July 10, 2007

Mr. Ralph A. Butler, Chief Operating Officer
Research Reactor Facility
University of Missouri
Columbia, MO 65211

SUBJECT: INITIAL EXAMINATION REPORT NO. 50-186/OL-07-01, UNIVERSITY OF MISSOURI – COLUMBIA

Dear Mr. Butler:

During the week of June 4, 2007, the NRC administered operator licensing examinations at your University of Missouri – Columbia Reactor. The examinations were conducted according to NUREG-1478, "Non-Power Reactor Operator Licensing Examiner Standards," Revision 1. Examination questions and preliminary findings were discussed with those members of your staff identified in the enclosed report at the conclusion of the examination.

In accordance with 10 CFR 2.390 of the Commission's regulations, a copy of this letter and the enclosures will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) http://www.nrc.gov/reading-rm/adams.html. The NRC is forwarding the individual grades to you in a separate letter which will not be released publicly. Should you have any questions concerning this examination, please contact Mr. Phillip T. Young at (301) 415-4094 or via internet e-mail pty@nrc.gov.

Sincerely,

/RA/

Johnny Eads, Chief
Research and Test Reactors Branch B
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No. 50-186

Enclosures: 1. Initial Examination Report No. 50-186/OL-07-01
2. Examination and answer key with facility comments incorporated

cc w/encls: Please see next page

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Research and Test Reactors Branch B
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Office of Nuclear Reactor Regulation

Docket No. 50-186

Enclosures: 1. Initial Examination Report No. 50-186/OL-06-01
2. Examination and answer key with facility comments incorporated.

cc w/encls: Please see next page
DISTRIBUTION w/ encls.:
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AAdams Facility File (EBarnhill) O-6 F-2

ADAMS ACCESSION #: ML071800051 Package:ML070820283 TEMPLATE #:NRR-074

OFFICE	PRTB:CE	IOLB:LA	PRTB:SC
NAME	PYoung:mlc	EBarnhill eb	JEads jhe
DATE	6/29/2007	7/3/2007	7/10/2007

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Test, Research, and Training
Reactor Newsletter
University of Florida
202 Nuclear Sciences Center
Gainesville, FL 32611

U. S. NUCLEAR REGULATORY COMMISSION
OPERATOR LICENSING INITIAL EXAMINATION REPORT

REPORT NO.: 50-186/OL-07-1

FACILITY DOCKET NO.: 50-186

FACILITY LICENSE NO.: R-103

FACILITY: University of Missouri – Columbia

EXAMINATION DATES: June 4 - 6, 2007

SUBMITTED BY: _____/RA/_____ 06/20/2007
Phillip T. Young, Chief Examiner Date

SUMMARY:

During the week of June 4, 2007, the NRC administered operator licensing examinations to four Operator Licensing Candidates. All four candidates passed. All four candidates passed all portions of their respective examinations.

REPORT DETAILS

1. Examiners:
   Phillip T. Young, Chief Examiner

2. Results:

	RO PASS/FAIL	SRO PASS/FAIL	TOTAL PASS/FAIL
Written	2/0	0/0	2/0
Operating Tests	2/0	2/0	4/0
Overall	2/0	2/0	4/0

3. Exit Meeting:
   Phillip T. Young, NRC, Examiner
   Robert Hudson, Training Coordinator, MURR
   John L. Fruits, Assistant Reactor Manager, Operations
   Les Foyto, Reactor Manager

   During the exit meeting the examiner thanked the facility for their support in the administration of the examination. The facility provided comments for correction of the written examination. All corrections to the examination have been incorporated into the copy included with this report.

ENCLOSURE 1

Facility Comments with NRC Resolution

Question C.012:

DPS 928A/B are used to sense primary heat exchanger low flow. A low flow condition will cause a reactor scram and cause:

a. valves 507A/B close.

b. valves 517A/B close.

c. valves 543A/B open.

d. valves 546A/B open.

Answer: C.012 d.
Reference: Training Manual for Reactor Operations, Coolant Loop Lesson {6/11/2003}

Facility Comment:

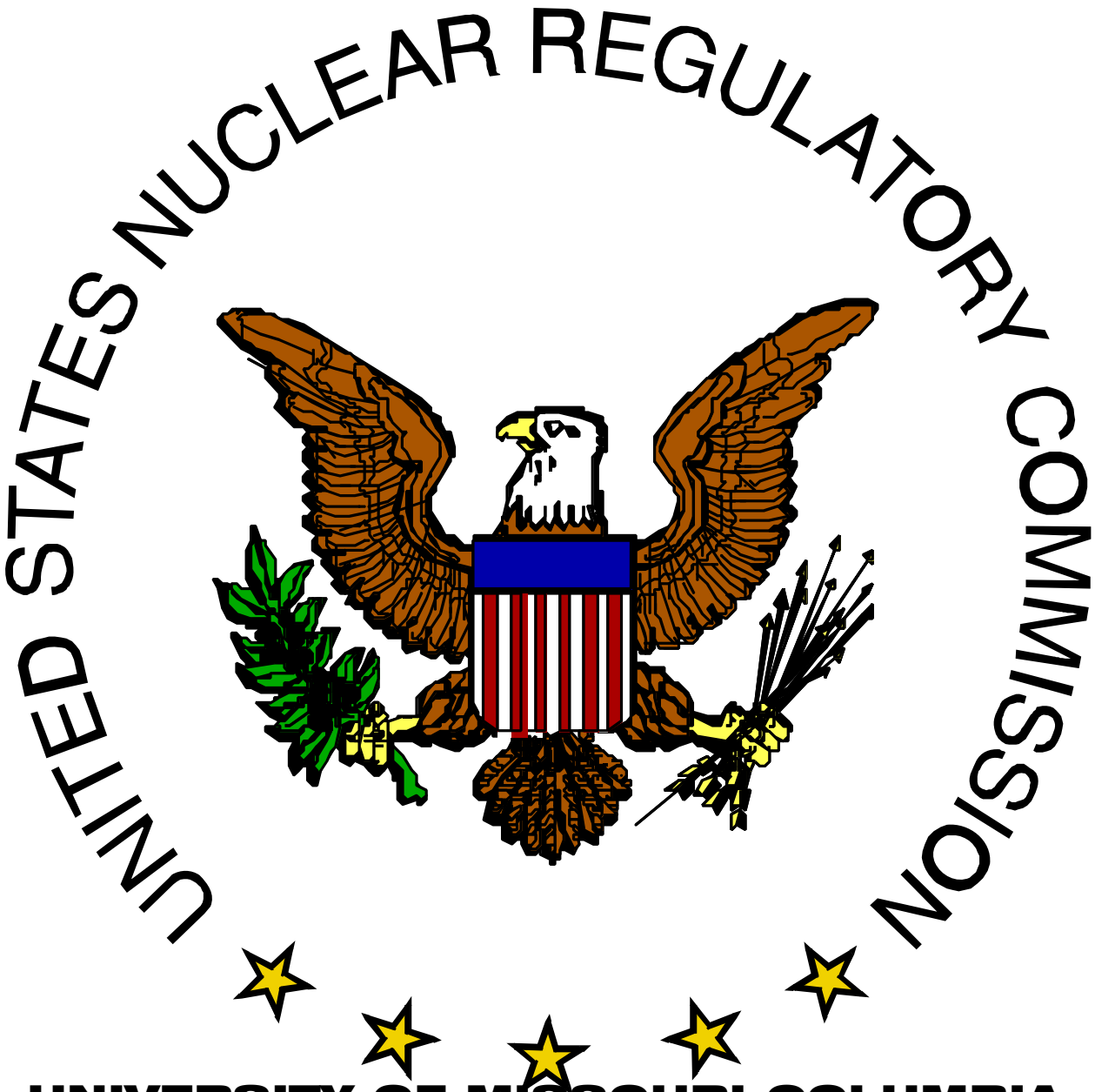
Facility changed instrumentation used for low flow scram from DPS 928A/B to 912A/H.

NRC Resolution:

Comment incorporated into examination.

OPERATOR LICENSING EXAMINATION

With Answer Key



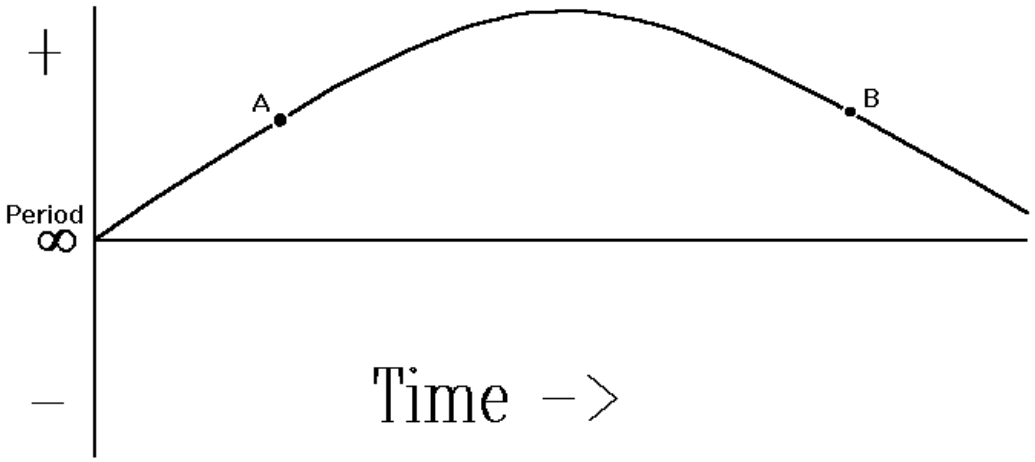
UNIVERSITY OF MISSOURI-COLUMBIA

June 4, 2007

Enclosure 2

QUESTION A.001 [1.0 point] (1.0)
Shown below is a trace of reactor period as a function of time. Between points A and B reactor power is:

a. continually increasing.
b. continually decreasing.
c. increasing, then decreasing.
d. constant.



Answer: A.001 a.
Reference: Standard NRC Question

QUESTION A.002 [1.0 point] (2.0)
To make a just critical reactor "PROMPT CRITICAL", by definition you must add reactivity equal to …

a. τ_{eff}
b. λ_{eff}
c. β_{eff}
d. K_{eff}

Answer A.002 c.
Reference: Primary Reference, Volume 2, Module 4, Reactor Theory (Reactor Operations), Enabling Objective 2.8

NOTE: ***Primary Reference: = DOE Fundamentals Handbook, Nuclear Physics and Reactor Theory.***

QUESTION A.003 [1.0 point] (3.0)
What is the period that would cause reactor power to double in 40 seconds?

a. 3.7 seconds
b. 27.7 seconds
c. 57.7 seconds
d. 80.0 seconds

Answer A.003 c.
$P = P^0 e^{t/T}$ $\ln(P/P_0) = t/T$ $T = t/\ln(P/P_0)$ $T = 30 \text{ sec}/(\ln(2)) = 30/0.693 = 57.7 \text{ sec}$
Reference: DOE Fundamentals Handbook, Nuclear Physics and Reactor Theory, Volume X, Module Y, Enabling Objective Z.Z

QUESTION A.004 (1.00) (4.0)
Which ONE of the reactions below is an example of a photoneutron source?

a. ${}_{51}Sb^{123} + n \rightarrow {}_{51}Sb^{124} + \gamma$
b. ${}_{92}U^{238} \rightarrow {}_{35}Br^{87} + {}_{57}La^{148} + 3n + \gamma$
c. ${}_{1}H^{2} + \gamma \rightarrow {}_{1}H^{1} + n$
d. ${}_{4}Be^{9} + \alpha \rightarrow {}_{6}C^{12} + n$

Answer A.004 c.
Reference DOE Fundamentals Handbook, Module 2, Neutron Sources, page 2.

Question deleted from examination, examiner editorial error.
~~**QUESTION** A.005 (1.00) (5.0)~~
~~Inelastic scattering can be described as a process whereby a neutron collides with a nucleus and:~~
~~a. reappears with a lower kinetic energy, with the nucleus emitting a gamma ray.~~
~~b. reappears with the same kinetic energy it had prior to the collision.~~
~~c. is absorbed by the nucleus, with the nucleus emitting a gamma ray.~~
~~d. reappears with a higher kinetic energy, with the nucleus absorbing a gamma ray.~~
~~Answer A.005 a.~~
~~Reference DOE Fundamentals Handbook, Module 1, Neutron Interactions, page 45.~~

QUESTION A.006 (1.00) (6.0)
The Moderating Ratio measures the effectiveness of a moderator by combining the scattering cross section, the absorption cross section, and the average energy loss per collision. The Moderating Ratio is expressed as:

a. (absorption cross section)x(scattering cross section)/(average energy loss per collision).
b. (absorption cross section)x(average energy loss per collision)/(scattering cross section).
c. (scattering cross section)x(absorption cross section)x(average energy loss per collision).
d. (average energy loss per collision)x(scattering cross section)/(absorption cross section).

Answer A.006 d.
Reference DOE Fundamentals Handbook, Module 2, Neutron Moderation, page 28.

QUESTION A.007 [1.0 point] (7.0)
An experimenter makes an error loading a rabbit sample. Injection of the sample results in a 100 millisecond period. If the scram setpoint is 12.5 Mwatt and the scram delay time is 0.1 seconds, WHICH ONE of the following is the peak power of the reactor at shutdown. (Assume Rabbit system is operational for this question.)

a. 12.5 Mw
b. 25.0 Mw
c. 34.0 Mw
d. 125 Mw

Answer A.007 c.
Reference Reference 1, Volume 2, Module 4, pp. 11.
$P = P_0 e^{t/\tau}$ $P = 1.25 \text{ Mwatts} \times e^{(0.1/0.1)} = 1.25 \times 2.71828 = 3.398$

QUESTION A.008 [1.0 point] (8.0)
Which ONE of the following is the correct definition of $\beta_{effective}$? The relative amount of delayed neutrons compared to the total number of neutrons …

a. per generation.
b. per generation corrected for leakage from the core.
c. per generation corrected for time after the fission event.
d. per generation corrected for both leakage and time after the fission event.

Answer A.008 b.
Reference Reference 1, Volume 2, Module 4, pp. 11-12.

QUESTION A.009 [1.0 point] (9.0)
Which ONE of the following reactor parameter changes would have the ***LEAST*** effect on reactivity of the reactor?

a. Increase moderator temperature by 5°F
b. Increase fuel temperature by 50°F
c. Drain the water out of the center flux trap.
d. Increase the pressure of the moderator by 20 psi.

Answer A.009 d.
References *DOE Fundamentals Handbook, Nuclear Physics and Reactor Theory*

QUESTION A.010 [1.0 point] (10.0)
Inserting a control rod predominantly affects K_{eff} by changing the …

a. fast fission factor
b. thermal utilization factor
c. neutron reproduction factor
d. resonance escape probability.

Answer A.010 b.
Reference Standard NRC Question

QUESTION A.011 [1.0 point] (11.0)
The difference between a moderator and a reflectors is that a reflector

a. increases the fast non-leakage factor while a moderator increases the thermal utilization factor.
b. increases the neutron production factor while a moderator increases the thermal utilization factor.
c. decreases the fast non-leakage factor while a moderator increases the fast non-leakage factor.
d. decreases the neutron production factor while a moderator increases the fast non-leakage factor.

Answer A.011 a.
Reference Standard NRC Question

QUESTION A.012 [1.0 point] (12.0)
Reactor power is increasing on a constant positive reactor period. Which ONE of the following power changes would finish in the shortest time?

a. 5% power – from 1% to 6%
b. 10% power – from 10% to 20%
c. 15% power – from 20% to 35%
d. 20% power – from 40% to 60%

Answer A.012 d .
Reference DOE Fundamentals Handbook, Nuclear Physics and Reactor Theory, Volume

QUESTION A.013 [1.0 point] (13.0)
Reactor power is rising on a 30 second period. Approximately how long will it take for power to double?

a. 15 seconds
b. 21 seconds
c. 30 seconds
d. 60 seconds

Answer A.013 b.
Reference DOE Fundamentals Handbook, Nuclear Physics and Reactor Theory,
$P = P_0 e^{t/T}$ –> ln (2) = time ÷ 30 sec –> time = ln (2) x 30 sec. 0.693 x 30 ≈ 0.7 x 30 ≈ 21 sec

QUESTION A.014 [1.0 point] (14.0)
Which ONE of the following is an example of alpha decay?

a. $_{35}Br^{87} \rightarrow {}_{33}As^{83}$
b. $_{35}Br^{87} \rightarrow {}_{35}Br^{86}$
c. $_{35}Br^{87} \rightarrow {}_{34}Se^{86}$
d. $_{35}Br^{87} \rightarrow {}_{36}Kr^{87}$

Answer A.014 a.
Reference DOE Fundamentals Handbook, Nuclear Physics and Reactor Theory, Volume 1, Module 1, *Atomic and Nuclear Physics,* Enabling Objective 2.1

QUESTION A.015 [1.0 point, ¼ each] (15.0)
Identify each isotope as being produced by the irradiation of **a**ir, irradiation of **w**ater, or is a **f**ission product.

a. N^{16}

b. Ar^{41}

c. H^{3}

d. Xe^{135}

Answer A.015 a. = Water; b. = Air; c. = Water; d. = Fission
Reference DOE Fundamentals Handbook, Nuclear Physics and Reactor Theory, Volume 2, Module 4, *Reactor Theory (Reactor Operations),* Enabling Objective

QUESTION A.016 [1.0 point] (16.0)
Which ONE of the following is the time period in which the maximum amount of Xe^{135} will be present in the core?

a. 8 to 10 hours after a startup to 100% power

b. 4 t0 6 hours a power increase from 50% to 100% power.

c. 4 to 6 hours after a power decrease from 100% to 50% power.

d. 8 to 10 hours after a scram from 100% power.

Answer A.016 d.
Reference Burn, R., *Introduction to Nuclear Reactor Operations,* © 1988, § 8.4.1, p. 8-10, 2nd ¶.

QUESTION A.017 [1.0 point] (17.0)
During the minutes following a reactor scram, reactor power decreases on a negative 80 second period corresponding to the half-life of the longest lived delayed neutron precursor, which is approximately …

a. 20 seconds

b. 40 seconds

c. 55 seconds

d. 80 seconds

Answer A.017 c.
Reference Burn, R., *Introduction to Nuclear Reactor Operations,* © 1988, §

QUESTION A.018 [1.0 point] (18.0)
Which ONE of the following statements correctly describes a positive temperature coefficient?

a. When moderator temperature increases, positive reactivity is added.

b. When moderator temperature decreases, positive reactivity is added.

c. When moderator temperature increases, negative reactivity is added.

d. When moderator temperature decreases, reactor power increases.

Answer: A.018 a.
Reference: Burn, R., *Introduction to Nuclear Reactor Operations,* © 1988, §

QUESTION A.019 [1.0 point] (19.0)
Two critical reactors at low power are identical except that reactor 1 has a effective beta fraction (β_{eff}) of 0.0072 and reactor 2 has a β_{eff} of 0.0060. An equal amount of positive reactivity is added to both reactors.
Which ONE of the following will be the response of reactor 2 as compared to reactor 1?

a. The resulting power level will be lower.

b. The resulting power level will be higher.

c. The resulting period will be longer.

d. The resulting period will be shorter.

Answer A.019 d.
Reference Burn, R., *Introduction to Nuclear Reactor Operations,* © 1988, §

QUESTION A.020 [1.0 point] (20.0)
Given a fuel temperature coefficient of -1.25×10^{-4} $\Delta K/K/^{\circ}C$. When a control rod with an average worth of 0.1% $\Delta K/K$/inch is withdrawn 10 inches, reactor power increases and becomes stable at a higher level. At this point fuel temperature has … (neglect power coefficient)

a. increased by 80°C

b. decreased by 80°C

c. increased by 8°C

d. decreased by 8°C

Answer A.020 a.
Reference Burn, R., *Introduction to Nuclear Reactor Operations,* © 1988, §

QUESTION B.001 [1.0 point, ¼ each] (1.0)
Match type of radiation (1 thru 4) with the proper penetrating power (a thru d)

a. Gamma	1. Stopped by thin sheet of paper
b. Beta	2. Stopped by thin sheet of metal
c. Alpha	3. Best shielded by light material
d. Neutron	4. Best shielded by dense material

Answer B.001 a. = 4; b. = 2; c. = 1; d. = 3
Reference Standard NRC Question

QUESTION B.002 [1.0 point] (2.0)
Which ONE of the following Reactor Emergencies would require you to insert a manual rod run-in as an immediate action?

a. Failure of experimental apparatus
b. High radiation levels
c. Nuclear instrumentation failure
d. Control rod drive failure/stuck rod

Answer B.002 a.
Reference REP-12; REP-4; REP-5; REP-8

QUESTION B.003 [2.0 points, 0.5 each] (4.0)
Match the Technical Specification Reactivity Limits in Column A with the correct value listed in Column B.

Column A	Column B
a. Max Experiment Reactivity Worth (Absolute) (Center Test Hole).	1. 0.098 ΔK
b. Max Moveable Experiment Reactivity Worth.	2. 0.006 ΔK
c. Min Subcritical Margin with any one Shim blade fully withdrawn	3. 0.025 ΔK
d. Maximum Core Excess	4. 0.02 ΔK
	5. 0.001 ΔK

Answer B.003 a. = 2; b. = 5; c. = 4; d. = 1
Reference T.S. § 3.1 Reactivity

QUESTION B.004 [1.0 point, ¼ each] (5.0)
How often must data be recorded for each of the forms listed in column A, per operating procedure AP-RO-110 Conduct of Operations?

a. Form FM-43, Nuclear Data	1. 1 Hour
b. Form FM-43, Process Data	2. 2 Hours
c. Form FM-55, Startup Nuclear Data	3. 4 Hours
d. Form FM-56, Reactor Routine Patrol	4. Daily

Answer B.004 a. = 1; b. = 2; c. = 4; d. = 3
Reference AP-RO-110 Conduct of Operations

QUESTION B.005 [1.0 point] (6.0)
Following an unscheduled shutdown, the operating staff has performed a thorough investigation but has not been able to determine the cause of the shutdown. All system are normal. The minimum level of management who may authorize the operating crew to restart the reactor is …

a. the Lead Senior Reactor Operator on shift.
b. the Assistant Reactor Manager-Physics
c. the Reactor Manager
d. the NRC

Answer B.005 c.
Reference AP-RO-110 Conduct of Operations,

QUESTION B.006 [1.0 point] (7.0)
Which ONE of the following emergencies requires the console operator to scram the reactor by placing Master Control Switch (1S1) in the **TEST** position?

a. REP-22, Emergency Core Cooling Valves 546A and 546B open during reactor operations.
b. REP-4, High Radiation Levels
c. REP-5, Nuclear Instrument Failure
d. REP-8, Control Rod Drive Mechanism Failure or Stuck Rod

Answer B.006 d.
Reference REO-RO-100, REP-4, REP-5, REP-8 and REP-22

QUESTION B.007 [1.0 point] (8.0)
A "Knowledgeable Person" is defined as an operations trainee who has …

a. been designated by his/her shift LSRO.
b. successfully complete a 50% board.
c. successfully complete a 90% board.
d. been designated by the Reactor Manager.

Answer B.007 d.
Reference AP-RO-110 Conduct of Operations, §

QUESTION B.008 [2.0 points, ½ each] (10.0)
Identify the correct number (1 through 20) which correctly defines the maximum period between testing intervals per the Technical Specifications definitions.

a. Weekly: ___ days
b. Monthly: ___ weeks
c. Quarterly: ___ months
d. Annually: ___ months

Answer B.008 a. = 9; b. = 6; c. = 4; d. = 14
Reference Technical Specifications § 1.0 Definitions

Question deleted from examination, examiner editorial error.

~~**QUESTION** B.009 [1.0 point] (11.0)~~
~~The fastest reactor period which may be used to raise power to 50 KW according to procedure is …~~

~~a. 10 seconds~~
~~b. 30 seconds~~
~~c. 50 seconds~~
~~d. 100 seconds~~

~~Answer B.009 c.~~
~~Reference SOP Manual II~~

QUESTION B.010 [1.0 point] (12.0)
Which one of the following conditions satisfies the requirements for containment integrity?

a. Truck door capable is operable and capable of being closed.

b. Containment building ventilation system automatically closing doors and automatically closing valves are closed.

c. The emergency electrical generator is operable.

d. Seal trench has enough water to maintain a seal of 47 inches.

Answer B.010 b.
Reference T.S. 1.15

QUESTION B.011 [1.0 point] (13.0)
An accessible area with a radiation level of 50 mR/hr should be posted as a:

a. restricted area

b. radiation area

c. high radiation area

d. very high radiation area

Answer B.011 b.
Reference 10CFR20.1003

QUESTION B.012 [1.0 point] (14.0)
If the reactor is not critical within the ECP limits, the reactor operator must:

a. recalculate the ECP prior to any further rod withdrawal.

b. shut down the reactor.

c. verify the ECP with a 1/M plot.

d. insert controls rods to 2 inches below ECP.

Answer: B.012 d.
Reference: OP-RO-210.

QUESTION B.013 [1.0 point] (15.0)
The shim blades:

a. shall be capable of full insertion in less than 0.7 seconds.

b. will automatically insert at a rate not to exceed 1 inch/min.

c. shall be capable of insertion to the 20% withdrawn position in less than 0.7 seconds.

d. shall remain within one inch of each other at power levels above 50 Kw.

Answer B.013 c.
Reference MURR Technical Specifications, Section 3.2.c.

QUESTION B.014 [1.0 point] (16.0)
An experiment is removed from the reactor with a radiation level of **10R/hr** at **15 feet**. **15 minutes later**, the radiation level is **7.2 Rem/hr** at **15 feet**. Approximately how long must you let the experiment decay before the radiation level is less than **100 mR/hr** at **1 foot**.

a. 4 hours

b. 8 hours

c. 12 hours

d. 16 hours

Answer B.014 b.
Reference first solve for λ_{eff}; $A = A_0\, e^{-t\,\lambda eff}$; $\ln (A/A_0) = \text{time} \times \lambda_{eff}$
$\lambda_{eff} = (\ln (7.2/10)) \div \text{time} = (-0.329)/15 \text{ minutes} = -0.0219 \text{ minutes}^{-1}$
Next solve for initial dose at 1 foot. $A_{1\,ft} = A_{15\,ft} \times 15^2 = 10 \text{ R/hr} \times 225 = 2250 \text{ R/hr}$ at 1 foot.
Finally solve for time to get to 0.1 R/hr at 1 foot.
$0.1 = 2250\, e^{t\,\lambda eff}$ ===> time = $\ln (2250/0.1) \div \lambda_{eff} = 457.6$ minutes = 7.6 hours

QUESTION B.015 [1.0 points, 0.33 each] (17.0)
Identify the MURR Emergency Classifications from most (3) to least (1) significant.

	Least Significant		Most Significant
a. Alert	1	2	3
b. Notification of Unusual Event	1	2	3
c. Site Area Emergency	1	2	3

Answer B.015 a. = 2; b. = 1; c. = 3
Reference Emergency Plan, § 3.0

QUESTION B.016 [1.0 point] (18.0)
According to MURR Technical Specifications which one of the following is the maximum primary coolant pressure allowed during normal operation?

a. 70 psig
b. 100 psig
c. 110 psig
d. 125 psig

Answer B.016 c.
Reference Technical Specification 3.4

QUESTION B.017 [1.0 point] (19.0)
The **CURIE** content of a radioactive source is a measure of …

a. the number of radioactive atoms in the source.
b. the amount of energy emitted per unit time by the source
c. the amount of damage to soft body tissue per unit time.
d. the number of nuclear disintegrations per unit time.

Answer B.017 d.
Reference Standard Rad Con Definition

QUESTION B.018 [1.0 point] (20.0)
Which one of the following is the reason for NOT starting two secondary pumps at the same time?

a. The power surge will trip the power supply breakers
b. The pressure surge will cause water hammer in the pool heat exchanger
c. The basin level will be reduced resulting in a low sump level trip
d. Initial high flow rates may result in thermal shock to the heat exchanger

Answer B.018 c.
Reference MURR SOP VI.1.H

QUESTION C.001 [1.0 point] (1.0)
The reactor has been operating for six days straight at full power when the facility has a complete loss of power. How is damage to the fuel prevented?

a. Two thermally (temperature) actuated valves open allowing steam to escape from the primary system, which is quenched in the pool water.

b. Two air operated valves fail open due to loss of electrical power, lining up the primary to an in-pool heat exchanger. Water flow is via natural convection.

c. Two thermally (temperature) actuated valves open, lining up the primary to an in-pool heat exchanger. Water flow is via natural convection.

d. Two motor operated valves (powered off the diesel) open, lining up the primary to an in-pool heat exchanger.

Answer: C.001 b.
Reference: Training Manual for Reactor Operations, InPool Heat Exchanger Lesson {1/26/2005}

QUESTION C.002 [1.0 point] (2.0)
The Fuel Element Failure Monitoring System functions by directing a controlled amount (approximately 100 cc/min) of primary coolant from the primary coolant demineralizer loop, upstream of the demineralizer, through a water sampling unit. This monitor detects radiation from fission products collected in the sampling unit…

a. filter

b. holdup tank

c. cation column

d. anion column

Answer: C.002 d.
Reference: SAR 2006 - § 7.9.3 Fuel Element Failure Monitoring System

QUESTION C.003 [1.0 point] (3.0)
Which ONE of the following signals does NOT feed into the digital power meter?

a. Pool ΔT

b. Pool Flow

c. Primary Demin Flow

d. Channel 4 Power Level

Answer: C.003 d.
Reference: OP-RO-350

QUESTION C.004 [1.0 point] (4.0)
Where does waste water from the primary and pool sampling station discharge to?

a. Containment Hot Sump

b. Liquid Waste Tank

c. Labyrinth Sump

d. Drain Collection Tank

Answer: C.004 d.
Reference: Training Manual for Reactor Operations, Sample Station Lesson {9/25/2003}

QUESTION C.005 [1.0 point] (5.0)
Procedure OP-RO-410 Primary Coolant System, contains a caution to immediately perform two steps to minimize the time the primary system is solid. The first step VERIFIES that Anti-Siphon Valves 543A and 543B close. Step 5.4.5 should open …

a. Primary Coolant Isolation Valves 507A/B.

b. Pressurizer Water Addition Valve 527B

c. Pressurizer Water Drain Valve 527B

d. Surge Line Isolation Valve 527C

Answer: C.005 d.
Reference: OP-RO-410 Caution following step 5.4.2.

QUESTION C.006 [1.0 point] (6.0)
In order to minimize check valve slam …

a. start both secondary coolant pumps simultaneously.

b. secure both secondary coolant pumps simultaneously.

c. start the first secondary coolant pump, then wait at least 5 minutes before starting the second pump.

d. secure the first secondary coolant pump, then wait at least 5 minutes before securing the second pump.

Answer: C.006 b.
Reference: OP-RO-480, *Secondary Coolant System*

QUESTION C.007 [1.0 point] (7.0)
You going to lower pool level lower than the surface block intake level. Prior to starting the evolution you must

a. close the upper and open the lower using the “T” wrench.

b. do nothing, both suctions (upper and lower) are normally open.

c. close the upper and open the lower using the handwheels on the valves.

d. close the upper and open the lower the switches in the control room (solenoid controlled air valves).

Answer: C.007 a.
Reference: OP-RO-465 *Pool Level Control - Skimmer System*

QUESTION C.008 [1.0 point] (8.0)
Which ONE of the following prevents structural damage to the containment building if the design limit of 2 PSI over-pressure is exceeded?

a. Electrical Entry penetration plates

b. Door 101

c. Utility Entry Water Trap

d. 16" valves

Answer: C.008 c.
Reference: SAR 2006 - § 6.2.3.1

QUESTION C.009 [1.0 point] (9.0)
Which of the following conditions will result in an automatic rod run-in?

a. High Power

b. Low Pressurizer Pressure

c. Anti-Siphon System Pressure High

d. Thermal Column Door Open

Answer: C.009 a.
Reference: SAR 2006 - TABLE 7-6 ROD RUN-INS

QUESTION C.010 [1.0 point] (10.0)
Given the following, choose the correct reason that the regulating blade will not go into automatic mode.

Wide Range	10 Kilowatt range with black pen reading higher than red.
Annunciator Panel Status	"Reg Blade out of Auto" Annunciator Window is **lit**.
IRM 2&3 Period	45 Seconds

a. Wide range meter range selected is too low.

b. Power is too low on selected range.

c. Regulating blade position is too low.

d. Intermediate range period is too short.

Answer: C.010 c.
Reference: SAR 2006 - 7.5.4 Automatic Control

QUESTION C.011 [1.0 point] (11.0)
When the "Pressurizer Lo Press" annunciator alarms, it means that:

a. Valve 537 has opened, reducing pressure to 75 psi.

b. Valve 526 has opened, reducing pressure to 65 psi.

c. PS 945 has sensed a pressure of 65 psi.

d. PS 941 has sensed a pressure of 75 psi.

Answer: C.011 c.
Reference: Training Manual for Reactor Operations, Pressurizer System Lesson {3/14/2005}

QUESTION C.012 [1.0 point] (12.0) Facility changed instrumentation used for low flow scram. ~~DPS 928A/B~~ 912A/H are used to sense primary heat exchanger low flow. A low flow condition will cause a reactor scram and cause:

a. valves 507A/B close.

b. valves 517A/B close.

c. valves 543A/B open.

d. valves 546A/B open.

Answer: C.012 d.
Reference: Training Manual for Reactor Operations, Coolant Loop Lesson {6/11/2003}

QUESTION C.013 [1.0 point] (13.0)
Temperature detectors 980A/B will provide a reactor scram in the event of high reactor coolant temperature. If they fail to initiate a scram, a backup scram signal is provided by:

a. TE901A.

b. TE901B.

c. TE901C.

d. TE943.

Answer: C.013 b.
Reference: Training Manual for Reactor Operations, Coolant Loop Lesson {6/11/2003}

QUESTION C.014 [1.0 point] (14.0)
Which ONE of the following devices is NOT connected to the Emergency Air Compressors?

a. Containment Building Exhaust Valve 16A.

b. Containment Building Exhaust Valve 16B.

c. Freight Door 101 gasket.

d. Pool Loop Isolation Valve 509.

Answer: C.014 d.
Reference: OP-RO-515 Valve Line-up Checksheet

QUESTION C.015 [1.0 point] (15.0)
The operator wishes to transfer the operation of bypass valve S-1 from Automatic to Manual mode. If there is a large difference between the manual position demand and the position of the valve in the automatic mode:

a. rapid movement of the valve could result in water hammer.

b. a significant positive or negative reactivity insertion could occur.

c. rapid movement of the valve could result in damage to the valve.

d. the control circuit might not respond properly to the large deviation signal.

Answer: C.015 b.
Reference: OP-RO-480

QUESTION C.016 [1.0 point] (16.0)
In the Reactor Isolation System, the ventilation supply and return fans, SF2 and RF2, will be secured as a result of:

a. the closing of door 504.

b. deenergizing the 16" valve solenoids.

c. energizing the containment isolation horns.

d. an alarm from “Air Plenum 1" or “Air Plenum 2" radiation detectors.

Answer: C.016 a.
Reference: SAR 2006 - § 7.8.2 Containment Actuation (Reactor Isolation) System, § 9.1 Heating, Ventilation, and Air-Conditioning Systems, and Training Manual for Reactor Operations, Area Radiation Monitors {3/29/2005}

QUESTION C.017 [1.0 point] (17.0)
Which ONE of the following conditions is NOT a Nuclear Instrument Anomaly?

a. PRM selector switch not in OPERATE position.

b. IRM selector switch not in OPERATE position.

c. SRM high voltage supply is low.

d. PRM at 120% power.

Answer: C.017 d.
Reference: SAR 2006 - § 7.4.2 Nuclear Flux Monitors

QUESTION C.018 [1.0 point] (18.0)
Which ONE of the following choices identifies two of the radiation detectors that upon a trip signal will generate a Reactor Isolation?

a. Air Plenum 2 and Nucleopore

b. North Wall and Room 114

c. Bridge ALARA and Fuel Vault

d. Air Plenum 1 and Bridge

Answer: C.018 d.
Reference: SAR 2006 - § 7.8.2 Containment Actuation (Reactor Isolation) System

QUESTION C.019 [1.0 point] (19.0)
On receipt of a scram signal, with the regulating rod controlling in AUTO, the reg rod will …

a. remain at its position at the time of the scram.

b. receive a rod run-in signal and be driven into the core.

c. be magnetically decoupled from the drive, and drop into the core via gravity.

d. receive a mis-match signal and be driven out of the core attempting to maintain power stable.

Answer: C.019 a.
Reference: SAR 2006 - 7.5.2 § Control Rods

QUESTION C.020 [1.0 point] (20.0)
Which ONE of the following conditions will result in a reactor scram?

a. Source Range Monitor channel 1 inoperative.

b. High Off-gas Activity.

c. Low Reflector Differential Pressure

d. Thermal Column Door Open

Answer: C.020 c.
Reference: SAR 2006 - TABLE 7-8 REACTOR SCRAMS