August 25, 2005

Mr. Jere H. Jenkins, Laboratory Director
1290 Nuclear Engineering Bldg.
Department of Nuclear Engineering
Purdue University
West Lafayette, IN 47907

SUBJECT: INITIAL EXAMINATION REPORT NO. 50-182/OL-05-01, PURDUE UNIVERSITY

Dear Mr. Jenkins:

During the week of July 25, 2005, the NRC administered an operator licensing examination at your Purdue University Reactor. The examination was 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. Paul V. Doyle Jr. at (301) 415-1058 or via internet e-mail pvd@nrc.gov.

Sincerely,

/RA/

Brian E. Thomas, Section Chief
Research and Test Reactors Section
New, Research and Test Reactors Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No. 50-182

Enclosures: 1. Initial Examination Report No. 50-182/OL-05-01
2. Examination corrected with facility comments

cc w/encls: Please see next page

cc:

Mayor
City of West Lafayette
609 W. Navajo
West Lafayette, IN 47906

Indoor and Radiologic Health
Indiana State Department of Health
2 North Meridian Street, 5th Floor
Indianapolis, IN 46204-3006

State Board of Health
ATTN: Director, Bureau of Engineering
1330 West Michigan Street
Indianapolis, IN 46206

Mr. Ed Merritt
Reactor Supervisor
Department of Nuclear Engineering
Purdue University
West Lafayette, IN 47907

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

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EXAMINATION REPORT ACCESSION #: ML043350286
REPORT ACCESSION #: ML052270163 **TEMPLATE #: NRR-074**

OFFICE	RNRP:CE		IROB:LA	E	RNRP:SC	
NAME	PDoyle		EBarnhill		BThomas	
DATE	08/16/2005		08/17/2005		08/25/2005	

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

REPORT NO.:	50-182/OL-05-01
FACILITY DOCKET NO.:	50-182
FACILITY LICENSE NO.:	R-87
FACILITY:	Purdue University
EXAMINATION DATES:	July 28, 2005
SUBMITTED BY:	__/RA/__________________ 8/9/05
	Paul V. Doyle Jr., Chief Examiner Date

SUMMARY:

On July 28, 2005, the NRC administered an operator licensing examination to one Senior Reactor Operator Candidate. The candidate passed all portions of the administered examinations. The examination included with this report has been corrected per facility e-mailed comments.

REPORT DETAILS

1. Examiners:
   Paul V. Doyle Jr., Chief Examiner

2. Results:

	RO PASS/FAIL	SRO PASS/FAIL	TOTAL PASS/FAIL
Written	0/0	1/0	1/0
Operating Tests	0/0	1/0	1/0
Overall	0/0	1/0	1/0

3. Exit Meeting:
   Paul V. Doyle Jr., NRC, Examiner
   Edward Merritt, Reactor Supervisor, Purdue University Reactor

   The NRC thanked the facility staff for their support in the administration of the examination.

OPERATOR LICENSING EXAMINATION

With Answer Key

UNITED STATES NUCLEAR REGULATORY COMMISSION

PURDUE UNIVERSITY

Week of July 25, 2005

Enclosure 2

QUESTION A.1 [1.0 point]
Core excess reactivity changes with …

a. fuel element burnup

b. control rod height

c. neutron energy level

d. reactor power level

QUESTION A.2 [1.0 point]
You're increasing reactor power on a steady +26 second period. How long will it take to increase power by a factor of 1000?

a. 60 seconds (1 minute)

b. 180 seconds (3 minutes)

c. 300 seconds (5 minutes)

d. 480 seconds (8 minutes)

QUESTION A.3 [1.0 point]
The difference between a moderator and a reflector is that a reflector …

a. increases the fast non-leakage factor and a moderator increases the thermal utilization factor.

b. increases the neutron production factor and a moderator increases the fast fission factor.

c. increases the neutron production factor and a moderator decreases the thermal utilization factor.

d. decreases the fast non-leakage factor and a moderator increases the thermal utilization factor.

QUESTION A.4 [1.0 point]
What is the kinetic energy range of a thermal neutron?

a. > 1 MeV

b. 100 KeV – 1 MeV

c. 1 eV – 100 KeV

d. < 1 eV

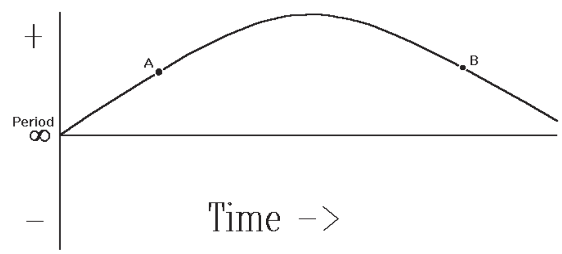
QUESTION A.5 [1.0 point]
Shown below is a trace of reactor period as a function of time. Between points A and B reactor power is:

a. continually increasing.

b. continually decreasing.

c. increasing, then decreasing.

d. constant.



QUESTION A.6 [1.0 point]
INELASTIC SCATTERING is the process by which a neutron collides with a nucleus and …

a. recoils with the same kinetic energy it had prior to the collision.

b. is absorbed, with the nucleus emitting a gamma ray, and the neutron with a lower kinetic energy.

c. is absorbed, with the nucleus emitting a gamma ray.

d. recoils with a higher kinetic energy than it had prior to the collision with the nucleus emitting a gamma ray.

QUESTION A.7 [2.0 points, ½ each]
The listed isotopes are all potential daughter products due to the radioactive decay of ${}_{35}Br^{87}$. Identify the type of decay necessary (Alpha, Beta, Gamma or Neutron emission) to produce each of the isotopes.

a. ${}_{33}As^{83}$

b. ${}_{35}Br^{86}$

c. ${}_{35}Br^{87}$

d. ${}_{36}Kr^{87}$

QUESTION A.8 [1.0 point]
Which ONE of the following is the reason for the -80 second period following a reactor scram?

a. The ability of U^{235} to fission source neutrons.

b. The half-life to the longest-lived group of delayed neutron precursors is 55 seconds.

c. The amount of negative reactivity added on a scram is greater than the shutdown margin.

d. The Doppler effect, which adds positive reactivity due to the temperature decrease following a scram.

QUESTION A.09 [1.0 point]
The neutron microscopic cross-section for absorption σ_a generally …

a. increases as neutron energy increases

b. decreases as neutron energy increases

c. increases as target nucleus mass increases

d. decreases as target nucleus mass increases

QUESTION A.10 [2.0 points, ½ each]
Using the drawing of the Single Rod Core provided, identify each of the following reactivity worths.

a. Total Rod Worth

b. Actual Shutdown Margin

c. Technical Specification Shutdown Margin Limit

d. Excess Reactivity

1. B - A
2. C - A
3. C - B
4. D - C
5. E - C
6. E - D
7. E - A

QUESTION A.11 [1.0 point]
Given the following data, which ONE of the following is the closest to the half life of the material?

TIME	ACTIVITY
0	2400 cps
10 min.	1757 cps
20 min.	1286 cps
30 min.	941 cps
60 min.	369 cps

a. 11 minutes

b. 22 minutes

c. 44 minutes

d. 51 minutes

QUESTION A.12 [1.0 point]
Which one of the following is the definition of the FAST FISSION FACTOR?

a. The ratio of the number of neutrons produced by fast fission to the number produced by thermal fission

b. The ratio of the number of neutrons produced by thermal fission to the number produced by fast fission

c. The ratio of the number of neutrons produced by fast and thermal fission to the number produced by thermal fission

d. The ratio of the number of neutrons produced by fast fission to the number produced by fast and thermal fission

QUESTION A.13 [1.0 point]
By definition, an exactly critical reactor can be made prompt critical by adding positive reactivity equal to …

a. the shutdown margin

b. the K_{excess} margin

c. the β_{eff} value

d. 1.0 %ΔK/K.

QUESTION A.14 [1.0 point]
The number of neutrons passing through a one square centimeter of target material per second is the definition of which one of the following?

a. Neutron Population (np)

b. Neutron Impact Potential (nip)

c. Neutron Flux (nv)

d. Neutron Density (nd)

QUESTION A.15 [1.0 point]
Reactor power doubles in 42 seconds. Based on the period associated with this transient, how long will it take for reactor power to increase by a factor of 10?

a. 80 seconds

b. 110 seconds

c. 140 seconds

d. 170 seconds

QUESTION A.16 [1.0 point]
Which ONE of the following is the correct reason that delayed neutrons enhance control of the reactor?

a. There are more delayed neutrons than prompt neutrons.

b. Delayed neutrons increase the average neutron generation time.

c. Delayed neutrons are born at higher energies than prompt neutrons and therefore have a greater effect.

d. Delayed neutrons take longer to reach thermal equilibrium.

QUESTION A.17 [1.0 point]
Regulating rod worth for a reactor is 0.001 ΔK/K/inch. Moderator temperature **INCREASES** by 9EF, and the regulating rod moves 4½ inches inward to compensate. The moderator temperature coefficient α_{Tmod} is …

a. $+5 \times 10^{-4}$ ΔK/K/EF

b. -5×10^{-4} ΔK/K/EF

c. $+2 \times 10^{-5}$ ΔK/K/EF

d. -2×10^{-5} ΔK/K/EF

QUESTION A.18 [1.0 point]
K_{eff} is K_4 times …

a. the fast fission factor (ε)

b. the total non-leakage probability ($‹_f \times ‹_{th}$)

c. the reproduction factor (η)

d. the resonance escape probability (p)

QUESTION B.1 [1.0 point]
An experiment irradiated in the pool reads 50mr/hr at 2 feet below the pool surface and 100 mr/hr at 1 foot below the pool surface. You decide to place the experiment at 20 feet below the surface of the pool. Based on the attenuation you noted between the 2 foot and 1 foot levels, you would expect the shielding due to 20 feet of water to reduce the dose by a factor of approximately … (Note: Ignore dose decrease due to distance.)

a. 1000

b. 10,000

c. 100,000

d. 1,000,000

QUESTION B.2 [2.0 points, 0.5 each]
As a licensed reactor operator you will be responsible for ensuring the correctness of the Form B *"Request for Reactor Operation (Irradiation)"*. To do this you must know your technical specification reactivity limits. Match the terms listed in column A with the respective reactivity limit from column B. Only one answer for each item in column A. Items in column B may be used more than once or not at all.)

	Column A	Column B
a.	Single Moveable	0.2 ΔK/K
b.	Total Moveable	0.3 ΔK/K
c.	Single Secured	0.4 ΔK/K
d.	Total Secured	0.5 ΔK/K

QUESTION B.3 [1.0 point]
According to 10 CFR 55.55e, "To maintain *'ACTIVE STATUS'* … the licensee shall actively perform the functions of an operator or a senior operator for a minimum of __ hours per calendar quarter."

a. 2

b. 4

c. 6

d. 8

QUESTION B.4 [1.0 point]
The NRC has four standard emergency classifications (listed below alphabetically). Which ONE of the classifications is credible for the Purdue PUR-I reactor?

a. Alert

b. General Emergency

c. Notification of Unusual Event

d. Site Area Emergency

QUESTION B.5 [1.0 point]
While working on an experiment, you receive the following radiation doses: 100 mrem (β), 25 mrem (γ), and 5 mrem (thermal neutrons). Which ONE of the following is your total dose?

a. 175 mrem

b. 155 mrem

c. 145 mrem

d. 130 mrem

QUESTION B.6 [1.0 point]
10CFR50.54(x) states: "A licensee may take reasonable action that departs from a license condition or a technical specification (contained in a license issued under this part) in an emergency when this action is immediately needed to protect the public health and safety and no action consistent with license conditions and technical specifications that can provide adequate or equivalent protection is immediately apparent." 10CFR50.54(y) states that the minimum level of management who may authorize this action is …

a. any NRC licensed Reactor Operator.

b. any NRC licensed Senior Reactor Operator.

c. Facility Manager (or equivalent at facility, e.g. Laboratory Director)

d. NRC project Manager.

QUESTION B.7 [1.0 point]
The Emergency Planning Zone (EPZ) for the Purdue PUR-I reactor is defined as …

a. the reactor room.

b. specific contamination levels of airborne, radiological dose or dose rates that may be used as thresholds for establishing emergency classes.

c. the area **BEYOND** the SITE BOUNDARY where the Laboratory Director has direct authority over all activities.

d. is the area bounded by a 150 meter radius as measured from the centerline of the PUR-I core.

QUESTION B.8 [2.0 point, 0.5 each]
Identify each of the following as either a Safety Limit (SL), a Limiting Safety System Setting (LSSS) or as a Limiting Condition for Operations (LCO).

a. maximum of 1.2 kW

b. minimum of 13 feet of water above the core

c. maximum of 50 kW

d. minimum of two manual scrams

QUESTION B.9 [1.0 point]
While working in an area marked “Caution Radiation Area” you discover that your dosimeter is off-scale and leave the area. Assuming you were in the area for 45 minutes, which ONE of the following is the **MAXIMUM** dose you would have received?

a. 3.8 mr

b. 35.6 mr

c. 75 mr

d. 100 mr

QUESTION B.10 [1.0 points, 0.25 each]
Identify the source for the listed radioisotopes. Irradiation of air, water, structural material (SM) or fission product (FP).

a. ${}_{7}N^{16}$

b. ${}_{11}Na^{24}$

c. ${}_{18}Ar^{41}$

d. ${}_{54}Xe^{133}$

QUESTION B.11 [1.0 point]
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.

QUESTION B.12 [1.0 point]
Consider two point sources, each having the ***SAME*** curie strength. Source A’s gammas have an energy of 0.5 MeV, while Source B’s gammas have an energy of 1.0 MeV. Using a Geiger-Müller detector the reading from source B will be … (NOTE: Ignore detector efficiency.)

a. four times that of source A.

b. twice that of source A.

c. the same.

d. half that of source A.

QUESTION B.13 [1.0 point, ¼ each]
Match each of the radiation types listed in column A with its appropriate Quality Factor from Column B

	Column A	Column B
a.	alpha	20
b.	beta	10
c.	gamma	5
d.	neutron of unknown energy	2
		1

QUESTION B.14 [2.0 points, 0.25 each]
Identify whether the listed scrams and setbacks are required (REQ) or not required (NOT) per the Technical Specifications.

a. Linear Channel Low Level Setback

b. Linear Channel High Level Setback

c. Log Count Rate Low Level Period Setback

d. Log N Channel High Level Period Setback

e. Scram on Console Radiation Area Monitor

f. Log Count Rate Channel Period Scram

g. Manual Scram Button

h. CSA Trouble Scram

QUESTION B.15 [1.0 point]
Which ONE of the following is the definition of a CHANNEL TEST?

a. the combination of sensor, line, amplifier, and output devices which are connected for the purpose of measuring the value of a parameter

b. an adjustment of the channel such that it output corresponds with acceptable accuracy to known values of the parameter which the channel measures. Calibration shall encompass the entire channel, Including equipment actuation, alarm, or 'trip and shall be deemed to include a channel test

c. a qualitative verification of acceptable performance by observation of channel behavior.' This verification, where possible, shall Include comparison of the channel with other Independent channels or systems measuring the same variable.

d. the introduction of a signal into the channel for verification that It Is operable.

QUESTION B.16 [1.0 point]
Which ONE of the following is the MINIMUM allowed reactor period for a reactor startup?

a. 60 seconds

b. 45 seconds

c. 30 seconds

d. 15 seconds

QUESTION C.1 [2.0 points, ¼ each]
Identify each of the items listed on the Core Map figure provided with

a. ________ 1. Compensated Ion Chamber

b. ________ 2. Fission Chamber

c. ________ 3. Fuel

d. ________ 4. Graphite

e. ________ 5. Irradiation Facility

f. ________ 6. Regulating Rod

g. ________ 7. Shim Safety Rods

h. ________ 8. Source

QUESTION C.2 [1.0 point]
In event of a spill, spread of radioactive material is prevented by …

a. running the ventilation system normally (egress of radioactive material stopped by HEPA filter).

b. manually securing the ventilation system, which closes dampers for the inlet and the outlet piping.

c. an alarm on any of the RAMs will automatically secure the ventilation system, shutting the inlet and outlet dampers.

d. an alarm the CAM will automatically secure the ventilation system, shutting the inlet and outlet dampers.

QUESTION C.3 [1.0 point]
Which one of the following is NOT a reason for having excess reactivity in the core?

a. Fission Product poisons buildup

b. Pool Temperature changes

c. Insertion of Experiments

d. The use of a neutron source

QUESTION C.4 [2.0 points, ½ each]
Match the purification system conditions listed in column A with their respective causes listed in column B. Each choice is used only once.

	Column A		Column B
a.	High Radiation Level at Demineralizer.	1.	Channeling in Demineralizer.
b.	High Radiation Level downstream of Demineralizer.	2.	Fuel element failure.
c.	High flow rate through Demineralizer.	3.	High temperature in Demineralizer system.
d.	High pressure upstream of Demineralizer.	4.	Clogged Demineralizer.

QUESTION C.5 [1.0 point]
You are the operator on the console. You are maintaining reactor power at 1 kilowatt with reactor control in automatic at the 50% withdrawn position. You note an unexplained power excursion and scram the reactor. Both shim-safety rods fully insert (scram) into the core. Which one of the following describes the position of the regulating rod?

a. fully inserted (scrammed).

b. inserting at normal insertion speed to fully inserted.

c. steady at 50% withdrawn in MANUAL control

d. withdrawing to 100% out in AUTO control.

QUESTION C.6 [1.0 point]
Which ONE of the following is the main function performed by the DISCRIMINATOR circuit in the Startup Channel?

a. To generate a current signal equal and of opposite polarity as the signal due to gammas generated within the Startup Channel Detector.

b. To filter out small pulses due to gamma interactions, passing only pulses due to neutron events within the Startup Channel Detector.

c. To convert the linear output of the Startup Channel Detector to a logarithmic signal for metering purposes.

d. To convert the logarithmic output of the metering circuit to a δt (delta time) output for period metering purposes.

QUESTION C.7 [1.0 point]
Which ONE of the following is NOT a Rod Withdrawal Interlock?

a. Low source count rate < 2 cps

b. source being raised

c. Short Period - 15 seconds

d. Source Range Signal/noise ratio of 2

QUESTION C.8 [2.0 point, 0.4 each]
Match the surveillance listed in column A with its required frequency (per Tech. Specs.) in column B.

a. Primary water pH	1. Daily
b. Primary water Gross β-γ	2. Weekly
c. Power Calibration (gold foil method)	3. Monthly
d. Reactor Room Negative Pressure Check	4. Semi-Annually
e. Air Conditioner Check	5. Annually

QUESTION C.9 [2.0 points, ½ each]
Match the Radiation Detection Systems in Column A with its corresponding detector type from Column B.

Column A	Column B
a. Continuous Air Monitor (CAM)	1. Proportional Counter (Fission Chamber)
b. Radiation Area Monitor (RAM)	2. Geiger-Müeller
c. Startup Channel	3. Scintillation
d. Log N Channel	4. Ion Chamber

QUESTION C.10
Which **ONE** of the following statements applies to a FAST SCRAM condition **ONLY**?

a. All rods simultaneously insert to their lower limit faster than for a slow scram.

b. Facility 110 volt power to the power supply circuit for the magnets is interrupted.

c. Both shim-safety rods insert to their lower limit faster than the regulating rod.

d. Current from the power supply circuit to the magnets is interrupted.

QUESTION C.11 [1.0 point]
You are performing the pre-startup check when you discover that the magnet indicating lights are NOT on and the magnet current meters do NOT indicate a magnet current. Which ONE of the following choices would be the correct course of action for you to take? Check

a. the Log Count rate meter to ensure it is in the “CALIBRATE” position.

b. the position of the Safety-shim rods to ensure that they are at their lower limit.

c. the setback and scram initiation meter setpoints to ensure that they are set to proper values.

d. Log-N amplifier selector switch to ensure it is in the “OPERATE” position.

QUESTION C.12 [1.0 point]
According to the analysis for a total loss of coolant accident (LOCA) while operating at 100% of licensed power, which ONE of the following conditions would occur?

a. Decay heat buildup would result in a core meltdown.

b. Loss of water would shut down the reactor.

c. Decay heat buildup would result in melting the fuel cladding.

d. Decay heat buildup would result in high pressure due to fission product gas heating resulting in fuel clad failure.

QUESTION C.13 [1.0 point]
Which ONE of the following statements correctly describes a POOL experiment? An experiment …

a. positioned in the pool more than 6 inches horizontally from the reflector.

b. conducted in the pool directly above or below the core.

c. whose nuclear characteristics have been determined within the pool.

d. placed within the core or within the graphite reflector.

A.1 a
REF: Burn, R., Introduction to Nuclear Reactor Operations, © 1988, § 6.2.1, p. 6-2.

A.2 b ln (P/P_0) × period = time, ln(1000) × 26 = 6.908 × 26 = 179.6 . 180 seconds
REF: Burn, R., Introduction to Nuclear Reactor Operations, © 1988, § 4.3, p. 4-4.

A.3 a
REF: Burn, R., Introduction to Nuclear Reactor Operations, © 1988, § 2.5.3, p. 2-45.

A.4 d
REF: Burn, R., Introduction to Nuclear Reactor Operations, © 1988, § 2.5.1, p. 2-36.

A.5 a
REF: Standard NRC Question.

A.6 b
REF: Burn, R., Introduction to Nuclear Reactor Operations, © 1988, § 2.4.5, p. 2-28.

A.7 a, alpha; b, neutron; c, gamma; d, Beta
REF: Burn, R., Introduction to Nuclear Reactor Operations, © 1988, § 4.4.5, p. 4-30

A.8 b
REF: Burn, R., Introduction to Nuclear Reactor Operations, © 1988, § 4.5, p. 4-12.

A.9 b
REF: Burn, R., Introduction to Nuclear Reactor Operations, © 1988, § 2.5.1, p. 2-36

A.10 a, 7; b, 5; c, 6; d, 2
REF: Burn, R., Introduction to Nuclear Reactor Operations, © 1988, § 6.2.1, p. 6-3

A.11 b
REF: Burn, R., Introduction to Nuclear Reactor Operations, © 1988, § 2.4.6, p. 2-32

A.12 c
REF: Burn, R., Introduction to Nuclear Reactor Operations, © 1988, § 3.3, p. 3-16

A.13 c
REF: Burn, R., Introduction to Nuclear Reactor Operations, © 1988, § 4.2, p. 4-1.

A.14 c
REF: Burn, R., Introduction to Nuclear Reactor Operations, © 1988, § 2..6, p. 2-47.

A.15 c $P = P_0 e^{t/\tau}$ 1st find τ. τ = time/(ln(2)) = 42/0.693 = 60.6 sec. Time = τ × ln(10) = 60.6 × 139.5 sec
REF: Standard NRC Question.

A.16 b
REF: Burn, R., Introduction to Nuclear Reactor Operations, © 1988, § 3.2.2, p. 3-7.

A.17 a 0.001 ΔK/K/~~inch~~ × 4.5 ~~inch~~ ÷ 9EF = 0.001 ÷ 2 = 0.0005 = 5×10^{-4} ΔK/K/EF
REF: Burn, R., Introduction to Nuclear Reactor Operations, © 1988, § 6.4.1, p. 6-5.

A.18 b
REF: Burn, R., Introduction to Nuclear Reactor Operations, © 1988, § 3.3, p. 3-17.

B.1 d
REF: 2^{20} = 1,048,756 . 1,000,000

B.2 a, 0.03 ΔK/K; b, 0.03 ΔK/K; c, 0.04 ΔK/K; d, 0.05 ΔK/K;
REF: Technical Specifications

B.3 b
REF: 10 CFR 55.55.e

B.4 c
REF: Emergency Plan §§ 4.0 through 4.5.

B.5 d
REF: A rem is a rem is a rem.

B.6 b
REF: 10CFR55.54(y)

B.7 a
REF: Emergency Plan Definition 2.8

B.8 a, LSSS; b, LCO; c, SL; d, LCO
REF: Technical Specifications 2.1, 2.2 and 3.0

B.9 c
REF: Standard NRC Health Physics Question

B.10 a, water; b, structural material; c, air; d, fission product
REF: Standard NRC Question

B.11 d
REF: Standard Health Physics Definition.

B.12 c
REF: Standard NRC Health Physics Question. G-M detector is not sensitive to incident energy levels.

B.13 a, 20; b, 1; c, 1; d, 10
REF: 10CFR20.1004.b(1) Table 1004B.1.

B.14 a, NOT; b, REQ; c, REQ; d, REQ; e, REQ; f, REQ; g, REQ; h, NOT
REF: Technical Specifications

B.15 d
REF: Technical Specifications §§ 1.1, 1.2, 1.3 and 1.13.

B.16 c
REF: Operating Procedure 91-1, *Reactor Startup, Operation and Shutdown* Part A, page 6.

C.1 a, 4; b, 3; c, 5; d, 8; e, 7; f, 6; g, 2; h, 1
REF: Purdue Reactor Requalification Test administered December 1978.

C.2 b
REF: Purdue Operator Requalification Quiz administered 10/14/1977.

C.3 d
REF: Standard NRC question

C.4 a, 2; b, 3; c, 1; d, 4
REF: Standard NRC question

C.5 b
REF: Standard NRC question

C.6 b
REF:

C.7 d
REF:

C.8 a, 2; b, 3; c, 5; d, 2; e, 4
REF: NRC administered Requalification Examination July, 1992.

C.9 a, 2; b, 3; c, 1; d, 4
REF: Operating Manual ‘62, §§ 1.5.1, 1.5.3, and 1.5.7

C.10 d
REF: NRC administered Requalification Examination July, 1992.

C.11 d
REF: PUR-I, Operating Manual, May 1965, Pre-Startup Procedure, step 14.

C.12 b
REF: Safety Analysis Report

C.13 a
REF: Technical Specifications, § 1.18, pg. 4.