior to Step 14, on page 10 of 161, there is a five minute time delay after the loss of offsite power and the automatic swapover from YV (Chilled Water) to RN (Nuclear Service Water). Five minutes after the loss of offsite power occurs, YV transfers to RN, the YV isolated light will be lit, and RN operable light will be lit.

B. Incorrect. First part is correct. Returning YV to normal operation is plausible, if the applicant misapplies the RNO for AP/07, Step 14; i.e., believing that offsite power is restored. With that misconception, realigning YV to normal operation would be correct.

C. Incorrect. Part 2 is correct. The status of the YV Isolated and RN Operable lights as DARK is plausible, if applicant believes the conditions involve a <u>manual</u> transfer, instead of automatic. In certain cases, this is true, depending on switch position; e.g., if the YV/RN switch on MC7R was in LOCAL, a manual transfer would be needed. However, in this case, a normal alignment is involved. If a manual alignment is performed, the YV Isolated and RN Operable lights would be DARK until manual transfer is complete.

D. Incorrect. First part plausibility is explained in "C" above. Second part is correct.

**<u>References</u>:**

- AP/1/A/5500/007, (Loss of Normal Power), Case I, Step 14, Rev. 71
- OP-CN-PSS-RN (Nuclear Service Water Lesson Plan), Rev. 104, Section 8.3

**<u>K/A Match</u>**

The K/A is matched because the question involves a plant condition (Loss of Normal Power) which affects the Containment Cooling System (YV and RN provide cooling water). The applicant is tested on knowledge of the abnormal procedure for the loss of power, and how the actions of that procedure are used to restore the containment cooling system.

**<u>Cognitive Level:</u>** **High**

This is a high cognitive level question because it requires more than one mental step to arrive at the correct answer. The applicant must evaluate a given set of conditions, recall the function of electrical lockout functions, and apply that knowledge to conclude the effect on plant components. Once that determination is made, the applicant must then recall detailed content from a procedure and apply that to make a decision on which action will achieve the desire results.

**<u>Source of Question:</u>** **Bank 4340**

**Question 53**
**078A3.01**
**Instrument Air System**
**Ability to monitor automatic operation of the IAS, including: Air pressure**

Given the following:

- VI compressors E & F are in operation.
- "D" VI compressor is secured. The REMOTE COMMUNICATION ENABLED/DISABLED switch is in the "DISABLED" position.

**<u>Subsequently:</u>**

- An instrument air leak developed.
- VI pressure is currently 78 psig and decreasing.

Assuming no operator action:

(1) 1VI-670 (VI Dryer Bypass Valve) is currently ________________ .

(2) "D" VI compressor is currently ______________ .

A. (1) closed
(2) secured

B. (1) closed
(2) operating

C. (1) open
(2) secured

**D. (1) open**
**(2) operating**

**QUESTION 53**

**Distractor Analysis**

A. Incorrect. The first part is plausible if the applicant believes that 1VI-670 opens at 76 psig; the setpoint for 1VS-78 (VS supply to VI). The second part is plausible if the applicant believes that the standby compressor will not start when computer communication is 'Disabled", or that it secures automatically on increasing pressure.

B. Incorrect. The first part is plausible if the applicant believes that 1VI-670 opens at 76 psig; the setpoint for 1VS-78 (VS supply to VI). Second part is correct.

C. Incorrect. First part is correct. The second part is plausible if the applicant believes that the standby compressor will not start when computer communication is 'Disabled", or that it secures automatically on increasing pressure.

D. **CORRECT.** 0VI-670 automatically opens at 80 psig decreasing. A standby compressor starts at 96 psig if communicating with the controlling computer and 94 psig if not. The compressor must be manually secured following autostart.

**References:**

- OP-CN-SS-VI (Instrument Air System Lesson Plan), Rev. 100, Section 3.5

**KA Match:**

The applicant is required to demonstrate knowledge of automatic operations of instrument air system components based on setpoints associated with decreasing air pressure.

**Cognitive Level:** **High**

Requires association of multiple data points, including setpoints for automatic valve openings, and compressor starting/stopping. These setpoints are recall, but they must compared to stem conditions to arrive at the correct answer.

**Source of Question:** **New**

**Question 54**
**103A1.01**
**Containment System**
**Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the containment system controls including: Containment pressure, temperature, and humidity**

Unit 1 containment pressure has exceeded 0.5 psig due to a steam leak. In an effort to lower containment temperature and pressure, Lower Containment Vent Unit (LCVU) cooling water flow will be controlled ______(1)______ and LCVU speed will be controlled ______(2)______ .

A. (1) manually
(2) manually

**B. (1) automatically**
**(2) manually**

C. (1) manually
(2) automatically

D. (1) automatically
(2) automatically

**QUESTION 54**

**Distractor Analysis**

A. Incorrect. First part is plausible as follows:

Cooling water flow through the LCVUs has two modes of cooling operation: NORM and MAX COOL, selected by control switches in the control room. NORM sounds like the normal method, and if NORM were used it would automatically control cooling water flow based on a thermostat setting. BUT, this mode is not used; we use MAX COOL as the "normal" mode. MAX COOL bypasses the thermostat, and water flow is "manually" controlled. See explanation of correct answer for why "manually" is NOT correct.

Second part is correct.

B. **CORRECT.** At 0.5 psig, the LCVU full flow valve will automatically open to double the cooling water flow. An annunciator titled "initiate high speed" will direct manual operation of fan speed, as required. But the cooling water flow has been "automatically" controlled by doubling the cooling water flow, based on containment pressure.

C. Incorrect. Plausible if the applicant confuses operation of the fan speed vs. cooling water control.

D. Incorrect. First part is correct. Second part is plausible because increased fan speed would reduce containment pressure and the associated annunciator is titled "Lower Cont Press 0.5 psig Initiate Hi Speed".

**References:**

- OP/1/B/6100/010R (1AD-19 Annunciator Response Procedure), B/12, Rev. 039

**KA Match:**

Given conditions containing an increasing containment pressure due to a steam leak, the applicant is required to demonstrate knowledge of the containment cooling system controls.

**Cognitive Level:** **High**

Requires recognition of a significant data point (containment pressure exceeding 0.5 psig) and then application of that knowledge to determine the required operating mode for containment ventilation equipment.

**Source of Question:** **New**

**Question 55**
**103K4.01**
**Containment System**
**Knowledge of containment system design feature(s) and/or interlock(s) which provide for the following: Vacuum breaker protection**

Which ONE of the following completes the statements below?

(1) The minimum design pressure of containment is ____(1)____ .

(2) The Containment Air Release (VQ) Fans are designed to automatically trip on __________(2)_________ .

**A. (1) - 1.5 psig**
**(2) low air flow**

B. (1) - 1.5 psig
(2) low containment pressure

C. (1) - 0.5 psig
(2) low air flow

D. (1) - 0.5 psig
(2) low containment pressure

**QUESTION 55**

**Distractor Analysis**

A. **CORRECT.** The maximum negative design pressure of containment is – 1.5 psig. Containment Air Release fans automatically secure upon a low air flow of 80 SCFM.

B. Incorrect. First part is correct. Second part is plausible because the purpose of securing air release fans is to prevent low containment pressure. Also, normal VQ releases are automatically terminated as follows: 1VQ-10 (isolation valve) closes on low containment pressure. This secures flow; THEN on low flow, the fan trips.

C. Incorrect. Plausibility of -0.5 psig is because it is the lower end of the range of the N/R CPCS pressure transmitters, per LP VQ excerpt:

Average containment pressure (OAC PT. P1112) is calculated by two means. P1112 indicates throughout the range of the eight narrow range (N/R) CPCS pressure transmitters (-.5 to + 1.5 psig) and the two wide range (W/R) pressure transmitters (-5 to + 60 psig).

D. Incorrect. See first part plausibility as explained in "C" above. See second part plausibility as explained in "B" above.

**References:**
- OP-CN-CNT-CNT (Containment Lesson Plan), Rev. 102, Section 2.8
- OP-CN-CNT-VQ (Containment Air Release and Addition System Lesson Plan), Rev. 101, Section 2.1

**KA Match:**
The applicant is required to recall the design maximum negative containment pressure and demonstrate knowledge of an interlock which prevents challenging this setpoint. Per telecom with Chief Examiner this has been determined to be a suitable match to this KA due to the fact that Catawba does not have installed vacuum breakers for containment.

**Cognitive Level:** **Low**

**Source of Question:** **New**

**Question 56**
**002K5.12**
**Reactor Coolant System**
**Knowledge of the operational implications of the following concepts as they apply to the RCS:**
**Relationship of temperature average and loop differential temperature to loop hot-let(g) and cold-leg temperature indications**

Given the following:

- Unit 1 is at 100% power.
- Loop “1C” Tavg has failed high.
- The RO suspects this is because the loop Tcold instrument has failed high.

(1) In order to verify this, the RO will expect to see the loop delta temperature gauge at ____________.

(2) Each loop Tavg is calculated using one Tcold and ___________ Thot input(s).

A. (1) top of scale
(2) one

B. (1) bottom of scale
(2) one

C. (1) top of scale
(2) three

**D. (1) bottom of scale**
**(2) three**

**QUESTION 56**

**Distractor Analysis**

A. Incorrect. First part is plausible because the stem of the question states that Tavg has failed high, and Tcold may have failed high. Second part is plausible because each loop has only one Tcold input.

B. Incorrect. First part is correct. The second part is plausible because each loop has only one Tcold input.

C. Incorrect. First part is plausible because the stem of the question states that Tavg has failed high, and Tcold may have failed high. Second part is correct.

D. **CORRECT.** If a loop Tcold was failed high, then the difference between Thot and Tcold would be less than zero, resulting in delta temperature indication at bottom of scale. The hot leg input into the Tavg calculation includes three RTDs due to laminar flow and streaming.

**References:**
- OP-CN-IC-IRX (Reactor Control Lesson Plan), Rev. 101, Section 2.1

**KA Match:**
The applicant is required to demonstrate knowledge of Thot inputs into the average temperature calculation and operational implications of a Tcold failure.

**Cognitive Level:** **High**
This question requires more than one mental step to arrive at the correct answer. First determine the difference between indicated cold and hot leg temperature for the given failure and then determine the implication to delta temperature indication.

**Source of Question:** **New**

**Question 57**
**016K4.03**
**Non-Nuclear Instrumentation System (NNIS)**
**Knowledge of NNIS design feature(s) and/or interlock(s) which provide for the following: Input to control systems**

The Turbine Load Inhibit (C-16) signal prevents ______(1)______ turbine load increase when active. The temperature error portion of this circuit is based on the difference between reference temperature and the second ______(2)_______ NC loop Tavg.

A. (1) ONLY an automatic
   (2) highest

**B. (1) ONLY an automatic**
   **(2) lowest**

C. (1) Automatic AND Manual
   (2) highest

D. (1) Automatic AND Manual
   (2) lowest

**QUESTION 57**

**Distractor Analysis**

A. Incorrect. First part is correct. Second part is plausible because the temperature error portion of the reactor control system uses the second highest loop Tavg.

B. **CORRECT.** The C-16 circuit stops auto turbine loading if either Selected Low Tavg (second lowest) differs from Tref by 20°F or reaches 553°F.

C. Incorrect. First part is plausible because most control interlocks ("C"s) prevent auto and manual operation (i.e. C-1 through C-4 block auto and manual rod withdrawal). Second part is plausible because the temperature error portion of the reactor control system uses the second highest loop Tavg.

D. Incorrect. First part is plausible because most control interlocks ("C"s) prevent auto and manual operation (i.e. C-1 through C-4 block auto and manual rod withdrawal). Second part is correct.

**References:**

- OP-CN-IC-IRX Reactor Control Lesson Plan, Rev. 101, Section 2.2.2
- OP-CN-IC-IPX Reactor Protection Lesson Plan, Rev. 100, Section 11

**KA Match:**
The applicant is required to recall the temperature signal which inputs a control system interlock and demonstrate knowledge of that specific interlock.

**Cognitive Level:** **Low**

**Source of Question:** **New**

**Question 58**
**017K6.01**
**In-Core Temperature Monitor System (ITM)**
**Knowledge of the effect of a loss or malfunction of the following ITM system components: Sensors and detectors**

Given the following Unit 1 initial conditions:

- The Unit was in Mode 3.

**Subsequently:**

- A Large Break LOCA occurred.
- The crew has entered EP/1/A/5000/E-1 (Loss of Reactor or Secondary Coolant).
- A core exit thermocouple (CET) for quadrant II on the plasma display is reading 50ºF lower than other adjacent nearby CETs.

(1) How does the lower reading CET affect the subcooling value displayed on the Plasma Display, if at all?

(2) In addition to the control room, CET indication is also available at the _____(2)_____ .

A. (1) The indicated subcooling will increase.
(2) ASP

B. (1) The indicated subcooling will increase.
(2) SSF

C. (1) The indicated subcooling will not be affected.
(2) ASP

**D. (1) The indicated subcooling will not be affected.**
**(2) SSF**

**QUESTION 58**

**Distractor Analysis**

A. Incorrect. First part is plausible if the applicant miscalculates and concludes that a lower reading affects the indicated subcooling. Second part is plausible since loop temperature indications available at the ASP (Auxiliary Shutdown Panel) can readily be confused with another remote shutdown system (SSF). There ARE temperature indications at the ASP, but they are for Cold and Hot Leg temperatures.

B. Incorrect. First part is plausible if the applicant miscalculates and concludes that a lower reading affects the indicated subcooling. Second part is correct.

C. Incorrect. First part is correct. Second part plausibility is explained in "A" above.

D. **CORRECT.** The average of the 5 highest thermocouple readings are used for input into the subcooling calculation. Therefore, a failure of one (low) will not affect the indication. Five RTDs provide input to a chart recorder at the SSF (Standby Shutdown Facility).

**References:**

- OP-CN-PS-CCM (Inadequate Core Cooling Monitor Lesson Plan) Rev. 100, Section 2.9
- OP-CN-CP-AD (Standby Shutdown Facility Lesson Plan) Rev. 103, Section 3.1.6
- OP-CN-CP-RSS, (Remote Shutdown System Lesson Plan) Rev. 101, Section 9.1

**KA Match:**
Given a malfunction of an incore temperature monitor detector, the applicant is required to demonstrate knowledge of system effect and also recall availability of indications.

**Cognitive Level:** **High**
Requires numerous mental steps to arrive at an analysis of the effect on subcooling indication. These mental steps are based on system knowledge, but they must be applied in the context of the stem conditions (one of the CETs indicating lower than the others), to arrive at the correct answer.

**Source of Question:** **Bank 4790**

**Question 59**
**027K2.01**
**Containment Iodine Removal System**
**Knowledge of bus power supplies to the following: Fans**

Unit 1 was operating at 100% power when the following sequence of events occurred:

- A Loss of Offsite Power occurred.
- The reactor tripped.
- When 1A D/G attempted to load 1ETA, 87G (Generator Differential) relay actuated due to a fault.
- Just after the reactor trip, a LOCA inside containment developed.
- Containment pressure has risen to 3.1 psig and is slowly increasing.

Which ONE of the following describes the status of the VE (Annulus Ventilation) fans?

**A. ONLY 1B VE fan is running.**

B. 1A AND 1B VE fans are running.

C. ONLY 1B VE fan will start after a 9 minute time delay.

D. 1A AND 1B VE fans will start after a 9 minute time delay.

**QUESTION 59**

**Distractor Analysis**

A. **CORRECT.** Power is unavailable to 1A VE fan due to the lockout of bus 1ETA. This 87G relay actuation causes the D/G output breaker to 1ETA (safety bus) trip open, and 1A D/G to shutdown. Power continues to be available to 1B VE fan, since 1B D/G started and loaded per design. With containment pressure at 3.1 psig, 1B VE fan will be operating, since a Safety Injection signal (Ss) initiated when containment pressure rose to > 1.2 psig.

B. Incorrect. Plausible since there ARE relays that if actuated, would not preclude the D/G from loading. Example: the D/G **would** load even if 86N,S, or B relays actuated.

C. Incorrect. Plausible because only 1B VE fan has power to start and run. But, the applicant must understand that the VE fans start immediately upon receipt of a Safety Injection signal, which also generates a Phase A signal. It is plausible for an applicant to misunderstand Phase A vs. Phase B time delays. A time delay of 9 minutes is plausible, since the Air Return Fans start after 9 minutes.

D. Incorrect. Plausible if the applicant does not understand that the 87G relay will lockout the 1D/G and therefore no power will be available to 1ETA and consequently no power is available to 1A VE fan. Also the applicant must understand that the VE fans start immediately upon receipt of a Safety Injection signal, with NO time delay. A time delay of 9 minutes is plausible, since the Air Return Fans start after 9 minutes.

**References:**
- OP-CN-CNT-VE (Annulus Ventilation System Lesson Plan) Rev. 100, Section 4
- OP-CN-DG-DG3 (Emergency Diesel Generator Lesson Plan) Rev. 102, Section 2.3 (Generator Differential Relay)
- OP-CN-CNT-VX (Containment Air Return System Lesson Plan) Rev. 101, Section 2.1.1

**KA Match:**
The K/A is matched because the stem of the question gives conditions involving a power abnormality. In order to answer the question and make the correct prediction on what will happen, the applicant must know the power supplies to the annulus ventilation fans. Though they are not labeled as iodine removal fans, they do perform that function.

**Cognitive Level:** **High**
This is a high cognitive level question because it involves more than one mental step to arrive at the correct answer. The applicant must recall system knowledge and apply it to a power supply loss and predict the system response.

**Source of Question:** **Bank 2010 NRC Exam Q60**

**Question 60**
**033A1.02**
**Spent Fuel Pool Cooling System**
**Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with Spent Fuel Pool Cooling System operating the controls including: Radiation monitoring systems**

Given the following:

- Unit 1 is at 100% power.
- 1A KF (Spent Fuel Cooling) Pump is in service.
- 1A VF (Spent Fuel Pool Ventilation) is operating in a normal alignment.

**Subsequently:**

- A large break LOCA has occurred on Unit 1.
- Containment pressure is 3.2 psig.
- 1EMF-39 (Containment) is in Trip 2.
- 1EMF-35 (Unit Vent) is in Trip 1.
- 1EMF-42 (Fuel Building Ventilation) indicates normal.
- 1EMF-15 (Spent Fuel Bldg Refueling Bridge) has experienced a loss of power.

As a result of the above conditions:

(1) 1A KF ______(1)______ have cooling water aligned.

(2) 1A VF ____(2)____ in Filter Mode.

A. (1) does
(2) is NOT

B. (1) does
(2) is

**C. (1) does NOT**
**(2) is NOT**

D. (1) does NOT
(2) is

**QUESTION 60**

**Distractor Analysis**

A. Incorrect. First part plausible if the applicant misinterprets the significance of containment pressure, and combines that with a misapplication of system knowledge regarding loads on the Aux. Bldg. non-essential header. Second part is correct.

B. Incorrect. First part plausible if the applicant has an incomplete understanding of Phase B actuations, including isolation of the Auxiliary Building non-essential header or that this header provides cooling to the KF pump. Second part is plausible since there is a radiation monitor that has lost power (EMF-15), and EMF-35 which is in Trip 1 condition, that could reasonably be interpreted as affecting the alignment of ventilation equipment for the SFP area, and because if EMF-35 reaches Trip 2 it does place the SFP ventilation in Filter Mode.

C. **CORRECT.** The KF pump is cooled by the Auxiliary Building non-essential header of the component cooling system. This header is automatically isolated on a Phase B signal (3 psig in containment). VF is placed in filter mode by a Trip 2 activation of EMF-35, 36, or 42.

D. Incorrect. First part is correct. Second part plausibility is explained in "B" above.

**References:**

- OP-CN-PSS-KC (Component Cooling Water Lesson Plan) Rev. 100, Section 2.6
- OP-CN-WE-EMF (Radiation Monitoring Lesson Plan) Rev. 102, Section 13

**KA Match:**
The applicant is required to predict changes in the Spent Fuel Pool Cooling system based on containment conditions along with the Spent Fuel Ventilation system based on a given status of radiation monitors.

**Cognitive Level:** **High**
The applicant is required to recall multiple setpoints and then compare the data in the stem to the recalled setpoints to arrive at the correct answer.

**Source of Question:** **New**

**Question 61**
**034G2.2.39**
**Fuel Handling Equipment**
**Knowledge of less than or equal to one hour Technical Specification action statements for systems**

Regarding Tech. Spec. 3.9.6, Refueling Cavity Water Level:

(1) The specification is that the refueling cavity water level is to be maintained at $\geq$ 23 ft. above the top of ______________(1)______________ .

(2) This specification _______(2)______ apply during unlatching of control rod drive shaft.

A. (1) the fuel assemblies
(2) does

B. (1) the fuel assemblies
(2) does not

C. (1) the reactor vessel flange
(2) does

**D. (1) the reactor vessel flange**
**(2) does not**

**QUESTION 61**

**Distractor Analysis**

A. Incorrect. First part is plausible because Spent Fuel Pool Water level (Per T.S. 3.7.14) requires $\geq$ 23 ft above the fuel assemblies. Second part is plausible since an applicant with an incomplete understanding of above the line information for the Tech. Spec., could reason that operations involving control rod drives is a type of refueling operation, and therefore is subject to the specification.

B. Incorrect. First part is plausible because Spent Fuel Pool Water level (Per T.S. 3.7.14) requires $\geq$ 23 ft above the fuel assemblies. Second part is correct.

C. Incorrect. First part is correct. Second part plausibility is explained in "A" above.

D. **CORRECT.** T.S. 3.9.6 requires water level to be $\geq$ 23 ft above the reactor vessel flange. This specification is applicable during core alterations, except during latching and unlatching of control rod drive shafts.

**References:**
- T.S. 3.9.6 (Refueling Cavity Water Level), Amend. Nos. 263/259
- T.S. 3.7.14 (Spent Fuel Pool Water Level), Amend. Nos. 263/259

**KA Match:**
The applicant is required to demonstrate knowledge of the applicability of a refueling technical specification containing less than one hour action statement.

**Cognitive Level:** **Low**

**Source of Question:** **New**

**Question 62**
**035K1.14**
**Steam Generator System**
**Knowledge of the physical connections and/or cause-effect relationships between the S/GS and the following systems: ESF**

During a loss of switchyard accident with a turbine/generator trip, what is the source of Auxiliary Feedwater (CA) to each steam generator? (Assume no operator action).

A. CA pump 'A' supplying 'A' & 'C' S/Gs; CA pump 'B' supplying 'B' & 'D' S/Gs; Turbine Driven Auxiliary Feedwater Pump {CAPT#1(2)} supplying 'B' and 'C' S/Gs.

**B. CA pump 'A' supplying 'A' & 'B' S/Gs; CA pump 'B' supplying 'C' & 'D' S/Gs; Turbine Driven Auxiliary Feedwater Pump {CAPT#1(2)} supplying all four S/Gs.**

C. CA pump 'A' supplying 'A' & 'C' S/Gs; CA pump 'B' supplying 'B' & 'D'' S/Gs; Turbine Driven Auxiliary Feedwater Pump {CAPT#1(2)} Supplying all four S/Gs.

D. CA pump 'A' supplying 'A' & 'B' S/Gs; CA pump 'B' supplying 'C' & 'D' S/Gs; Turbine Driven Auxiliary Feedwater Pump {CAPT#1(2)} supplying 'B' & 'C' S/Gs.

**QUESTION 62**

**Distractor Analysis**

A. Incorrect. Plausible if the applicant confuses the S/Gs supplied by A and B motor driven CA pumps. Most plant applications apply train "A" to the "1" and "3" channels (i.e. "A" train offsite power normally supplies the TA and TC switchgear). CAPT supply is plausible because "B" and "C" S/Gs provide the steam source to power the pump.

B. **CORRECT.** "A" motor driven CA pump normally discharges to "A" and "B" S/Gs; "B" motor driven CA pump normally discharges to "C" and "D" S/Gs. Either pump can be aligned to supply all four S/Gs, but this would require manual action. The CAPT receives steam from the "B" and "C" S/Gs but discharges to all S/Gs.

C. Incorrect. Plausible if the applicant confuses the S/Gs supplied by A and B motor driven CA pumps. Most plant applications apply train "A" to the "1" and "3" channels (i.e. "A" train offsite power normally supplies the TA and TC switchgear). CAPT supply is correct.

D. Incorrect. Motor driven CA pump supplies are correct. CAPT supply is plausible because "B" and "C" S/Gs provide the steam source to power the pump.

**References:**
- OP-CN-CF-CA (Auxiliary Feedwater Lesson Plan), Rev. 100, Section 14 (Flowpath)

**KA Match:**
The applicant is required to demonstrate knowledge of the connections and flowpath between individual S/Gs and each auxiliary feedwater pump upon an actuation of the blackout sequencer.

**Cognitive Level:** **High**
Requires analysis of the effects of a power loss on Auxiliary Feedwater sources to the S/Gs; this is more than one mental step, and is therefore, a higher cognitive level question.

**Source of Question:** **Bank Taskmaster CA-030-D**

**Question 63**
**071A2.03**
**Waste Gas Disposal System**
**Ability to (a) predict the impacts of the following malfunctions or operations on the Waste Gas Disposal System ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Rupture disk failures**

Given the following condition:

- An instrument fitting on one of the Waste Gas Decay Tanks has broken.
- The tank is leaking in an uncontrolled manner.

(1) To limit public exposure, (Selected Licensee Commitment) SLC 16.11-19 (Gas Storage Tanks) requires that the storage tank be limited to no more than _____(1)_____ .

(2) If this limit is exceeded the Required Action is to immediately ____(2)____ .

A. (1) 97,000 Curies
   (2) reduce tank contents within limits

B. (1) 10 Curies
   (2) reduce tank contents within limits

**C. (1) 97,000 Curies**
   **(2) suspend all additions of radioactive material to the tank**

D. (1) 10 Curies
   (2) suspend all additions of radioactive material to the tank

**QUESTION 63**

**Distractor Analysis**

A. Incorrect. First part is correct. Second part is plausible because this is a required action, but completion time is not immediately.

B. Incorrect. First part is plausible because this is the requirement for Liquid Holdup Tanks per SLC 16.11-17. Second part is plausible because this is a required action, but completion time is not immediately.

C. **CORRECT.** SLC 16.11-19 lists a limit of 97,000 Curies for Gas Storage Tanks. If exceeded, the immediate required action is to suspend all additions of radioactive material.

D. Incorrect. First part is plausible because this is the requirement for Liquid Holdup Tanks per SLC 16.11-17. Second part is correct.

**References:**

- SLC 16.11-19 (Gas Storage Tanks), Rev. 0
- SLC 16.11-17 (Liquid Holdup Tanks), Rev. 0

**KA Match:**

The applicant is required to demonstrate knowledge of procedures (SLCs) to control/mitigate the consequences of the a waste gas disposal malfunction. The omission of a rupture disk failure has been previously approved via discussion with Chief Examiner because rupture disks are not installed on CNS WGDTs. An uncontrolled leak, as described in the stem, meets the intent of this KA.

**Cognitive Level:** **Low**

**Source of Question:** **2013 NRC Exam Q98 - modified**

**Question 64**
**079A4.01**
**Station Air System**
**Ability to manually operate and/or monitor in the control room:**
**Cross-tie valves with IAS**

Given the following:

- 1AD-8 A/7 (VI LO PRESS) is received.
- The BOP verifies pressure as indicated on 0VIP5260 (VI Pressure) to be 74 psig and slowly decreasing.

Which ONE of the following describes the position of VI system valves (and correct setpoint) in response to the lowering VI header pressure?

A. 1VS-78 (VS supply to VI) opens at 80 psig

B. 1**VS-78 (VS supply to VI) opens at 76 psig**

C. 1VI-500 (VI supply to VS) closes at 76 psig

D. 1VI-500 (VI supply to VS) closes at 78 psig

**QUESTION 64**

**Distractor Analysis**

A. Incorrect. Plausible because the valve position is correct; setpoint is incorrect.

B. **CORRECT.** From the applicable lesson plan -
80 psig → VI supply to VS CLOSES (VI-500)
76 psig → VS supply to VI OPENS (VS-78)

C. Incorrect. Plausible because the valve position is correct; setpoint is incorrect.

D. Incorrect. Plausible because the valve position is correct; setpoint is incorrect.

**References:**

- OP-CN-SS-VI, VS, & VB (Air Systems Lesson Plan), Rev. 100, Section 16 (Emergency Operations)
- OP/1/A/6100/010I (Annunciator Response Procedure for 1AD-8) Pg. 11

**KA Match:**

The applicant is required to demonstrate knowledge of automatic operation of instrument air system valves (which cross-tie to another system) while monitoring a lowering pressure condition in the control room.

**Cognitive Level:** **Low**

**Source of Question:** **Bank 570 modified**

**Question 65**
**086K3.01**
**Fire Protection System**
**Knowledge of the effect that a loss or malfunction of the Fire Protection System will have on the following: Shutdown capability with redundant equipment**

Given the following conditions:

- A fire started in Unit 1 cable room.
- Fire protection system malfunctions occurred and the fire spread to the Unit 2 cable room and control room.
- Crews are transferring control to the Safe Shutdown Facility (SSF).

Which ONE of the following evolutions can be performed using controls available within the SSF once control function is transferred to the SSF?

A. Energize 1EMXA from the SSF diesel generator.

**B. Increase pressurizer pressure with "D" pressurizer heater sub-banks.**

C. Throttle auxiliary feedwater flow to B Steam Generator using its flow control valve.

D. Decrease pressurizer level using the reactor coolant pump seal return header.

**QUESTION 65**

**Distractor Analysis**

A. Incorrect. Plausible because 1EMXA is the location where the operators transfer EMXS to the SSF power system.

B. **CORRECT.** A subgroup of “D” Pressurizer heaters can be powered from the local motor control center (SLXG) and will be controlled from the SSF following transfer.

C. Incorrect. Plausible because this option is available, but must be performed locally.

D. Incorrect. Plausible because these valves will be closed prior to exiting the control room.

**References:**

- OP-CN-AD-AD (Standby Shutdown Facility Lesson Plan), Rev. 103, Sections 6.4 and 13 (Primary Side Pressure Control, Flow Control Methods, )

**KA Match:**
The applicant is required to demonstrate knowledge of the capabilities of the safe shutdown complex upon a plant fire complicated by a fire protection system failure.

**Cognitive Level:** **Low**

**Source of Question:** **Bank 467**

**Question 66**
**G2.1.14**
**Conduct of Operations**
**Knowledge of criteria or conditions that require plant-wide announcements, such as pump starts, reactor trip, mode changes, etc.**

Which ONE of the following events specifically requires a plant announcement in accordance with AD-OP-ALL-1000 (Conduct of Operations)?

**A. Starting 1A2 KC Pump**

B. Latching the Unit 1 Main Turbine

C. Unit 1 Reactor Trip

D. Mode 4 entry

## QUESTION 66

### Distractor Analysis

A. **CORRECT.** Section 5.6.3 Item #4 of the Conduct of Operations procedure requires plant announcements for breaker operations >4Kv. The breaker for this component is a 6.9Kv breaker.

B. Incorrect. Plausible because latching the main turbine is addressed in this procedure (concerning check out of equipment), but plant announcement is not required.

C. Incorrect. Plausible because an announcement will be required per EP/1/A/5000/ES-0.1, not AD-OP-ALL-1000.

D. Incorrect. Plausible because mode change is addressed in this procedure (concerning log book entries), but plant announcement is not required.

**References:**

- EP/1/A/5000ES-0.1 (Reactor Trip Response), Rev. 039, Step 3
- OP-AD-ALL-1000 (Conduct of Operations), Rev. , Sections 5.6.3

**KA Match:**
The applicant is required to demonstrate knowledge of a condition requiring a plant wide announcement per the Conduct of Operations administrative document.

**Cognitive Level:** **High**
At first glance, appears to be a low cog level question (recall of procedure requirements). But it is high cog, because the applicant must evaluate each choice, and determine that the correct answer is NOT straight recall/recognition. It involves application of knowledge of the voltage of the breaker for 1A2 KC Pump, and that it does therefore (based on that application of knowledge) meet the requirements of the procedure for a plant announcement.

**Source of Question:** **New**

**Question 67**
**G2.1.19**
**Conduct of Operations**
**Ability to use plant computer to evaluate system or component status**

Which ONE of the following completes the statement below?

"On the Operator Aid Computer, a computer point color of __(1)__ indicates that the computer point is __(2)__."

A. (1) RED
   (2) LOCK OUT

B. (1) BLUE
   (2) GOOD

**C. (1) MAGENTA**
   **(2) BAD**

D. (1) YELLOW
   (2) SUSPECT

**QUESTION 67**

**Distractor Analysis**

A. Incorrect. Plausible because red is used for OAC indication , but for above/below Hi-Hi/Lo-Lo limits.

B. Incorrect. Plausible because blue is used for OAC indication, but for suspect values vs. good.

C. **CORRECT.** Magenta colored points are descriptive of bad quality inputs.

D. Incorrect. Plausible because yellow is used for OAC indication, but for above/below hi/lo setpoints.

**References:**

- OP-CN-SFAM-OAC (OAC Familiarization Simulator Exercise Guide), Rev. 07, Section 3.4.C

**KA Match:**
The applicant if required to demonstrate knowledge of the plant computer color coding system to evaluate system/component status.

**Cognitive Level:** **Low**

**Source of Question:** **Bank 4536**

**Question 68**
**G2.1.23**
**Conduct of Operations**
**Ability to perform specific system and integrated plant procedures during all modes of plant operation**

In accordance with OP/1/A/6200/001, (Chemical and Volume Control System), if normal Pressurizer Spray is not available and the crew is using Auxiliary Spray during a cooldown of the Pressurizer:

(1) Letdown _____(1)____ required to be in service.

(2) The above procedure guidance is based on concerns for thermal stress of the __________(2)__________ .

**A. (1) is**
**(2) PZR spray nozzle**

B. (1) is
(2) Auxiliary Spray line piping

C. (1) is not
(2) PZR spray nozzle

D. (1) is not
(2) Auxiliary Spray line piping

**QUESTION 68**

**Distractor Analysis**

A. **CORRECT.** Enclosure 4.15 (Operation of NV Aux Spray) contains a caution concerning use of Aux spray with letdown secured due to thermal shocking of the pressurizer spray nozzle.

B. Incorrect. First part is correct. Second part is plausible because thermal stress to Auxiliary Spray piping is a concern (Preferred use is ≤ 240°F).

C. Incorrect. First part is plausible because pressurizer spray would not require letdown to be in service. Second part is correct.

D. Incorrect. First part is plausible because pressurizer spray would not require letdown to be in service. Second part is plausible because thermal stress to Auxiliary Spray piping is a concern (Preferred use is ≤ 240°F).

**References:**

- OP/1/A/6200/001 (Chemical and Volume Control System), Rev. 148, Enclosure 4.15 Caution prior to step 3.2

**KA Match:**

The applicant is required to demonstrate knowledge of specific system interactions and the reasons for restrictions based on plant alignment, a specific system procedure. The integrated procedure aspect is met because the requirements of the system procedure are most applicable during a plant cooldown.

**Cognitive Level:** **Low**

**Source of Question:** **New**

**Question 69**
**G2.2.1**
**Equipment Control**
**Ability to perform pre-startup procedures for the facility, including operating those controls associated with plant equipment that could affect reactivity**

Given the following Unit 1 conditions:

- A Unit startup is in progress in accordance with OP/1/A/6100/001 (Controlling Procedure for Unit Startup).
- Auxiliary Steam (AS) from Unit 2 is being used for turbine warming.
- NC system pressure is 2235 psig.
- Steam dumps are controlling NC Tavg at 557ºF.
- The crew is preparing to restore AS to a normal alignment by closing 1AS-4, (Main Steam to AS HDR CTRL Bypass).

(1) Operation of 1AS-4 is performed ______(1)_____ the Control Room.

(2) In accordance with SOMP 01-02, (Reactivity Management), the Unit startup will require a dedicated _______(2)______ with no concurrent duties.

**A. (1) outside**
**(2) RO AND SRO**

B. (1) inside
(2) RO AND SRO

C. (1) outside
(2) RO ONLY

D. (1) inside
(2) RO ONLY

**QUESTION 69**

**Distractor Analysis**

A. **CORRECT.** 1AS-4 is a manually operated valve in the turbine building and the operation of this valve, as described in the stem, is designated as a reactivity management per the Operating Procedure for Unit Startup, Enclosure 4.1, Step 3.141. Per SOMP 01-02, Section 6.2.3, an SRO and an RO shall be dedicated to the reactor startup, with no concurrent responsibilities.

B. Incorrect. First part is plausible because 1AS-2 (Main Steam to Aux Stm) is operated by the control operator. Second part is correct.

C. Incorrect. First part is correct. Second part is plausible if applicant misapplies guidance in SOMP 01-02 for a Reactivity Management Activity (R2) which only requires a dedicated RO with no concurrent duties, and CRS oversight (but not required to be dedicated). The stem conditions are for an R1 activity, which requires an SRO and an RO.

D. Incorrect. First part is plausible because 1AS-2 (Main Steam to Aux Stm) is operated by the control operator. Second part plausibility is described in "C" above.

**References:**
- OP/1/A/6100/001 (Controlling Procedure for Unit Startup), Rev. 232, Encl. 4.1, steps 3.123.7, and 3.141.5
- SOMP 01-02 (Reactivity Management), Section 8.3.1, Rev. 009

**KA Match:**
While performing pre-startup activities, the applicant is required to demonstrate knowledge of the control locations for specific plant equipment and associated administrative controls and requirements for management of the reactivity evolution.

**Cognitive Level:** **High**
At first look, may appear to be simple recall/recognition of the definition of reactivity management from a procedure. But, in this case, the applicant must analyze the given conditions and recognize that a Unit startup is categorized as a Reactivity Management evolution that is an R1 (though they do not need to know this number), and that it is the "highest" level of reactivity management requirements, to arrive at the correct answer.

**Source of Question:** **New**

**Question 70**
**G2.2.22**
**Equipment Control**
**Knowledge of limiting conditions for operations and safety limits**

In accordance with Tech Spec 2.1.1 (Reactor Core SLs), the peak centerline fuel temperature shall be maintained _____(1)_____ . This limit ______(2)_____ change over core life.

A. (1) less than 5080°F
(2) does NOT

B. (1) less than 2200°F
(2) does NOT

**C. (1) less than 5080°F**
**(2) does**

D. (1) less than 2200°F
(2) does

## QUESTION 70

### Distractor Analysis

A. Incorrect. First part is correct. Second part: plausible to believe value does not change since it is "safety limit", and the other two safety limits do not have a similar change over core life.

B. Incorrect. First part is plausible because this value is listed in the Fuel Design Criteria. Second part plausibility is explained in "A" above.

C. **CORRECT.** Per T.S. 2.1.1, the peak centerline temperature shall be maintained < 5080°F, decreasing 58°F for every 10,000MWd/mtU of fuel burnup.

D. Incorrect. First part is plausible because this value is listed in the Fuel Design Criteria. Second part is correct.

**References:**
- T.S. 2.1.1 (Reactor Core SLs), Amendment Nos. 210/204
- T.S.B. 3.2.1 (Heat Flux Hot Channel Factor) Basis, Rev. 004, Applicable Safety Analysis

**KA Match:**
The applicant is required to demonstrate knowledge of a safety limit and the changes of this limit over plant life.

**Cognitive Level:** **Low**

**Source of Question:** **New**

**Question 71**
**G2.3.11**
**Radiation Control**
**Ability to control radiation releases**

Given the following condition:

- A Liquid Waste Release from the 543' elevation is in progress.

(1) In accordance with appropriate procedures, can a release from the Monitor Tank Building also be initiated concurrently?

(2) If YES, under what conditions?
If NO, why not?

A. (1) YES
(2) Provided a separate Liquid Release Permit is initiated and signed by the CRS.

B. (1) YES
(2) Provided the Trip 2 setpoint on EMF-49 (Liquid Waste Discharge Monitor) is recalculated for the higher combined limit.

C. (1) NO
(2) Because there is the potential for activity to be released into the Standby Nuclear Service Water Pond (SNSWP).

**D. (1) NO**
**(2) Both discharge into the same line, which invalidates the RL Flow interlock for automatic termination.**

**QUESTION 71**

**Distractor Analysis**

A. Incorrect. First part is plausible because there is no physical limitation to prevent this. Procedures prohibit this to prevent inaccuracies in the dilution flow calculation. Second part is plausible because each release does require a separate permit.

B. Incorrect. First part is plausible because there is no physical limitation to prevent this. Procedures prohibit this to prevent inaccuracies in the dilution flow calculation. Second part is plausible because this option would account for the increased activity release. However, EMF-49 does not monitor both release paths.

C. Incorrect. First part is correct. Second part is plausible because this is a concern for a release from the auxiliary building with RN aligned to the SNSWP, but does not impact the stated condition.

D. **CORRECT.** From the system lesson plan:
**Concurrent multiple releases are not allowed:** Releases are only allowed from one location at a time. That is to say a MTB and an Aux building release is not allowed at the same time. Both these flow paths join into the same point, and the dilution flow calculation would be inaccurate.

**References:**
- OP-CN-WE-WL (Liquid Waste System Lesson Plan), Rev. 202, Section 17.6

**KA Match:**
The applicant is required to demonstrate knowledge of limits/administrative controls associated with a liquid waste release.

**Cognitive Level:** **Low**

**Source of Question:** **Bank Vision WL-207**

**Question 72**
**G2.3.12**
**Radiation Control**
**Knowledge of radiological safety principles pertaining to license operator duties, such as containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc.**

Given the following Unit 1 conditions:

- The NV system is being aligned for startup.
- The procedure in use requires independent verification of a single valve located in a room with a general dose rate of 130 mREM/hr.
- Estimated time to independently verify the valve's position is 10 minutes.
- There are no known hot spots in the area.
- There is no airborne activity in this room.
- The room has no surface contamination areas.

In accordance with NSD 700, (Verification Techniques), independent verification of the valve above _____(1)____ be waived because ______________(2)_____________.

Which ONE of the following completes the statement above?

A. (1) may
(2) the general area dose rate is greater than 100 mREM/hr

B. (1) may NOT
(2) the general area dose rate is less than 1 REM/hr

**C. (1) may**
**(2) the radiation exposure for a single verification would exceed the allowable limit**

D. (1) may NOT
(2) the radiation exposure for a single verification is within the allowable limit

**QUESTION 72**

**Distractor Analysis**

A. Incorrect. Plausible because IV may be waived if dose rates are greater than 1000 mR/hr.

B. Incorrect. Plausible because the second part is true. However, the IV may be waived for a reason other than dose rate.

C. **CORRECT.** Total dose for this IV would equal 21.7 mREM which exceeds the guideline of 10 mREM for a single verification.

D. Incorrect. Plausible if the applicant miscalculates the potential exposure.

**References:**
- NSD-700 (Verification Techniques), Rev. 6, Section 700.8

**KA Match:**
The applicant is required to demonstrate knowledge of radiological safety principles related to the exception to independent verification requirements based on personnel exposure.

**Cognitive Level:** **High**
The applicant is required to analyze information and perform a calculation in order to obtain the correct answer.

**Source of Question:** **Bank 2770**

**Question 73**
**G2.4.22**
**Emergency Procedures/Plans**
**Knowledge of the bases for prioritizing safety functions during abnormal/emergency operations**

Operators have entered EP/1/A/5000/FR-P.1 (Response to Imminent Pressurized Thermal Shock Condition) due to a valid Orange Path status for Reactor Coolant Integrity.

<u>Consider each question **SEPARATELY** as it relates to the initial condition.</u>

(1) If Integrity status turns Red during performance of FR-P.1, the CRS _____(1)______ return to step 1.

(2) If Core Cooling status turns Orange during performance of FR-P.1 (i.e. while Integrity is Orange), the CRS _____(2)_______ go to EP/1/A/5000/FR-C.2.

In accordance with OMP 1-7, (Emergency/Abnormal Procedure Implementation Guidelines), which ONE of the following completes the above statements?

A. (1) will
(2) will

B. (1) will
(2) will NOT

**C. (1) will NOT**
**(2) will**

D. (1) will NOT
(2) will NOT

**QUESTION 73**

**<u>Distractor Analysis</u>**

A. <u>Incorrect.</u> First part is plausible because the CRS will usually transition due to higher color priority, but this is not required if the same procedure is specified for orange and red conditions. Second part is correct.

B. <u>Incorrect.</u> First part is plausible because the CRS will usually transition due to higher color priority, but this is not required if the same procedure is specified for orange and red conditions. Second part is plausible because transition from a “1” to a “2” procedure (i.e. P.1 to C.2) is not common, or if the applicant confuses CSF priorities.

C. **CORRECT.** The following statements from OMP 1-7:

Certain CSF procedures are used to address both orange and red path conditions for the same parameters. If the procedure is already in progress due to the orange path condition, it is not required to return to the first step if the condition becomes red.

If during the performance of an orange path procedure, any red condition or higher priority orange condition arises, then the red or higher priority orange condition shall be addressed first, and the original orange path procedure suspended.

D. <u>Incorrect.</u> First part is correct. Second part is plausible because transition from a “1” to a “2” procedure (i.e. P.1 to C.2) is not common, or if the applicant confuses CSF priorities.

**<u>References</u>:**

- OMP 1-7 (Emergency/Abnormal Procedure Implementation Guidelines), Rev. 040, Section 7.3.E

**<u>KA Match:</u>**
The applicant is required to demonstrate knowledge and application concerning prioritization of critical safety function procedures. This question tests knowledge of general statements for CSF implementation guidelines of OMP 1-7, which is basis type knowledge for prioritizing safety functions.

**<u>Cognitive Level:</u>** **High**
The applicant if required to recall the order of critical safety function implementation and then determine application based on varying scenarios.

**<u>Source of Question:</u>** **New**

**Question 74**
**G2.4.3**
**Emergency Procedures/Plans**
**Ability to identify post-accident instrumentation**

Of the four (4) nuclear instruments listed in F-0, (Critical Safety Function Status Trees), for assessing the “Subcriticality” safety function, which ONE is a Post-Accident Monitoring (PAM) instrument required by LCO 3.3.3, “PAM (Post-Accident Monitoring) Instrumentation?”

A. Source Range

B. Intermediate Range

C. Power Range

**D. Wide Range**

**QUESTION 74**

**Distractor Analysis**

A. Incorrect. Plausible, since the applicant could misapply the knowledge that this instrument does appear in a procedure used during an accident.

B. Incorrect. Plausible, since the applicant could misapply the knowledge that this instrument does appear in a procedure used during an accident.

C. Incorrect. Plausible, since the applicant could misapply the knowledge that this instrument does appear in a procedure used during an accident.

D. **CORRECT.** Neutron Flux (Wide Range) is the only one of the four nuclear instruments in the question which is required by LCO 3.3.3, as listed in Table 3.3.3-1, Post Accident Monitoring Instrumentation. All four of the listed nuclear instruments are in F-0 under "Subcriticality".

**References:**
- T.S. 3.3.3 (Post Accident Monitoring Instrumentation) Amendment Nos. 219-214, Table 3.3.3-1
- EP/1/A/5000/F-0 (Critical Safety Function Status Trees), Rev. 009, Page 3

**KA Match:**
This question is a straightforward approach to the K/A by testing the applicant's ability to identify which instrument is required by the PAM Tech. Spec.

**Cognitive Level:** **Low**

**Source of Question:** **Bank 2010 NRC Exam Q73**

**Question 75**
**G2.4.32**
**Emergency Procedures/Plans**
**Knowledge of operator response to loss of all annunciators**

Given the following conditions:

- The Fire Detection System (EFA) is aligned to the Unit 1 Operator Aid Computer (OAC) for monitoring.
- A loss of the Unit 1 OAC then occurs.

As a result of these conditions, the EFA OAC monitoring:

A. automatically swaps to the Unit 2 OAC.

**B. must be manually swapped to the Unit 2 OAC.**

C. automatically swaps to the computer at the fire detection panel.

D. must be manually swapped to the computer at the fire detection panel.

## QUESTION 75

### Distractor Analysis

A. Incorrect. Plausible if the applicant recognizes that there must be a swap, and then believes that since it is with an important monitoring function (such as fire), it would have an automatic swap feature.

B. **CORRECT.** Annunciator 1AD-3 F/1 will direct the operator to swap EFA points per OP/0/A/6400/035 which directs a manual transfer.

C. Incorrect. Plausible because this is the required action if both units' OAC fail.

D. Incorrect. Plausible because fire detection panel monitoring would be required if both OACs fail. There is no alarm function to transfer to this computer.

**References:**

- OP/0/A/6400/035 (Operations Fire Detection Console), Rev. 019, Enclosure 4.6, Step 3.2
- OP/1/B/6100/010 D (Annunciator Response for Panel 1AD-3), Rev. 028, F/1 (Computer Trouble)

**KA Match:**
The applicant must demonstrate knowledge of the requirements for a loss of alarm monitoring capability.

**Cognitive Level:** **Low**

**Source of Question:** **Bank 865**