

**U. S. Nuclear Regulatory Commission
Site-Specific
Written Examination**

Applicant Information

Name:	Region I
Date:	Facility/Unit: Three Mile Island
License Level: SRO	Reactor Type: B&W
Start Time:	Finish Time:

Instructions

Use the answer sheets provided to document your answers. Staple this cover sheet on top of the answer sheets. The passing grade requires a final grade of at least 80.00 percent. Examination papers will be collected six hours after the examination starts.

Applicant Certification

All work done on this examination is my own. I have neither given nor received aid.

Applicant's Signature

Results

Examination Value	100 Points
-------------------	------------

Applicant's Score	_____ Points
-------------------	--------------

Applicant's Grade	_____ Points
-------------------	--------------

**SRO21 NRC Exam
Three Mile Island Nuclear Station
May 2003**

Written Exam Answer Sheet

Name: _____ **SS #:** _____ **Date:** _____

001 A B C D	026 A B C D	051 A B C D	076 A B C D
002 A B C D	027 A B C D	052 A B C D	077 A B C D
003 A B C D	028 A B C D	053 A B C D	078 A B C D
004 A B C D	029 A B C D	054 A B C D	079 A B C D
005 A B C D	030 A B C D	055 A B C D	080 A B C D
006 A B C D	031 A B C D	056 A B C D	081 A B C D
007 A B C D	032 A B C D	057 A B C D	082 A B C D
008 A B C D	033 A B C D	058 A B C D	083 A B C D
009 A B C D	034 A B C D	059 A B C D	084 A B C D
010 A B C D	035 A B C D	060 A B C D	085 A B C D
011 A B C D	036 A B C D	061 A B C D	086 A B C D
012 A B C D	037 A B C D	062 A B C D	087 A B C D
013 A B C D	038 A B C D	063 A B C D	088 A B C D
014 A B C D	039 A B C D	064 A B C D	089 A B C D
015 A B C D	040 A B C D	065 A B C D	090 A B C D
016 A B C D	041 A B C D	066 A B C D	091 A B C D
017 A B C D	042 A B C D	067 A B C D	092 A B C D
018 A B C D	043 A B C D	068 A B C D	093 A B C D
019 A B C D	044 A B C D	069 A B C D	094 A B C D
020 A B C D	045 A B C D	070 A B C D	095 A B C D
021 A B C D	046 A B C D	071 A B C D	096 A B C D
022 A B C D	047 A B C D	072 A B C D	097 A B C D
023 A B C D	048 A B C D	073 A B C D	098 A B C D
024 A B C D	049 A B C D	074 A B C D	099 A B C D
025 A B C D	050 A B C D	075 A B C D	100 A B C D

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 001

Q 001

Point Value: 1

Sequence of events:

- Reactor power is initially 50% with ICS in automatic.
- ICS T-Ave SETPOINT signal fails slowly, ramping HIGHER at 5°F/minute. due to setpoint potentiometer malfunction.
- ICS control mode does NOT transfer to Tracking during this sequence.

Based on these conditions, identify the ONE statement below that describes initial reactor power trend and control system response to this event.

- A. Reactor power RISES due to rod withdrawal.
- B. Reactor power is REDUCED due to rod insertion.
- C. Reactor power DOES NOT CHANGE due to CRD logic circuit operation.
- D. Reactor power DOES NOT CHANGE due to T-Ave control transfer to Feedwater.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 002

Q 002

Point Value: 1

Initial plant conditions:

- Reactor power is 100%, with ICS in full automatic.
- No surveillance testing or maintenance in progress.
- All CRDs energized from NORMAL power supplies.

Event:

- CRD Group 7 Rod #1 dropped into the core.

Analyze the conditions above to diagnose the ONE operational event below that caused this SINGLE control rod to drop.

- A. Two DC hold breakers failed open.
- B. Two CRD motor fuses failed on energized phases.
- C. Two Auxiliary Power Supply Programmer lamp fuses failed.
- D. Two Group 7 Programmer phase indication lamp bulbs failed.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 003

Point Value: 1

Q 003

Sequence of events:

- Reactor power is 100%, with ICS in full automatic.
- Group 7 Rod #4 drops into the core, Quadrant YZ.

Based on these conditions, identify the ONE statement below that describes initial plant response when the rod reaches full insertion.

- A. Pressurizer level rises.
- B. RCS pressure and temperature lower.
- C. Diamond rod control transfers to manual.
- D. Quadrant power tilt becomes more positive in Quadrant YZ.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 004

Point Value: 1

Q 004

Initial conditions:

- Reactor power is 100%, with ICS in full automatic.
- Reactor power imbalance is 0%.

Sequence of events:

- Power reduction to 50%.
- Rod index during power reduction changed from 292 to 238.
- Stuck rod in CRD Group 7 was diagnosed at the end of the power reduction.
- CRD Group 8 position was NOT changed.

Operational plan for the next 8 hours:

- Maintain Group 7 aligned with the stuck rod at index 238.
- Maintain reactor power at 50% by adjusting RCS boron concentration.
- CRD Group 8 position will NOT be changed.

Based on these conditions, identify the ONE set of conditions below that describes the operational implications regarding reactor power IMBALANCE for the power reduction and the stuck rod operational plan.

During the power reduction, power IMBALANCE became (1) _____,
and during the next 8 hours power IMBALANCE will become (2) _____.

- A. (1) negative
 (2) more negative
- B. (1) positive
 (2) more positive
- C. (1) negative
 (2) less negative
- D. (1) positive
 (2) less positive

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 005

Point Value: 1

Q 005

Initial conditions:

- Reactor is at 100% power
- All RPS cabinet lights are normal
- Electricians are doing breaker checks in plant

Sequence of events:

- RPS cabinet B - Breaker Trip light goes BRIGHT
- RPS cabinet C - Breaker Trip light goes BRIGHT
- (ALL other RPS lights remain unchanged)

Assuming NO operator action, choose the plant status associated with the Control Rods that is a DIRECT result of these conditions.

- A. Groups 1 - 4 are DROPPED into core, groups 5 - 7 remain OUT.
- B. Groups 5 - 7 are DROPPED into core, groups 1 - 4 remain OUT.
- C. Groups 1 - 7 are DROPPED into core.
- D. Groups 1- 7 remain OUT.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 006

Point Value: 1

Q 006

Sequence of events:

- Reactor power was 100%, with ICS in full automatic.
- Loss of all Circulating Water pumps.
- Turbine and Reactor trip.

Based on these conditions, identify the ONE selection below that describes how to control (1) RCS temperature and (2) RCS pressure in the PT Plot post-trip window.

- A. (1) Turbine bypass valves (TBVs) control OTSG pressures.
(2) Electric heaters cycle to control Pressurizer temperature.
- B. (1) Atmospheric dump valves (ADVs) control OTSG pressures.
(2) Electric heaters cycle to control Pressurizer temperature.
- C. (1) Turbine bypass valves (TBVs) control OTSG pressures.
(2) Spray valve (RC-V-1) cycles open to control Pressurizer temperature.
- D. (1) Atmospheric dump valves (ADVs) control OTSG pressures.
(2) Letdown flow isolates to control Pressurizer level.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 007

Point Value: 1

Q 007

Plant conditions:

- Reactor power is 100%, with ICS in full automatic.
- T-Ave is stable at 579°F.
- Pressurizer level is stable at 220 inches.
- OTSG pressures are stable at 910 psig.
- RCS pressure is 2110 psig and stable.
- ALL Pressurizer Heaters are energized.
- ALL Pressurizer relief tailpipe differential temperatures are rising - the highest has risen 25°F.

Based on these conditions, identify the ONE statement below that describes required manual action.

- A. Close PORV Block valve RC-V-2.
- B. Isolate RCS letdown using MU-V-3.
- C. Secure ALL Pressurizer Heater Banks.
- D. Vent the RC Drain Tank to the Vent Header.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 008

Point Value: 1

Q 008

Identify the ONE statement below that describes the purpose of the Protective Action Recommendations (PARs) associated with the Exelon Standard Emergency Plan.

- A. Provides guidance to prevent plant workers from receiving radiation exposures in excess of 10 CFR 20 limits.
- B. Provides sheltering and evacuation recommendations for protection of the general public.
- C. Determines if potassium iodide tablets should be administered to reduce thyroid dose.
- D. Determines if radioactive releases from the site will exceed 10 CFR 20 limits.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 009

Point Value: 1

Q 009

Identify the ONE statement below that describes the basis for the Technical Specification requirements for MINIMUM BORATED water inventory in the BWST (Borated Water Storage Tank).

- A. Reflood the uncovered core to ensure the reactor coolant remains subcooled.
- B. Recirculate the coolant in the core and RB sump, and ensure the core remains 1% delta K/K subcritical.
- C. Recirculate the coolant in the core and RB sump to limit peak fuel clad temperature to less than 1800°F.
- D. Reflood the uncovered core to limit peak fuel clad temperature to less than 1800°F, and borate the core to at least 10% deltaK/K subcritical.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 010

Point Value: 1

Q 010

Plant conditions:

- Reactor tripped from 100% power due to LOCA.
- Automatic ESAS/EFW actuations occurred.
- All RCPs are tripped.
- One HPI pump is operating.
- Core Flood Tanks are now emptying, "floating on the RCS."
- RCS is at 200 psig, with core exit thermocouple temperature at 382°F.
- Pressurizer level indication = 20 inches.
- OTSG pressures are both 150 psig, and steady.
- OTSGs are at required levels, with 0 gpm EFW flow to each OTSG.
- TBVs are closed.
- RCS cooldown has STOPPED, and heatup rate is now +20°F/hr.

Based on these conditions, identify the ONE phrase below that describes current status of boiler-condenser core cooling.

- A. Stopped due to low EFW flows.
- B. Interrupted by introduction of the cold Core Flood Tank water.
- C. Occurring because OTSG levels have been raised sufficiently.
- D. Occurring because the OTSG temperatures are lower than core exit temperature.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 011

Point Value: 1

Q 011

Plant conditions:

- Reactor trip due to loss of offsite power (LOOP).
- ESAS actuation due to LOCA.
- EG-Y-1A failed to start.
- B Train HPI and LPI systems actuated, and continue to operate.
- Both Core Flood tank levels are at 2 feet.
- RCS pressure = 260 psig.
- Pressurizer level is offscale low.
- RCS temperature is 180°F.

Based on this event, identify the ONE condition below that requires NRC to be notified regarding VIOLATION of a Tech Spec LCO (Limiting Condition for Operation).

- A. EG-Y-1A failure.
- B. Pressurizer empty.
- C. Low Core Flood tank levels.
- D. RCS temperature at 180°F with HPI operating.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 012

Point Value: 1

Q 012

From the list below, identify the ONE statement that describes operational implications of Primary-to-Secondary Heat Transfer during a large break LOCA, characterized by establishment of LPI flow into the reactor core.

- A. Boiler-condenser cooling can be enhanced by raising OTSG levels to the upper tube sheet.
- B. Single phase natural circulation cooling can be established after LPI flow refills the reactor vessel.
- C. Boiler-condenser cooling is NOT required to augment ECCS cooling if 1250 gpm LPI flow is established to the reactor core.
- D. Single phase natural circulation will NOT be possible until reactor vessel head temperature is lower than pressurizer temperature.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 013

Point Value: 1

Q 013

Sequence of events:

TIME	EVENT
------	-------

1800	- Reactor trip from 100% power.
------	---------------------------------

1810	- RCS SCM (Subcooled Margin) reduces to less than 25°F.
------	---

1813	- Procedure directs operators to run all available RCPs.
------	--

1814	- All four RCPs are running.
------	------------------------------

1900	- RC-P-1A Seal #1 failure is diagnosed.
------	---

	- SCM is at 4°F.
--	------------------

Based on these conditions, identify the ONE statement below that describes required actions and procedure to be implemented.

- A. Trip RC-P-1A in accordance with 1203-16, Reactor Coolant Pump and Motor Malfunction.
- B. Trip RC-P-1A in accordance with OP-TM-EOP-010, Abnormal Transients Rules, Guides and Graphs.
- C. Continue to operate RC-P-1A in accordance with 1203-16, Reactor Coolant Pump and Motor Malfunction.
- D. Continue to operate RC-P-1A in accordance with OP-TM-EOP-010, Abnormal Transients Rules, Guides and Graphs.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 014

Point Value: 1

Q 014

Plant conditions:

- Reactor power 100%, with ICS in full automatic.
- Intermediate Closed Cooling Pump is IC-P-1B OOS for motor replacement.
- Total RCP seal injection flow is 18 gpm, controlled locally in Makeup Valve Alley.

Event:

- IC-P-1A trips.
- Plant remains steady at 100% power.

Based on these conditions, identify the ONE statement below that identifies the applicable procedure and required action(s) to be implemented.

- A. Initiate plant shutdown in accordance with OP 1102-4, Power Operations.
- B. Increase RCP seal injection flow in accordance with OP 1104-2, Makeup and Purification System.
- C. Attempt to restart IC-P-1A one time in accordance with OP-AA-103-103, Operation of Plant Equipment.
- D. Trip the reactor AND then trip all 4 RCPs in accordance with OP-AA-101-111, Roles and Responsibilities of On-Shift Personnel.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 015

Point Value: 1

Q 015

Sequence of events:

- Manual reactor trip due to excessive RCS leakage.
- ES actuation prevented loss of RCS subcooled margin (SCM).
- MU-V-18 (Make up isolation) is closed.
- HPI flow is now manually throttled to 100 gpm.
- Pressurizer level is steady at 120 inches.
- RCS temperature is steady at 535°F.
- RCS pressure is now 1600 psig.
- TBVs (turbine bypass valves) are 5% open.

Based on these conditions, identify the ONE statement below that describes operational impact on HPI flow, if the TBVs were to fail closed.

- A. HPI flow REDUCES due to automatic closure of MU-V-17 (Pressurizer Level Control Valve).
- B. HPI flow RISES due to reduction in coolant density.
- C. HPI flow REDUCES due to rising RCS pressure.
- D. HPI flow RISES due to rising RCS leakrate.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 016

Q 016

Point Value: 1

Identify the ONE statement below that describes the basis for procedural guidance to close NS-V-32 (cooling inlet isolation to evaporators, seal return coolers, and waste gas compressors) during implementation of 1203-20, Nuclear Services Closed Cooling System Failure.

- A. Isolate a NSCC leak at the Spent Fuel Coolers.
- B. Isolate a NSCC leak at the Seal Return Coolers.
- C. Reduce NSCC system heat load when ESAS is actuated.
- D. Reduce NSCC system heat load when only one NSCC pump is available.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 017

Point Value: 1

Q 017

Plant conditions:

- Reactor power is 100%, with ICS in full automatic.
- Intermediate Closed Cooling Pump IC-P-1A is operating.
- ESAS testing is in progress on IC-V-6 (CRDM cooling supply isolation).
- IC-V-6 is inadvertently CLOSED to 0% position.

Based on these conditions, identify the ONE statement below that describes operator action that will be required if IC-V-6 CANNOT be re-opened.

- A. Open IC-V-74 (minimum flow recirculation valve).
- B. Isolate RCS letdown flow.
- C. Trip the reactor.
- D. Start IC-P-1B.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 018

Point Value: 1

Q 018

Plant conditions:

- Reactor power is 100%, with ICS in full automatic.
- Pressurizer pressure control systems are in automatic.
- Control console Pressurizer pressure SETPOINT signal fails to 2500 psig.

From the list below, identify the ONE statement that describes automatic response to this malfunction.

- A. RC-V-1 Pressurizer spray valve opens to 100%.
- B. RC-V-1 Pressurizer spray valve opens to 40%.
- C. Pressurizer heater banks 1, 2 and 3 energize.
- D. RC-RV-2 PORV opens.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 019

Point Value: 1

Q 019

The Diverse Scram System (DSS) provides backup protection for an ATWS (Abnormal Transient Without Scram) by (1)_____ the shunt trip coils on the (2)_____ 480V breakers.

- A. (1) de-energizing
(2) 1L-2A and 1G-2A (CRD System Feeders)
- B. (1) energizing
(2) 1L-2A and 1G-2A (CRD System Feeders)
- C. (1) de-energizing
(2) CRD #10 and #11
- D. (1) energizing
(2) CRD #10 and #11

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 020

Point Value: 1

Q 020

Sequence of events:

- Reactor power was initially 100%, with ICS in full automatic.
- No maintenance or surveillance tests in progress.
- Automatic reactor trip.
- CRD safety groups 1-4 fail to drop into the core.

Based on these conditions, select the ONE statement below that describes required response to this event.

- A. Emergency borate from the BWST in accordance with Rule 5, EB.
- B. Manually insert CRD Groups 1-4 from the Diamond Control Panel.
- C. Locally open the CRD DC Hold power supply breakers.
- D. Trip all four RCPs.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 021

Point Value: 1

Q 021

Plant conditions:

- Plant startup in progress.
- Intermediate Range nuclear instrument NI-3 is inoperable due to log amplifier failure. Replacement amplifier will arrive in 16 hours.
- Reactor is critical at $1E-8$ Amps.

Event:

- NI-4 Intermediate Range nuclear instrument log amplifier fails in same manner as NI-3, and is required to be replaced.

Based on these conditions, identify the ONE statement below that describes why startup is required to be terminated.

- A. Loss of reactor protection automatic trip function.
- B. Inability to detect an ejected rod accident.
- C. Lack of protection against a continuous rod withdrawal accident.
- D. Non-compliance with Remote Shutdown System instrumentation requirements.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 022

Point Value: 1

Q 022

Plant conditions:

- Reactor is shutdown due to Steam Generator tube leak in OTSG 1A.
- All RCPs are operating.
- Both OTSG levels are steady at 25 inches.
- T-Ave is 510°F.
- RCS subcooled margin is 93°F.

The Unit Supervisor directs the team to "minimize RCS subcooled margin." Based on the conditions above, identify the ONE set of actions below that complies with this order.

- A. De-energize Pressurizer heaters and open RC-V-1 (spray valve) to reduce RCS pressure until SCM lowers to 45°F.
- B. Close Turbine Bypass Valves to raise RCS temperature until SCM lowers to 45°F.
- C. De-energize Pressurizer heaters and open RC-V-1 (spray valve) to reduce RCS pressure until SCM lowers to 75°F.
- D. Open the PORV to reduce RCS pressure until SCM lowers to 75°F.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 023

Point Value: 1

Q 023

Sequence of events:

- Reactor tripped due to loss of offsite power (LOOP).
- Tube rupture occurred in OTSG 1B.
- OTSG 1B was isolated and filled solid when T-Ave was 510°F.
- EF-P-1 was secured.

Current plant conditions:

- T-Ave is now 480°F.
- Subcooling Margin is 55°F.
- RCS pressure is 900 psig.
- EFW flowrates:
 - OTSG 1A = 500 gpm.
 - OTSG 1B = 0 gpm.
- OTSG 1A level is 30%, rising at 1%/minute.
- RCITS suggests the existence of a 8 inch reactor vessel HEAD BUBBLE.

Based on these conditions, identify the ONE statement below that describes CURRENT natural circulation core cooling capability.

Natural circulation core cooling is...

- A. POSSIBLE in RCS Loop A, due to EFW spray effectiveness.
- B. NOT POSSIBLE in RCS Loop A, due to low OTSG level.
- C. POSSIBLE in RCS Loop B, due to large heat sink area.
- D. NOT POSSIBLE in RCS Loop B, due to the head bubble.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 024

Point Value: 1

Q 024

Transferring OTSG pressure control from the turbine bypass valves to the atmospheric dump valves during loss of vacuum conditions in the Main Condenser prevents _____

- A. condenser tube leaks.
- B. over-fill of the condenser hotwell.
- C. damage to turbine bypass valve operators.
- D. rupture of low pressure turbine exhaust hood diaphragms.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 025

Point Value: 1

Q 025

Identify the ONE statement below that describes the FSAR basis for the length of time for which the Station Batteries are designed during a station blackout (loss of ALL offsite power, with NO operable emergency diesel generators).

- A. Maintain RCP lift oil pressure during pump coastdown.
- B. Provide for turbine-generator bearing oil flow during shaft coastdown.
- C. Provide emergency lighting in vital areas to support performance of time critical tasks.
- D. Support remote control of emergency feedwater flow to the OTSGs during plant cooldown.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 026

Q 026

Point Value: 1

Plant conditions:

- Reactor power is 100%, with ICS in full automatic.
- Pump down of Reactor Coolant Drain Tank (RCDT) in progress.
- Radiation monitor RM-G-20 (RCDT) high alarm actuates unexpectedly.

Based on this occurrence, from the list below identify the ONE set of procedures that is required to be implemented.

- A. EP 1202-29, Pressurizer System Failure
AbP 1203-15, Loss of RC Makeup/Seal Injection
- B. EP 1202-11, High RCS Activity
EP 1202-12, Excessive Radiation Levels
AbP 1203-15, Loss of RC Makeup/Seal Injection
- C. EP 1202-12, Excessive Radiation Levels
EP 1202-29, Pressurizer System Failure
AbP 1203-15, Loss of RC Makeup/Seal Injection
- D. EP 1202-11, High RCS Activity
EP 1202-12, Excessive Radiation Levels
EP 1202-29, Pressurizer System Failure

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 027

Point Value: 1

Q 027

A warning is posted locally at RM-A-2 (Reactor Building Atmospheric Monitor) particulate housing to "Contact the Control Room prior to opening." The reason for this is to ensure...

- A. RM-A-2 pump is shutdown and isolated to prevent damage to the pump diaphragm.
- B. RM-A-2 pump is shutdown and isolated to prevent inadvertent breach of containment integrity.
- C. shift management notifies Work Management before initiating work.
- D. shift personnel mark the control room charts due to potential radioactive particulate release in the Intermediate Building.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 028

Q 028

Point Value: 1

A fire in the relay room has occurred. Under this condition, identify the ONE reason below for an operator to depress and hold the CO2 Discharge Delay Switch.

- A. To prevent undesirable component actuation by allowing fire brigade personnel to combat fire quickly without needing to don breathing apparatus.
- B. To prevent undesirable component actuation caused by CO2-induced cold room temperatures before the plant is shutdown.
- C. To await personnel working in the relay room to evacuate before an oxygen deficient atmosphere is created.
- D. To allow the fire brigade leader to assess the fire condition before an oxygen deficient atmosphere is created.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 029

Point Value: 1

Q 029

Plant is in refueling shutdown mode. Identify the ONE situation below that represents a condition that does NOT meet requirements for containment closure control during handling of irradiated fuel.

- A. Service Air is in use inside the RB.
- B. TWO RB purge exhaust valves are stuck at 30% open.
- C. Containment Building nitrogen supply spool piece is installed.
- D. BOTH air lock doors of the RB personnel hatch are open. An Operator is responsible for closing ONE door.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 030

Point Value: 1

Q 030

Plant conditions:

- Reactor tripped due to loss of off-site power (LOOP).
- MS-V-4A/B ADVs are controlling OTSG pressures at 500 psig.
- OTSG 1A tube leak rate = 5 gpm.
- In accordance with procedural guidance, RCS pressure is being reduced from 900 psig to 800 psig.

Based on these conditions, identify the ONE selection below that completes the following phrase:

The operational implication of this action to lower RCS pressure is to reduce the...

- A. OTSG level rise.
- B. off-site radioactive release rate.
- C. time required for cooldown of the RCS.
- D. potential of lifting Main Steam safety valves.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 031

Q 031

Point Value: 1

Initial plant conditions:

- Reactor tripped from 100% power due to loss of off-site power (LOOP).
- Emergency Feedwater Pump EF-P-2B tripped.
- One Makeup Pump operating.
- Pressurizer level = 100 inches, controlled in automatic.
- Core exit thermocouple temperature is steady at 570°F.
- RCS pressure steady at 2100 psig.
- OTSG pressures = 1000 psig.
- OTSG levels at 12% Operating Range, slowly rising.
- OP-TM-EOP-001, Reactor Trip, Immediate Actions complete.
- Initial post trip Symptom Check has been completed.

Sequence of events:

- PORV opened unexpectedly, and failed to reclose.
- RC-V-2 control power fuse failed during attempt to close PORV block.
- RCS pressure rapidly reduced to 1680 psig, and now is slowly lowering to 1660 psig.
- At the end of the pressure reduction, Pressurizer level rose rapidly to 300 inches, and is now rising slowly.

HPI has NOT been actuated at this time. Based on these conditions, identify the ONE set of statements below that describes (1) the reason for the Pressurizer insurge and (2) required actions.

- A. (1) Displacement of water from under the RV head due to steam bubble formation.
(2) Continue with EOP-001 VSSVs.
- B. (1) Displacement of water from under the RV head due to steam bubble formation.
(2) Exit EOP-001 and GO TO OP-TM-EOP-009 HPI Cooling - Recovery From Solid Operations.
- C. (1) Expansion of RCS loop water due to depressurization..
(2) Continue with EOP-001 VSSVs.
- D. (1) Expansion of RCS loop water due to depressurization.
(2) Exit EOP-001 and GO TO OP-TM-EOP-009 HPI Cooling - Recovery From Solid Operations.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 032

Point Value: 1

Q 032

Initial conditions:

- Reactor power is 100%, with ICS in full automatic.

Sequence of events:

- FW-P-1A trip initiated an automatic ICS runback.
- During the runback, Group 7 Rod 6 dropped (fully inserted).

Based on these two concurrent conditions, identify the ONE selection below that identifies (1) the rate of change for the ICS runback, and (2) the final power level when the plant stabilizes.

- A. (1) 50%/minute.
(2) 68% power.
- B. (1) 30%/minute.
(2) 68% power.
- C. (1) 50%/minute.
(2) 55% power.
- D. (1) 30%/minute.
(2) 55% power.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 033

Q 033

Point Value: 1

Initial plant conditions:

- Reactor is in Cold Shutdown condition.
- Decay Heat Removal Train A is operating.

Clearance and tagging activity:

- Vital Bus A is de-energized.
- Vital Bus A is re-energized 1 minute later.

Based on these conditions, identify the ONE set of statements below that describes DC-V-2A (DH Removal Cooler inlet valve) and DC-V-65A (DH Removal Cooler bypass valve) automatic responses to:

- (1) Loss of power to Foxboro controllers.
 - (2) Restoration of power to Foxboro controllers.
-
- A. (1) DC-V-2A fails fully open, DC-V-65A fails fully closed.
(2) DC-V-2A and DC-V-65A both return to their original positions.
 - B. (1) DC-V-2A and DC-V-65A both fail to random unpredictable positions.
(2) DC-V-2A repositions to fully closed, DC-V-65A reposition to fully open.
 - C. (1) DC-V-2A fails fully open, DC-V-65A fails fully closed.
(2) DC-V-2A and DC-V-65A both move to random, unpredictable positions.
 - D. (1) DC-V-2A fails fully closed, DC-V-65A fails fully open.
(2) DC-V-2A and DC-V-65A both move to random, unpredictable positions.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 034

Point Value: 1

Q 034

Initial Conditions:

- Reactor power is 100%, with ICS in full automatic.
- ICS Power Supplies are in their normal line-up.

Event:

- Loss of Bus ATA.

Identify the ONE statement below that describes automatic equipment response to this event, and the reason for the response.

- A. MU-V-5 controller fails to the mid position due to loss of ICS HAND Power.
- B. MU-V-5 controller fails to the mid position due to loss of ICS AUTO Power.
- C. MS-V-4A/B control transfers to the Back-up Loaders due to loss of ICS HAND Power.
- D. MS-V-4A/B control transfers to the Back-up Loaders due to loss of ICS AUTO Power.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 035

Point Value: 1

Q 035

Plant conditions:

- Cooldown outside the control room in progress.
- RCS temperatures are steady.
- MU-P-1C is operating.
- All MU system cross-tie valves are open.
- Pressurizer is observed to be rising in level, at a rate higher than attributable to RCP seal injection flow.

Based on these conditions, the action to be taken at the Remote Shutdown panels to limit this increase is to close _____

- A. MU-V-17 (Normal Makeup Control Valve).
- B. MU-V-217 (High Capacity Makeup Valve).
- C. MU-V-18 (Normal Makeup Isolation Valve).
- D. MU-V-16A & B (High Pressure Injection Valves).

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 036

Point Value: 1

Q 036

Plant conditions:

- Refueling outage in progress.
- Fuel Handling Bridge is over the reactor core with new fuel assembly.
- Annunciator PLB-4-9, Fuel Transfer Canal Lo Level, actuates.
- Fuel Transfer Canal water level is lowering at 7 inches per minute.
- RB Sump level is rising.

Based on these conditions, complete the following statement from the list below:

The fuel assembly engaged and in the mast of the main fuel handling bridge shall be ...

- A. inserted between the plenum and the upender in the deep end of the Fuel Transfer Canal, IAW EP 1203-43, Transfer Canal Level Loss.
- B. inserted between the plenum and the upender in the deep end of the Fuel Transfer Canal, IAW annunciator PLB-4-9 alarm response procedure.
- C. inserted into the nearest available core location, IAW EP 1203-43 Transfer Canal Level Loss.
- D. transferred to the spent fuel pool, IAW annunciator PLB-4-9 alarm response procedure.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 037

Point Value: 1

Q 037

Plant conditions:

- Reactor power is 100%, with ICS in full automatic.
- Loss of ICS/NNI HAND and AUTO power occur.

Power should not be restored to ICS HAND power before the emergency procedure immediate manual actions are completed because this action could result in...

- A. overloading the alternate power supply.
- B. turbine bypass valves failing open.
- C. loss of Emergency Feedwater.
- D. an overfeed event.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 038

Point Value: 1

Q 038

Sequence of events:

- Reactor trip due to low RCS pressure.
- Automatic 1600 psig ESAS actuation.
- Loss of RCS Subcooled Margin.
- All RCPs were tripped.

Current plant conditions:

- RCS pressure is 780 psig.
- Core exit thermocouple temperature is 485°F.

Identify the ONE statement below that describes the MAXIMUM ALLOWABLE RCS cooldown rate limit for these conditions.

- A. 40°F per hour in accordance with OP-TM-EOP-006, LOCA Cooldown.
- B. 50°F per hour, since RCPs are not running, in accordance with OP-TM-EOP-010 Guide 11, Cooldown Rate (CDR) Limits.
- C. 100°F per hour in accordance with TMI Technical Specifications.
- D. NO maximum cooldown rate limit applies, since the RCS had been saturated, in accordance with OP-TM-EOP-010 Guide 11, Cooldown Rate (CDR) Limits.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 039

Point Value: 1

Q 039

Sequence of events:

- Reactor trip due to low RCS pressure (LOCA).
- Automatic ES actuations:
 - 1600 psig.
 - 500 psig.
 - 4 psig RB pressure.
 - 30 psig RB pressure.

Current plant conditions:

- RCS pressure is STABLE at 270 psig.
- RB flood level is 32 inches and rising.
- RB pressure is 7 psig and lowering.
- BWST level is 14.5 feet and lowering.

Based on the conditions above, identify the ONE statement below that describes (1) operational implications related to continuing to lower BWST and raising RB flood levels, and (2) required remedial action.

- A. (1) Adequate pump NPSH (Net Positive Suction Head) will be lost.
(2) Transfer HPI Pump suction to LPI pump discharge per OP-TM-EOP-010 Guide 5, Transfer MU Pumps to "Piggyback" Mode.
- B. (1) Vital instrumentation could be damaged by flooding in the RB.
(2) Transfer LPI pump suction to RB sump per OP-TM-EOP-010 Guide 21, Transfer to RB Sump Recirculation.
- C. (1) Adequate pump NPSH (Net Positive Suction Head) will be lost.
(2) Secure LPI pumps per OP-TM-EOP-010 Guide 22, RB Sump Recirculation.
- D. (1) Vital instrumentation could be damaged by flooding in the RB.
(2) Secure RB Spray pumps per OP-TM-EOP-010 Guide 18, Containment.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 040

Point Value: 1

Q 040

Initial plant conditions:

- Reactor power is 100%, with ICS in full automatic.

Based on these conditions, identify the ONE operational event below that will require the SOONEST (from time of event) NRC notification.

- A. ICS runback due to trip of one feedwater pump.
- B. Trip of all 4 RCPs due to loss of offsite power (LOOP).
- C. Reduction to 50% power due to Main Condenser tube leak.
- D. EF-P-1 start caused by invalid signal due to personnel error. No EFW flow was initiated into the OTSGs.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 041

Point Value: 1

Q 041

Plant conditions:

- Reactor is tripped from full power due to loss of offsite power (LOOP).
- Subcooled natural circulation RCS cooldown in progress.
- Pressurizer heaters are de-energized.

Based on these conditions, identify the ONE statement below that describes the required method to reduce RCS pressure, IAW OP-TM-EOP-010 Guide #8, RCS Pressure Control.

- A. Vent the Pressurizer to the RC Drain Tank.
- B. Open RC-V-1 (Spray Valve).
- C. Initiate RCS letdown flow.
- D. Raise EFW flow.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 042

Q 042

Point Value: 1

From the list below, identify the ONE condition that requires PLANT SHUTDOWN to be initiated due to unavailability of instrumentation needed to diagnose and respond to (implement guides and rules) situations that could result in inadequate core cooling or accidents outside the design basis for the plant.

- A. Loop A SCM Monitor is operable;
Loop B SCM Monitor has been inoperable for the past 8 days.
- B. Pressurizer level instrumentation channels LT-1 and LT-3 inoperable for 3 days;
Using alternate process computer indication for manual Pressurizer level control.
- C. Both EFW Flow indication channels for OTSG 1B are inoperable for 2 days;
OTSG 1A level and EFP discharge pressure instrumentation is operable.
- D. BIRO Display Channel Quadrant X has only 1 detector operable for 5 days;
Both Loop A and Loop B SCM Monitors are operable.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 043

Point Value: 1

Q 043

Plant conditions:

- PORV-HPI cooling is in progress.
- OTSG 1A and OTSG 1B are both dry.
- RCS subcooled margin is 3°F.
- RCPs are tripped.

Both Main Feedwater (MFW) and Emergency Feedwater (EFW) are now available to re-establish FW to the OTSGs.

OP-TM-EOP-010 guidance for this plant condition:

- Rule 4, FWC:
 - Minimum EFW flow rate is 215 gpm per OTSG.
 - Minimum MFW flow rate is 1E6 lbm/hr per OTSG.
 - Use of EFW is preferred.
- Guide 13, Dry OTSG:
 - Maximum EFW flow rate is 185 gpm.
 - Maximum MFW flow rate is 0.1E6 lbm/hr.
 - Use of MFW is preferred.

Based on these conditions, identify the ONE statement below that describes operator action that demonstrates proper application of this procedure guidance.

- A. Establish and maintain greater than or equal to 215 gpm EFW flow to each OTSG.
- B. Establish and maintain less than or equal to 185 gpm EFW flow to each OTSG.
- C. Establish greater than or equal to 1E6 lbm/hr MFW flow to each OTSG.
- D. Establish and maintain less than or equal to 0.1 E6 lbm/hr MFW flow to each OTSG.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 044

Point Value: 1

Q 044

Plant conditions:

- Reactor power is 100%.
- RPS surveillance testing in progress.
- ICS stations in manual:
 - FW Loop masters A and B.
 - Delta TC.
 - Reactor Master control station.
 - Steam Generator Reactor Master.
 - Diamond Rod Control panel.
- CRD power supply breaker associated with 'B' RPS cabinet is open, and will not reclose.
- Repair parts will take two days to arrive.

Based on these conditions, AUTOMATIC CRD Diamond Panel control can _____.

- A. be established, with normal CRD IN/OUT motion control.
- B. be established, however CRD OUT motion will be inhibited.
- C. NOT be established, due to MOTOR FAULT condition existing.
- D. NOT be established, due to SYSTEM POWER FAULT condition existing.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 045

Point Value: 1

Q 045

From the list below, identify the ONE process that constitutes the largest (volumetric) source of non-condensable gases in the RCS during severe accident conditions.

- A. Release of pre-accident dissolved hydrogen in the RCS water.
- B. Release of volatile fission product gases from failed fuel.
- C. Zirconium-water reaction of the fuel cladding.
- D. Radiolytic decomposition of water.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 046

Point Value: 1

Q 046

Plant conditions:

- Reactor is tripped from 100% power due to Loss of Offsite Power (LOOP).
- RCS pressure is 1750 psig.
- RCS temperature is steady at 570°F.
- MU-P-1A is operating.
- MU-V-17 (RCS Inventory Control Valve) is failed closed.
- MU-V-217 (High Capacity Normal MU Valve) is being used to control pressurizer level.
- EG-Y-1B failed to start.

Based on these conditions, identify the EOP procedure below that is required to be implemented.

- A. OP-TM-EOP-002, Loss of Subcooled Margin.
- B. OP-TM-EOP-010 Guide 4, HPI Failure.
- C. OP-TM-EOP-006, LOCA Cooldown.
- D. OP-TM-EOP-010 Rule 6, PTS.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 047

Point Value: 1

Q 047

Sequence of events:

- Reactor power is initially 100%, with ICS in full automatic.
- Turbine trip causes reactor trip.
- Low grid voltage causes RC-P-1A and RC-P-1B to trip.

Based on these conditions, identify the ONE statement below that describes automatic response of the (1) Main Feedwater system and (2) EFW system.

- A. (1) Main Feedwater controls both OTSG levels at 25 inches on the Startup Range.
(2) EFW remains secured.
- B. (1) Main Feedwater controls OTSG 1A level at 50% on the Operating Range, and OTSG 1B level at 25 inches on the Startup Range.
(2) EFW remains secured.
- C. (1) Main Feedwater controls OTSG 1B at 25 inches on the Startup Range.
(2) EFW actuates and controls OTSG 1A at 50% on the Operating Range.
- D. (1) Main Feedwater controls both OTSG levels at 25 inches on the Startup Range.
(2) EFW actuates, and controls both OTSG levels at 25 inches on the Startup Range.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 048

Q 048

Point Value: 1

Plant conditions:

- Reactor power is 70%, with ICS in automatic.
- All RCPs are operating.
- No maintenance or testing in progress.

Event:

- RC-P-1A number one seal leak-off flow indication lowers from 2.2 to 0.5 gpm.
- MAP F-1-3, RCP Seal #1 Leak-off Flow Hi/Lo actuates.
- RC-P-1A shaft and motor stand vibration alarms actuate.
 - Alarms reset without re-actuation, but vibrations remain excessive.
- RC-P-1A parameters:
 - Labyrinth seal delta pressure is steady at 46 inches H₂O.
 - Radial bearing temperature indication is 127°F.
 - Seal #1 inlet temperature is 130°F, steady.
- L2755 RC-P-1A Standpipe Level High alarm actuates.

Based on these conditions, identify the (1) impact on the RC-P-1A operation and the (2) required procedure section of 1203-16 Reactor Coolant Pump and Motor Malfunction to be implemented.

- A. (1) Secure pump within 24 hours.
(2) NUMBER 2 SEAL FAILURE section.
- B. (1) Trip RC-P-1A.
(2) PUMP AND MOTOR VIBRATION section.
- C. (1) Commence plant shutdown and secure RC-P-1A.
(2) PUMP MOTOR SEPARATION - DROPPED IMPELLER section.
- D. (1) Secure pump within 30 minutes, THEN isolate #1 seal leakoff within 5 minutes.
(2) NUMBER 1 SEAL FAILURE section.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 049

Point Value: 1

Q 049

Plant conditions:

- Reactor power is 100%, with ICS in full automatic.
- RCS T-ave is 579°F.
- Make up tank level is LOWERING at 1"/minute.
- MU-V-17 is in manual control.
- Letdown flow is constant at 45 gpm.
- Indicated RCP total seal injection flow is 38 gpm.
- MU-V-32 is in automatic.
- RCP labyrinth seal D/P indicators are low off-scale (negative).
- Auxiliary Building airborne activity is rising.

Based on these conditions, diagnose the cause for the abnormal event and the identify proper response.

- A. RCP seal #1 leak-off flow is aligned to the Auxiliary Building sump; notify supervision for investigation and perform line-up per 1104-2 Makeup and Purification System
- B. RCP seal #1 leak-off flow has been isolated by closure of MU-V-26; notify supervision for investigation and open MU-V-26.
- C. RCP total seal injection flow transmitter has failed; notify I AND C supervision for assessment and repair.
- D. RCP seal injection flow is not reaching the RCPs, initiate 1203-15 Loss of Make-up/Seal injection.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 050

Point Value: 1

Q 050

Plant conditions:

- LWDS Panel Bleed Tank, Feed Tank, and Feed Pump selector switches in OFF position.
- LWDS Panel Deborating Demin selector switch in OFF position.

Based on these conditions, identify the ONE selection below that completes the following statement:

Backup (RBAT) emergency boration valve WDL-V-61 will open when _____.

- A. MU-V-10, makeup batch isolation valve, is opened.
- B. the Control Room Boric Acid Injection switch is positioned to INJECT position.
- C. the batch is set and "Enter" is pushed on the Makeup System totalizer batch controller.
- D. boric acid injection pump CA-P-1A or CA-P-1B is started with pump selector switch in "LWDS" position.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 051

Point Value: 1

Q 051

Plant conditions:

- Reactor is in Cold Shutdown condition.
- Decay Heat Removal Train A is operating.
- Decay Heat Closed Cooling flow through the Decay Heat Removal cooler is throttled to maintain the RCS at 130°F.
- Total loss of Instrument Air (0 psig) occurred.

Identify the ONE statement below that describes the response of the cooling system and subsequent effect on RCS temperature for this situation.

- A. Closure of DC-V-65A (Cooler bypass) AND DC-V-2A (Cooler inlet) results in RCS heatup.
- B. Opening of DC-V-65A (Cooler bypass) AND DC-V-2A (Cooler inlet) results in RCS cooldown.
- C. Closure of DC-V-2A (Cooler inlet) results in RCS heatup.
- D. Opening of DC-V-2A (Cooler inlet) results in RCS cooldown.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 052

Point Value: 1

Q 052

Plant conditions:

- Reactor shutdown, cooling down for refueling outage.
- RC-P-1C is the only RCP operating.
- 'A' Decay Heat Removal loop in operation.
- Decay Closed flow is fully bypassing 'A' Decay Heat Removal cooler.

Based on these conditions, identify the ONE parameter below that is required to be monitored and controlled in order to prevent exceeding RCS design limits after securing RC-P-1C.

- A. Core exit thermocouples.
- B. RCS Loop A wide range hot leg temperature.
- C. 'A' Decay heat cooler outlet temperature DH2-TE-1.
- D. 'A' Decay heat pump suction temperature DH6-TE-1.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 053

Point Value: 1

Q 053

From the list below, identify the ONE signal that will initiate an automatic open signal for IC-V-20, RC Drain Tank Cooler cooling outlet valve.

- A. RC Drain Tank pressure greater than the high pressure alarm setpoint.
- B. RC Drain Tank level greater than the high level alarm setpoint.
- C. Both RC Drain Tank containment isolation valves open (WDL-V-304 and WDL-V-305).
- D. RC Drain Tank pump running.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 054

Q 054

Point Value: 1

Identify the ONE selection below that completes the description of the basis for the limiting conditions for operation (LCOs) for Nuclear Services Closed Cooling (NSCC).

- (a) _____ NSCC pump(s) is/are required for normal operation heat loads;
(b) _____ NSCC pump(s) is/are required for ECCS support during a LOCA.

- A. (a) Two
(b) Two
- B. (a) Two
(b) One
- C. (a) One
(b) Two
- D. (a) One
(b) One

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 055

Point Value: 1

Q 055

Initial conditions:

- Reactor power 100%, with ICS in full automatic.
- Pressurizer level and temperature are normal.

Sequence of events:

- Temperature compensation to the selected Pressurizer level instrument fails LOW.

Based on these conditions, identify the ONE statement below that describes:

- (1) Automatic response of the Pressurizer level control system;
- (2) Immediate manual actions required.

- A. (1) Makeup valve MU-V-17 OPENS to 100%, Pressurizer heaters DO NOT trip.
(2) Transfer MU-V-17 to manual and adjust to maintain Makeup Tank level constant.
- B. (1) Makeup valve MU-V-17 OPENS to 100%, Pressurizer heaters trip.
(2) Raise RCS Letdown flow to maximum (140 gpm).
- C. (1) Makeup valve MU-V-17 CLOSES to 0%, Pressurizer heaters energize in response to actual Pressurizer level reduction.
(2) Isolate RCS Letdown flow.
- D. (1) Makeup valve MU-V-17 CLOSES to 0%, Pressurizer heaters energize in response to actual Pressurizer level reduction.
(2) Raise RCP Seal injection flow to compensate for reduced Makeup flow.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 056

Point Value: 1

Q 056

From the list below, identify the ONE selection that describes the Reactor Protection System (RPS) design features that provide:

- (1) Spurious trip protection;
- (2) 100% reactor power on-line testing capability.

- A. (1) 2 out of 4 trip logic
(2) manual bypass
- B. (1) 2 out of 4 trip logic
(2) shutdown bypass
- C. (1) electrical independence
(2) module removal
- D. (1) electrical independence
(2) shutdown bypass

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 057

Point Value: 1

Q 057

Plant conditions:

- Reactor power is 100%, with ICS in full automatic.
- No surveillance testing in progress.

Based on these conditions, identify the ONE statement below that describes an RPS cabinet trip string input failure that will cause the RPS CHANNEL to trip.

- A. Contact Monitor switches to '3 RCP' setpoint.
- B. Total RCS flow fails to 160 x E6 lbm/hr.
- C. Loop 'A' RCS flow fails to ZERO lbm/hr.
- D. Power imbalance fails to ZERO %.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 058

Point Value: 1

Q 058

1203-7 (Hand Calculations for Quadrant Power Tilt and Core Power Imbalance) limit and precaution states, "After a power change, wait ten minutes before taking data from the Minimum Incore System Backup recorders."

This limit ensures accurate recorder readings by allowing for decay effects of _____.

- A. Palladium.
- B. Rubidium.
- C. Rhodium.
- D. Cesium.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 059

Point Value: 1

Q 059

Plant conditions:

- Reactor power is 75%.
- 3 RCPs are operating.
- NI-5 power range instrument is selected for ICS input
- ICS stations in manual: SG/RX Master, Rx Master, Diamond CRD Control Panel, FW Loop Masters, Delta TC.

Sequence of events:

- NI-5 output signal fails slowly to ZERO % power.
- SASS actuation does NOT occur.
- Plant remains stable under manual control.

From the list below, identify the ONE statement that describes the effect of these conditions on plant control/logic circuits.

- A. ICS Neutron Cross Limit circuit actuates.
- B. CRD high startup rate Out Inhibit circuit is enabled.
- C. RCP NI starting interlock designed to prevent a cold water accident is NOT functional.
- D. RPS degree of redundancy for NI overpower trip defaults to ZERO.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 060

Point Value: 1

Q 060

Plant conditions:

- LOCA cooldown in progress.
- ES Actuations in effect:
 - Automatic: 1600 A/B, 500 A/B, 4 PSIG A/B
 - Manual: 1600 A/B, 4 PSIG A/B
- RCS pressure = 100 psig, slowly decreasing.
- RB pressure is 32 psig.

Sequence of events:

- Bus fault occurs on 1E 4KV Switchgear.
- Unit Supervisor directs CRO to re-energize 1C ES Valve MCC to enable restart of AH-E-1C.

Identify the ONE statement below that describes MINIMUM required actions to re-energize 1C ES Valve MCC from its alternate power supply.

- A. Bypass/Defeat all AUTOMATIC ES signals, and then manually select the alternate power supply.
- B. Bypass/Defeat/Reset all AUTOMATIC and MANUAL ES signals, and then select the alternate power supply.
- C. Bypass/Defeat/Reset all AUTOMATIC and MANUAL ES signals, depress 1C ES Valve MCC Power Reset pushbutton, to enable automatic ABT transfer to the alternate power supply.
- D. Bypass/Defeat/Reset all AUTOMATIC and MANUAL ES signals, depress 1C ES Valve MCC Power Reset pushbutton, and then MANUALLY select the alternate power supply.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 061

Point Value: 1

Q 061

Sequence of events:

Time	RCS Pressure	Event
0950		Reactor trip from full power due to LOCA.
1000	1200 psig	HPI systems injecting BWST water into the RCS.
1030	800 psig	RB Pressure peaked at 6 psig.
1130	700 psig	LPI/HPI Pumps in "Piggyback" Mode.
1200	550 psig	Core Flood Tanks dumping.
1230	150 psig	LPI systems injecting BWST water into RCS.

- RB Spray Pumps are NOT operating.
- RB Sump recirculation is NOT initiated.

Based on this event, identify the EARLIEST TIME below when sodium hydroxide (NaOH) will actually be injected into the reactor core.

- A. Time = 1000.
- B. Time = 1130.
- C. Time = 1200.
- D. Time = 1230.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 062

Point Value: 1

Q 062

Plant conditions:

- Reactor trip from full power due to LOCA.
- RB pressure reached 5 psig.
- Manual ESAS actuation signals were NOT initiated.
- Automatic ES Actuation status:

	Train A	Train B
1600#	Bypassed	Bypassed
4#	Defeated	Actuated (NOT defeated)

Based on these initial conditions, identify the ONE statement below that describes automatic component response if RB pressure rises rapidly (spikes) to 40 psig.

- A. Only BS-P-1B starts.
- B. Both BS-P-1A and BS-P-1B start.
- C. Only BS-P-1A starts;
Train 'A' RB Spray (BS) valves open.
- D. Both BS-P-1A and BS-P-1B start;
Both Train 'A' and Train 'B' RB Spray (BS) valves open.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 063

Point Value: 1

Q 063

From the list below, identify the ONE statement that describes the response of the Reactor Building Purge System to a High alarm condition on RM-A-9G, Reactor Building Purge Duct monitor.

- A. ONLY purge supply fans AH-E-6A/B trip.
- B. ONLY purge supply and exhaust isolation valves AH-V-1A/B/C/D close.
- C. Only purge exhaust fans AH-E-7A/B trip AND purge exhaust isolation valves AH-V-1A/B close.
- D. Purge exhaust fans AH-E-7A/B trip, AND purge supply and exhaust isolation valves AH-V-1A/B/C/D close.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 064

Point Value: 1

Q 064

Initial conditions:

- Reactor power is 100%, with ICS in full automatic.

Based on these conditions, identify the ONE selection below that describes the automatic interface between Spent Fuel Cooling Pump, SF-P-1A, and SF Cooler inlet valve, NS-V-16A.

NS-V-16A, cooling isolation to Spent Fuel Cooler A, automatically (1) _____ when SF-P-1A extension control is switched from the (2) _____.

- A. (1) opens
(2) Pull to Lock position to the Stop position.
- B. (1) opens
(2) Normal After Stop position to the Start position.
- C. (1) closes
(2) Stop position to the Pull to Lock position.
- D. (1) closes
(2) Normal After Start position to the Stop position.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 065

Point Value: 1

Q 065

Plant conditions:

- Spent Fuel shipment activities are being conducted in compliance with applicable procedure and Tech Spec requirements.
- A cask containing spent fuel is being transferred from the Cask Loading Pit to the transport vehicle in the truck bay.
- During transfer, the fuel handling crane hoist brake fails, and the cask is dropped.

Based on these conditions, identify the ONE selection below that predicts (1) the impact of the load drop, and (2) the mitigating action required to be taken.

- A. (1) New Fuel Elevator may be damaged.
(2) Implement 1503-1, Receipt of New Fuel and Control Components.
- B. (1) The transport vehicle may be damaged.
(2) Follow Rad Con and Safety Engineering guidance.
- C. (1) Fuel Transfer Carriage may be damaged.
(2) Implement 1503-2, Damaged Fuel and Control Components.
- D. (1) One or more fuel assemblies in the Spent Fuel Pool may be damaged.
(2) Implement 1503-2, Damaged Fuel and Control Components.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 066

Point Value: 1

Q 066

Plant conditions:

- Reactor trip from full power due to low RCS pressure.
- All 4 RCPs are operating.
- OTSG 1A pressure is 800 psig and lowering.
- OTSG 1B pressure is 950 psig and lowering.
- Both OTSG levels are 33 inches in Startup Range and lowering.
- RCS T-Ave is 549°F and lowering.
- RCS pressure is 1700 psig and lowering.
- RB pressure is 0.1 psig and stable.
- Pressurizer level is 73 inches and lowering.

Based on these conditions, identify the OP-TM-EOP-010 procedural guidance required to be implemented to mitigate the transient.

- A. Guide 15, EFW Actuation Response.
- B. Rule 3, Excessive Heat Transfer.
- C. Rule 2, HPI/LPI Throttling.
- D. Rule 1, Loss of SCM.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 067

Point Value: 1

Q 067

Plant conditions:

- Reactor tripped from 100% power.
- ICS Turbine Bypass Valve/Atmospheric Dump valve control stations are in automatic.
- Condenser vacuum is low at 20 inches due to condenser air leak.
- OTSG pressures are stable at 1010 psig.

Assuming NO operator action, based on these conditions, identify the ONE statement below that describes the response of OTSG pressure control systems when the Main Condenser vacuum interlock resets to NORMAL.

- A. ADVs will automatically control OTSG pressures between 1026-1052 psig; TBVs remain closed.
- B. TBVs open to automatically control OTSG pressures at 1010 psig; ADVs close, but will open if OTSG pressure exceeds 1040 psig.
- C. ADV control is transferred to the (control room) Backup Manual Loaders; TBVs remain closed.
- D. TBV control is automatically transferred to ICS Manual; ADVs close, but will open if OTSG pressure exceeds 1040 psig.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 068

Point Value: 1

Q 068

Plant conditions:

- Reactor power is 100%, with ICS in full automatic.
- VA-P-1C is the only operating Main Vacuum Pump.
- Loss of 'A' DC Distribution System power occurs.

Based on these conditions, identify the ONE statement below that describes related response to the loss of 'A' DC power.

- A. RM-A-5 Condenser Offgas Monitor indication rises to the high alarm level.
- B. Immediate LOW Vacuum trip of the main turbine.
- C. Immediate start of the standby Vacuum Pump.
- D. Vacuum exhaust flow indication lowers.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 069

Point Value: 1

Q 069

Plant conditions:

- Reactor tripped from 100% power due to loss of offsite power (LOOP).
- Both OTSG pressures are 1010 psig and stable.
- Both OTSG levels are at proper setpoint and stable.
- EFW flowrates are stable.
- RCS cooldown rate is 0° per hour.
- RCS natural circulation is verified.
- Time is 30 minutes post trip.

Based on these equilibrium conditions, from the list below, complete the following phrase:

This trip from full power results in a _____, compared to a trip from 15% power.

- A. lower core delta T
- B. higher EFW flowrate
- C. longer (RCS) loop transport time
- D. lower Atmospheric Dump Valve position (% open)

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 070

Point Value: 1

Q 070

Plant conditions:

- Reactor trip from 100% power due to loss of both Main Feedwater Pumps.
- EFW flows:
 - OTSG 1A = 0 gpm.
 - OTSG 1B = 400 gpm
- Status indications above the EF-V-30 controllers for OTSG 1A:
 - AUTO light is illuminated.
 - OP light is illuminated.
 - SU light is NOT illuminated.

Based on these conditions, identify the ONE selection below that completes the following statement to describe the only method to control the required level in OTSG 1A.

Transfer EF-V-30A and/or EF-V-30D controller(s) to _____.

- A. Local Auto and dial in a 25% setpoint.
- B. Local Auto and dial in a 50% setpoint.
- C. Manual and control level manually at 50%.
- D. Manual and control level manually at 25 inches.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 071

Point Value: 1

Q 071

Plant conditions:

- Reactor power is 100%, with ICS in full automatic.
- MU-P-1A (Makeup Pump 1A) is supplying normal makeup/seal injection.

Sequence of events:

- The following alarms, actuate simultaneously:
 - A-1-7 Battery 1A Discharging
 - A-2-7 Batt Charger 1A/1C/1E Trouble
 - A-3-7 Inverter 1A/1C/1E System Trouble
 - PRF1-1-1 CRDM Breaker Test Trouble
 - NN-3-1 230 KV Substation Trouble
 - AA-3-2 7KV Bus Trouble
 - AA-3-3 4KV BOP Bus Trouble
 - AA-3-5 480V BOP Bus Trouble

Based on these conditions identify the ONE selection below that describes (1) the controlling procedure and (2) required actions.

- A. (1) 1202-9A, Loss of "A" DC Distribution System
(2) Notify Auxiliary Operator to close EG-V-15A, air start isolation for Emergency Diesel Generator 1A.
- B. (1) 1202-9A, Loss of "A" DC Distribution System.
(2) Notify Auxiliary Operator to verify MU-P-1C is ready for start.
- C. (1) Alarm response for AA-3-2, 7KV Bus Trouble.
(2) Notify Transmission System Operator (TSO) and trip the reactor.
- D. (1) Alarm response for NN-3-1, 230 KV Substation Trouble.
(2) Notify Transmission System Operator (TSO) and trip the reactor.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 072

Point Value: 1

Q 072

Sequence of events:

- Reactor power is 100%, with ICS in full automatic.
- Loss of 'B' 125/250V DC distribution system.
- Reactor is manually tripped.
- Shift management directs CRO to immediately secure all RCPs.
- CRO announces that all 4 RCP breaker closed lights are de-energized, but the ammeters are functional.

Based on the conditions above, identify the ONE statement below that describes how to accomplish this task.

- A. Insert key and rotate local 69 Switch to the TRIP position.
- B. Depress local TRIP pushbuttons on front of RCP breaker cubicle doors.
- C. Open RCP motor breakers using normal control room extension controls.
- D. De-energize both 7KV buses, using Panel Right feeder breaker extension controls.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 073

Point Value: 1

Q 073

Plant conditions:

- Reactor power is 100%, with ICS in full automatic.
- Normal electrical line-up.
- No testing/maintenance in progress
- No emergency system actuation signals
- Auxiliary Operator reports discovering EG-Y-1A is operating.

Based on these conditions, identify the ONE selection below that describes where to send maintenance to investigate this loss of control power event.

- A. 1P DC bus.
- B. 1Q DC bus.
- C. 1M DC bus.
- D. 1H DC bus.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 074

Point Value: 1

Q 074

Plant conditions:

- Reactor power is 100%, with ICS in full automatic.

Based on these conditions, identify the ONE selection below that describes a NORMAL source of water to the Liquid Waste Disposal System.

- A. PORV pilot valve leakoff.
- B. Leakoff from between the reactor vessel flange O-Rings.
- C. Intermittent drain flow from the Waste Gas Compressor Separator.
- D. Valve packing leakage from Letdown isolation valves MU-V-1A and MU-V-1B.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 075

Q 075

Point Value: 1

Form the list below, identify the ONE operating condition that will automatically terminate process flow during a liquid transfer from the Reactor Building Sump to the Auxiliary Building sump.

- A. High alarm on RM-A-4 Gas (Aux Building Atmospheric Monitor).
- B. High alarm on RM-G-5 (RB Area Monitor).
- C. Low Reactor Building sump level.
- D. High Auxiliary Building sump level.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 076

Point Value: 1

Q 076

Plant conditions:

- Releasing Waste Gas Decay Tank WDG-T-1A.
- RM-A-7 High Alarm actuates.

Based on these conditions, identify the ONE statement below that describes (1) automatic interlocks actuated and (2) operator actions required.

- A. (1) AH-E-11, Auxiliary Building Supply Fan, trips.
(2) Close WDG-V-25, WDG-T-1A outlet isolation valve.
- B. (1) WDG-V-47, Waste Gas release control valve, closes.
(2) Stop AH-E-11, Auxiliary Building Supply fan.
- C. (1) WDG-V-47 Waste Gas release control valve, closes.
(2) Implement EP 1202-12, Excessive Radiation Levels.
- D. (1) WDG-V-25, WDG-T-1A outlet isolation valve, closes.
(2) Implement alarm response procedure for MAP C-1-1, High Radiation.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 077

Q 077

Point Value: 1

Refueling operations are scheduled to begin in one hour. From the list below, identify the ONE operational condition that would require the Unit Supervisor to delay handling of irradiated fuel inside the RB.

- A. RM-A-2 (RB Atmospheric Monitor) sample pump trips.
- B. RM-G-22 (RB High Range Monitor) is declared inoperable.
- C. RM-A-9 (RB stack) automatic interlock surveillance test fails.
- D. RM-G-5 (RB Personnel Access Hatch) monitor Fail/Reset light de-energizes due to off-scale low indication.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 078

Point Value: 1

Q 078

Plant conditions:

- Plant is in HOT SHUTDOWN, initial post-refueling plant startup is in progress.
- RM-G-16 (OTSG 'A' Sample line monitor) is TURNED OFF for maintenance.
- Compensatory actions for RM-G-16 have been taken IAW procedures.
- OTSG tube leakage is at baseline value.
- OTSG 'A' sample is in progress.

Sequence of events:

- I and C technician takes RM-G-16 control switch to "ALL" position IAW the gamma monitor startup section of 1105-8 Radiation Monitoring System.

Based on these conditions, predict the system response.

- A. (1) RM-G-16 alarms due to process flow radiation levels.
(2) "A" OTSG sample valves AUTO-CLOSE.
- B. (1) RM-G-16 alarms due to process flow radiation levels.
(2) "A" OTSG sample valves REMAIN OPEN.
- C. (1) RM-G-16 alarms due to electronic power spike.
(2) "A" OTSG sample valves AUTO-CLOSE.
- D. (1) RM-G-16 alarms due to electronic power spike.
(2) "A" OTSG sample valves REMAIN OPEN.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 079

Point Value: 1

Q 079

From the list below, identify the ONE set of conditions that can automatically terminate an inadvertent radioactive liquid release from the Waste Evaporator Condensate Storage Tank (WECST) in the event the wrong tank is released.

- A. RM-L-7 in ALERT alarm OR loss of sample flow through RM-L-6.
- B. RM-L-6 HIGH alarm OR high tank release rate.
- C. High MDCT effluent flow OR low tank release rate.
- D. RM-L-6 ALERT alarm OR RM-L-7 ALERT alarm.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 080

Point Value: 1

Q 080

Plant conditions:

- Reactor power is 100%, with ICS in full automatic.
- RM-L-1, RCS Letdown High Range Monitor, is out of service for calibration testing.

Event:

- Fuel pin failure occurs.

Based on these conditions, assuming no operator action, complete the statement below that predicts the effect of this event.

Auxiliary Building general area radiation levels...

- A. RISE until letdown automatically isolates.
- B. RISE with NO automatic letdown isolation.
- C. DO NOT CHANGE since MU-V-1A/B are required to be closed before any RM-L-1 testing.
- D. DO NOT CHANGE since MU-V-2A/B are required to be closed before any RM-L-1 testing.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 081

Q 081

Point Value: 1

Plant conditions:

- RCS cooldown in progress due to OTSG tube leakage.
- RCS T-Ave = 510°F.
- OTSG 1B tube leakage = 5 gpm.
- OTSG 1A TBV status: 10% open in Manual.
- OTSG 1B TBV status: 0% open in Manual.
- Report from AO that "B" side Main Steam Safety (MSSV) valve is stuck open.
- OTSG pressures = 700 psig.

Based on these conditions, procedural guidance is to steam the MOST AFFECTED OTSG to the condenser while monitoring condenser vacuum.

Identify the ONE selection below that describes:

- (1) How to implement these actions.
 - (2) The objective of the procedure guidance.
-
- A. (1) Open OTSG 1B TBVs to reduce OTSG 1B pressure.
(2) Attempt to reseal the MSSV.
 - B. (1) Open OTSG 1B TBVs while closing OTSG 1A TBVs.
(2) Raise RCS cooldown rate.
 - C. (1) Open OTSG 1B TBVs while closing OTSG 1A TBVs.
(2) Reduce radioactive release rate out the MSSV.
 - D. (1) Open OTSG 1B TBVs.
(2) Increase OTSG 1B FW flow to dilute the radioactive release out the MSSV.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 082

Point Value: 1

Q 082

At full power, a loss of _____ will cause all three EFW (Emergency Feedwater) pumps to auto-start

- A. Both Intermediate Closed Cooling Water Pumps.
- B. Six Circulating Water Pumps.
- C. 1A Auxiliary Transformer.
- D. 1B Station Battery.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 083

Q 083

Point Value: 1

From the list below, identify the ONE selection that describes (1) an operating condition that exceeds a design limit, requiring NRC notification, and (2) the basis for the design limit.

- A. (1) Reactor power 1%, with average RB temperature above 320' elevation at 135°F.
(2) Maintain Core Flood Tank water within acceptable temperature limit.
- B. (1) Reactor at Hot Shutdown, with average RB temperature above 320' elevation at 135°F.
(2) Prevent exceeding containment design temperature and pressure during a LOCA.
- C. (1) Reactor power 1%, with RB pressure at 2.0 psi vacuum.
(2) Prevent exceeding reactor building structure differential pressure limits.
- D. (1) Reactor at Hot Shutdown with RB pressure at 2.0 psi vacuum.
(2) Maintain sample flow to RB atmospheric radiation monitor.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 084

Point Value: 1

Q 084

Plant conditions:

- Reactor power is 100%, with ICS in full automatic.
- Main Condenser tube leak in progress in 'B' side of Main Condenser.
- Chemistry reports validated readings:
 - 6.5 umho/cm at CE-6A, corrected feedwater cation conductivity.
 - 7.5 umho/cm at CE-6, feedwater cation conductivity.

Based on these conditions, identify the ONE statement below that describes required operator actions.

- A. Trip the reactor and go to OP-TM-EOP-001, Reactor Trip.
- B. Secure all Moisture Separator Drain Pumps and continue power operation.
- C. Reduce power to less than 50% and isolate the 'B' side Circulating Water loop.
- D. Perform a normal plant shutdown and cooldown to Decay Heat Removal operation.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 085

Q 085

Point Value: 1

Identify the ONE selection below that describes a condition when it is permissible for a Reactor Operator to be the ONLY NRC LICENSED person in the Control Room.

- A. Reactor power is 100%;
There is one other person, a CRO trainee (NOT LICENSED) in the Control Room.
- B. Plant is in Hot Shutdown condition;
The Shift Technical Advisor (NOT LICENSED) is also in the Control Room.
- C. RCS temperature is 210°F;
The duty Shift Manager (LICENSED) is in the Shift Manager's Office.
- D. RCS temperature is 189°F;
The duty Shift Manager (LICENSED) is in the Operations Office Building.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 086

Point Value: 1

Q 086

Plant conditions for the past 45 days:

- NORMAL OPERATIONS.
- Reactor power is 100%, with ICS in full automatic.
- STAR module has maintained Heat Balance Power at 2568 MW thermal.
- Control Rod Index has been maintained at 290-292.
- RCS boron concentration was reduced 75 ppm, ramped over the 45 days.
- Power Range NI readings have slowly risen from (initial) 100% to 101%.

Based on plant performance data above, identify the ONE selection below that describes (1) impact and (2) credible reason for the NI-Heat Balance Calculation mismatch.

- A. (1) Heat balance calculation is non-conservative.
ACTUAL reactor power = 101%.
(2) FW temperature instrument error drift (indicating LOWER than actual) could be producing a heat balance calculation error to produce this mismatch.
- B. (1) Heat balance calculation is accurate.
ACTUAL reactor power is still 100%.
(2) INDICATED reactor power is rising due to (outward) radial flux redistribution as fuel depletion continues.
- C. (1) Heat balance calculation is accurate.
ACTUAL reactor power is still 100%.
(2) INDICATED reactor power is rising due to LOWER thermal neutron leakage resulting from the ramped reduction in RCS boron concentration.
- D. (1) Heat balance calculation is non-conservative.
ACTUAL reactor power = 101%.
(2) Plant efficiency could be reduced due to rising FW heater tube leakage.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 087

Q 087

Point Value: 1

From the list below, identify the ONE set of conditions that constitutes a VIOLATION of conditions and limitations in the facility license.

- A. Operation at 50% power for 20 hours:
 - Control rod positions inside the RESTRICTED operating region.
 - Corrective actions initiated immediately when condition was discovered.
 - Power peaking was verified within acceptable limits the entire time.
- B. Operation at 44% power for 9 hours:
 - 3 RCPs operating.
 - 1 asymmetric rod cannot be aligned with its group, declared inoperable.
 - Ejected rod worth and nuclear peaking factors were verified within limits.
 - RPS nuclear overpower trip setpoints are set at 102%.
- C. Operation at 100% power for 1 week:
 - RCS net unidentified leakage = 0.02 gpm.
 - OTSG tube leakage = 0.5 gpm.
 - Baseline OTSG leakage = 0.01 gpm.
- D. Operation at 100% power for 1 month:
 - RCS net unidentified leakage = 0.05 gpm.
 - OTSG tube leakage = 0.02 gpm.
 - Baseline OTSG leakage = 0.01 gpm.
 - MU Pump seal leakage = 1.0 gpm.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 088

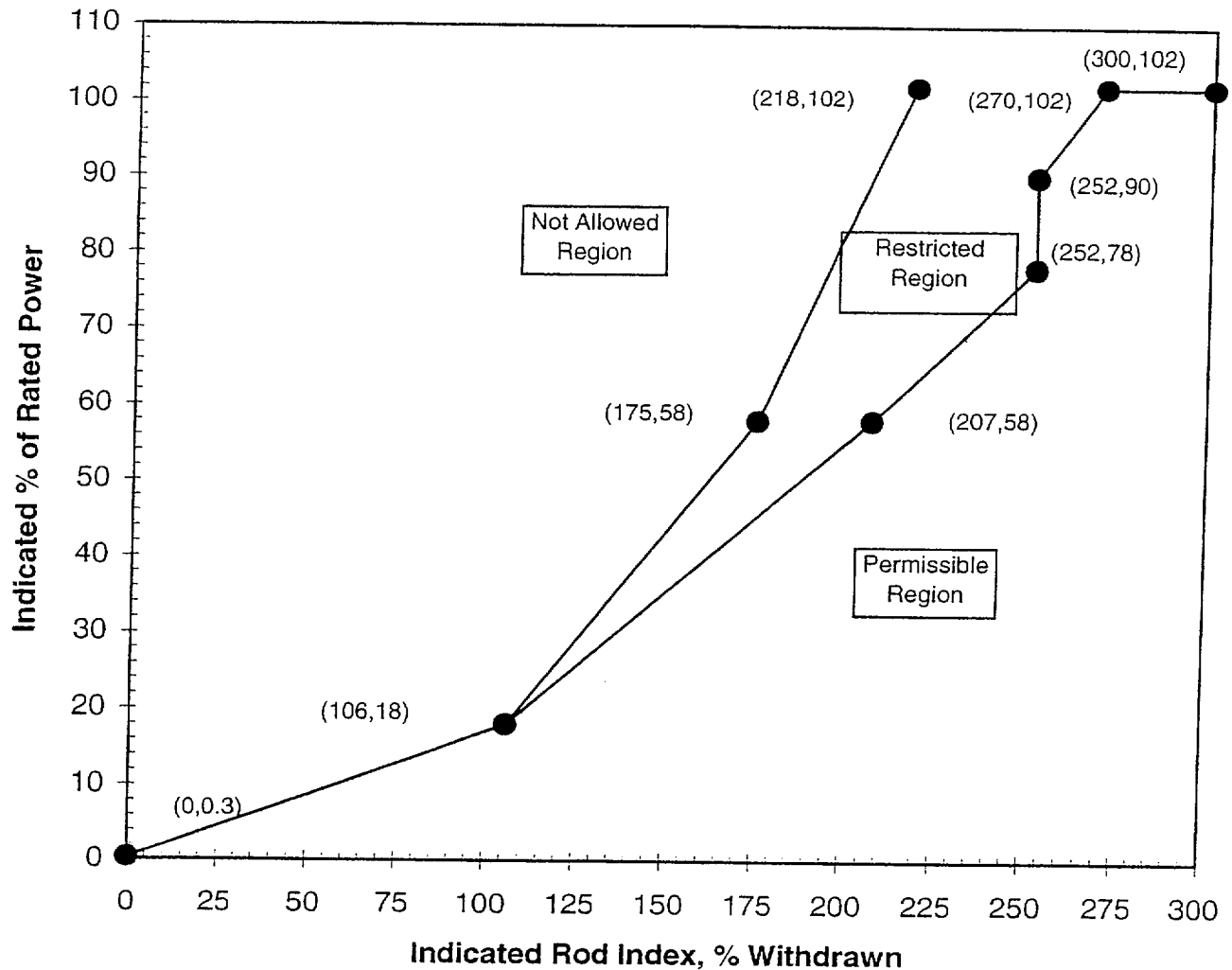
Point Value: 1

Q 088

Identify the ONE statement that describes a consequence of operating inside the RESTRICTED Region of the COLR control rod insertion limits. Refer to the attached figure.

- A. Inadequate shutdown margin if the reactor is tripped.
- B. Excessive fuel pellet swelling due to core power imbalance.
- C. Accelerated fuel clad creep due to elevated local power densities.
- D. Excessive fuel clad temperatures during initial phases of a loss of coolant accident.

Figure 1 (Page 2 of 2)
Error Adjusted Rod Insertion Limits
(400 \pm 10 EFPD to EOC; 4 Pump Operation)



A Rod group overlap of 25 \pm 5% between sequential groups 5 and 6, and 6 and 7 shall be maintained.

This figure is referred to by
TS 3.5.2.5.b & 3.5.2.4.e.3

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 089

Q 089

Point Value: 1

Plant conditions:

- A maintenance work order requires a pneumatic operated valve to be closed as part of the clearance order safety boundary.
- The valve fails OPEN on loss of air or loss of power to the solenoids controlling the air.

Based on these conditions, identify the ONE selection below that completes the following phrase:

This valve may be used as part of the safety boundary if ...

- A. the power supply to the solenoids is tagged to ensure a continuous power supply.
- B. the fluid controlled by the valve is less than 200°F and less than 500 psig.
- C. a temporary air bottle is installed to ensure a continuous air supply.
- D. an appropriate gag is used on the valve operator.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 090

Point Value: 1

Q 090

Identify the ONE operation below that is subject to the requirements of AP 1013, Temporary Modifications and Bypass of Safety Functions.

- A. Using a power buggy to energize a portable sump pump in the Amertap pit.
- B. Installation of a pipe cap on the outlet of a drain valve to stop leakage to the floor at 'A' 12th stage heater.
- C. Bolting a stainless steel collar around a valve stem to prevent vibration induced damage.
- D. Installation of a calibrated test gauge to support performance of a Tech Spec surveillance on a temporary basis.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 091

Q 091

Point Value: 1

During transfer of an irradiated fuel assembly with the Main Fuel Handling Bridge, the bridge stops travel, and will NOT move south to complete the operation. Investigation reveals that the south wall interlock has failed in the actuated position.

Based on these conditions, identify the ONE person below required to approve bypass of this interlock to continue the transfer.

- A. Core Load Engineer.
- B. Duty Shift Manager.
- C. Fuel Handling Supervisor.
- D. Refueling Outage Manager.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 092

Point Value: 1

Q 092

Plant conditions:

- Plant startup in progress.
- Reactor power is stable at 1E-8 Amps.

Critical data shows that actual criticality has occurred outside (above) the estimated critical position (ECP) band. From the list below, identify the ONE statement that describes required action(s) for this condition.

- A. Manually trip the reactor.
- B. Go to 1203-10, Unanticipated Criticality.
- C. Maintain criticality at current rod position, and initiate an assessment.
- D. Insert the control rods to achieve at least 1% Delta K/K subcritical condition, and initiate an assessment.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 093

Point Value: 1

Q 093

Plant conditions:

- Reactor power is 100%, with ICS in full automatic.
- Fuel pin failure has occurred.
- RCS degassification has resulted in higher than normal activity in the Waste Gas System vent header.
- Waste Gas Decay Tank WDG-T-1A has been isolated in support sampling in preparation for releasing its contents to the environment.

Based on these conditions, identify the ONE statement below that describes a procedural method used to limit the amount of radioactivity discharged when this tank is released to the environment.

- A. Shorten the WDG-T-1A holdup time prior to release.
- B. Introduce nitrogen dilution flow into the release effluent piping.
- C. Filter the release through the normal roughing, HEPA and charcoal filters.
- D. Verify both WDG-T-1B and WDG-T-1C are LESS than 65 psig prior to release.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 094

Q 094

Point Value: 1

Plant conditions:

- Reactor power is 100%, with ICS in full automatic.
- Fuel pin failure occurred 3 days ago.
- RC Bleed Tank WDL-T-1B cleanup is in progress to reduce activity.
 - Paperwork (P&ID and OP1104-29A) to process the water specifies use of:
 - Waste Transfer Pump WDL-P-6B.
 - 'A' Precoat Filter.
 - 'A' Cation Demineralizer.
- Leak develops at 'A' Cation Demineralizer.

Based on conditions above, identify the ONE statement below that describes Unit Supervisor responsibility regarding operation of the Liquid Waste Disposal System.

- A. Temporarily suspend the process until the leak is repaired, and then direct the operator to continue the process using the current paperwork.
- B. Direct the operator to continue the process using 'B' Cation Demineralizer, and replace the paperwork after the process is completed.
- C. Modify current paperwork to use 'B' Cation Demineralizer, and then direct the operator to continue cleanup of WDL-T-1B.
- D. Terminate the process, and annotate the paperwork, describing cause for pre-empting the process.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 095

Q 095

Point Value: 1

A male radiation worker at Three Mile Island (TMI) has just returned from 3 weeks of outage support at Peach Bottom.

- His Total Effective Dose Equivalent (TEDE) received at Peach Bottom was 150 mrem.
- After a fall at home, the worker had an ankle x-ray estimated at 10 mrem exposure to the ankle.
- This worker's current TEDE from TMI for this year is 75 mrem.

Based on these figures, choose the calculated MAXIMUM annual non-emergency TEDE that he can receive at TMI for the remainder of this year without exceeding the Federal Exposure Limits.

- A. 4765 mrem.
- B. 4775 mrem.
- C. 4850 mrem.
- D. 4925 mrem.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 096

Q 096

Point Value: 1

Identify the ONE action below that is performed to reduce excessive levels of radiation and guard against personnel exposure during accident conditions in accordance with OP-TM-EOP-010, Abnormal Transients, Rules, Guides and Graphs.

- A. After Subcooled Margin is restored, maintain natural circulation for greater than 1 hour prior to starting a Reactor Coolant Pump per Guide 7, RCP Restart.
- B. Continue RB Spray pump operation with RB pressure below 2 psig per Guide 18, Containment.
- C. Maintain RB flood level below 64 inches per Guide 22, RB Sump Recirculation.
- D. Verify RB flood level >32 inches prior to transferring to RB Sump recirculation per Guide 21, Transfer to RB Sump Recirculation.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 097

Point Value: 1

Q 097

Plant conditions:

- Reactor power is 100%, with ICS in full automatic.
- SR-P-1B is tripped, SR-P-1C started automatically.
- Applicable procedure Immediate Actions are complete, and Follow-up Actions are in progress in response to SR-P-1B trip.
- Control Room Alarm PLB 6-8, River Rake or Screen Trouble, is repeatedly actuating/resetting, interrupting control room communications.
- There is no valid reason for the alarms, according to the Auxiliary Operator's field report.
- You, the Unit Supervisor, want to authorize the alarm to be removed from service, in order to eliminate the distraction.
- No alarm repair is expected during this shift.
- The nuisance alarm has been disabled.

Based on conditions above, identify the ONE statement below that describes how to track the inoperable alarm per OP-AA-103-102, Watchstanding Practices.

- A. Initiate an Equipment Status Tag (EST), and direct the crew to denote the inoperable alarm in turnover documents.
- B. Apply an Equipment Deficiency Tag (EDT), and document the condition in a Control Room Log entry.
- C. Apply an Instrument Out of Service (OOS) tag, and direct the crew to denote the inoperable alarm in turnover documents.
- D. Apply an Information Tag, and document the condition in a Control Room Log entry.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 098

Q 098

Point Value: 1

Plant conditions:

- Reactor power is 100%, with ICS in full automatic.
- A Pressurizer Safety Valve leak has been diagnosed.

In accordance with the applicable procedure, the Unit Supervisor requests chemistry samples for RCS and Pressurizer boron concentrations.

The basis for this chemistry sampling is to ensure that the Pressurizer boron concentration does NOT become significantly (1)_____ than the RCS boron concentration in order to prevent a reactivity excursion if an unexpected plant (2)_____ would occur.

- A. (1) lower
(2) heatup
- B. (1) lower
(2) cooldown
- C. (1) higher
(2) heatup
- D. (1) higher
(2) cooldown

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 099

Point Value: 1

Q 099

Initial conditions:

- Reactor power is 100%, with ICS in full automatic.

Sequence of events:

- Reactor power is rising at 0.1%/minute.
- RCS pressure has lowered to 2130 psig, and is now steady.
- Average RCS temperature has lowered to 578.5°F, and is now steady.
- MU-V-17 is opening to maintain pressurizer level at 220 inches.
- Generator load is 900 MW and lowering at 1 MW every 2 minutes.
- Alarm B-2-8, RB Coolers Excess Condensate has actuated.
- RB pressure is 0.1 psig and rising at a rate of 0.1 psig every 5 minutes.

Identify the ONE statement below that describes required response to these conditions.

- A. Trip the reactor and go to OP-TM-EOP-001.
- B. Reduce power to <45% and trip the turbine.
- C. Commence a one hour RCS leak rate calculation.
- D. Commence plant shutdown at the rate specified by the Unit Supervisor.

**NRC SRO21 Licensing Examination
Three Mile Island Nuclear Station
May 2003**

Q 100

Point Value: 1

Q 100

Plant conditions:

- Reactor power is 100%, with ICS in full automatic.

Event:

- Value for Process Computer point TA168, Stator Bar Water Out TC16, unexpectedly exceeds the high alarm limit.

Based on this condition, identify the ONE statement below that describes where the primary alarm response guidance for this alarm is identified.

- A. OP 1106-1, Turbine Generator, Section 3.7 (Emergency Trip).
- B. OP-TM-MAP-L0307, Gen. Stator Liquid Clg Trouble.
- C. OP 1105-10, Plant Computer Operations, Enclosure 5, Plant Computer Alarm.
- D. OP 1105-10A, Plant Computer Alarm Attributes, "Reference Document" column.

**SRO21 NRC Exam
Three Mile Island Nuclear Station
May 2003**

Written Examination Answer Key

001 A	026 D, <i>B</i>	051 D	076 C
002 B	027 B	052 C	077 C
003 B	028 C	053 D	078 D
004 A	029 B	054 B	079 B
005 A	030 B	055 A	080 B
006 B	031 A	056 A	081 C
007 A	032 D	057 C	082 B
008 B	033 C	058 C	083 C
009 B	034 D	059 C	084 A
010 B	035 C	060 C	085 D
011 D	036 C	061 B	086 B
012 C	037 D	062 A	087 C
013 D	038 B	063 B	088 D
014 D	039 A	064 B	089 D
015 C	040 B	065 B	090 C
016 D	041 A	066 B	091 C
017 C	042 B	067 A	092 D
018 C	043 <i>A D</i>	068 D	093 C
019 B	044 A	069 B	094 D
020 A	045 C	070 D	095 B
021 C	046 D	071 A	096 B
022 A	047 A	072 D	097 A
023 A	048 A	073 A	098 D
024 D	049 D	074 <i>B C</i>	099 D
025 D	050 B	075 C	100 D

FINAL VERSION

May 2003
NRC SRO Initial Licensing Written Examination
TMI Preliminary Unofficial Grades

The following table presents the preliminary unofficial grades from the SRO initial licensing written examination administered on May 19, 2003, by TMI Training for the NRC. These scores reflect the adjustments made following collection of comments from the examinees, as approved by Operations and Training. Maximum individual score change due to adjustments was 1%, so there was no impact on pass/fail results.

Name	Score %
Noble, Philip	86.9
Parfitt, Brad	90.9
Saltz, Doug	88.9
Smith, Matt	87.9
AVERAGE	88.65

These scores are unofficial, and therefore should not be published. Materials are being sent to the Region I office, for the Chief Examiner to review the answer key adjustments, and then to complete the final, official NRC grading.

NRC RESOLUTION OF FACILITY COMMENTS

Q26 Comment: Accept two correct answers.

Resolution:

Both answers accepted. There is not enough information in the question to choose one answer over the other.

Q42 Comment: No correct answer, delete.

Resolution:

Question deleted.

Q43 Comment: Change correct answer.

Resolution:

Answer key changed to the technically correct answer.

Q74 Comment: Typo in answer key.

Resolution: Key changed to the correct answer.