

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

REPORT NO.: 50-128/OL-92-02
FACILITY DOCKET NO.: 50-128
FACILITY LICENSE NO.: R-83
FACILITY: Texas A&M University System
EXAMINATION DATE: April 13, 1992
EXAMINER: Patrick Isaac, Chief Examiner

SUBMITTED BY: Patrick Isaac 5/20/92
Patrick Isaac, Chief Examiner Date
APPROVED BY: James L. Caldwell 5/20/92
James L. Caldwell, Chief for Date
Non-Power Reactor Section
Operator Licensing Branch
Division of Licensee Performance
and Quality Evaluation, NRR

SUMMARY:
NRC administered written examination retake to one Reactor Operator (RO) applicant and retake of the written and operating examinations to one Senior Reactor Operator (SRO) applicant. Both candidates passed the applicable portions of the examination.

REPORT DETAILS

1. Examiner:
Patrick Isaac

2. Results:

	<u>RO</u> <u>(Pass/Fail)</u>	<u>SRO</u> <u>(Pass/Fail)</u>	<u>Total</u> <u>(Pass/Fail)</u>
NRC Grading:	1/0	1/0	2/0

3. Written Examination:

A retake of section B of the written examination was administered on April 13, 1992 to one RO and one SRO candidates. At the conclusion of the examination, the Chief Examiner immediately secured the master examination answer key and all of the candidate's answer sheets. A copy of the master "as given" examination with answer key was forwarded to the licensee's training staff for their formal review.

The facility's written examination comments and the NRC's resolution to those comments are found in Enclosure 2.

Both candidates passed this portion of the examination.

4. Operating Examinations:

An Operating Examination retake was administered to one SRO candidate on April 13, 1992. The examination tested the candidate's integral system knowledge and ability to actually operate the reactor facility.

The candidate passed this portion of the examination.

5. Exit Meeting:

Personnel attending: Mr. Bill F. Asher, Manager
Reactor Operations

Patrick J. Isaac, Chief Examiner

Mr. Patrick Isaac expressed appreciation to Mr. Asher for his efforts in support of the examination.

NRC RESOLUTIONS - WRITTEN EXAMINATIONSECTION BQuestion 10:

What is the half life of the isotope contained in a sample which produces the following count rates?

Time, Minutes	Counts per Minute
initial count	900
30	740
60	615
90	512
180	294

- a. 551 minutes
- b. 312 minutes
- c. 111 minutes
- d. 88 minutes

Answer 10:

d

Facility Comment 10:

The Answer Key indicates that the correct answer is "D", however the calculations indicates that the correct answer is "C".

NRC Resolution 10:

Comment accepted. The Answer Key has been modified to accept "C" as correct.

Question 15:

During pre-startup checkouts in preparation for pulsing operations, the operator sets the Log Power Channel test signal for an indicated 50% on the 300 W scale and attempts to fire the transient rod. He hears the transient rod pneumatic system fire. Which ONE of the following statements describes the status of the pre-startup checks?

- a. The pre-startup checkouts requirements ARE satisfied. Audible indication of the pneumatic system operation is sufficient to verify operability of the system since actual rod motion is not yet permitted.
- b. The pre-startup checkouts requirements ARE satisfied if the transient rod position indication confirms that the rod did, in fact, withdraw. Both audible indication and position feedback indicating withdrawal are required to satisfy the checkouts requirements.
- c. The pre-startup checkouts requirements are NOT satisfied. The indicated Log Power Channel power levels should be set higher than the interlock level. A procedural error has been made.
- d. The pre-startup checkouts requirements are NOT satisfied. The pneumatic system should not have fired since the Log Power Channel test signal should have prevented pneumatic system operation at this setting. A system malfunction has occurred.

Answer 15:

c

Facility Comment 15:

This question needs to be rewritten. The Log Power Channel test signal will not cause a change in the Linear Channel indication which is where the 50% reading on the 300w scale would be indicated. The Log Power Channel drawer does not have the ability to switch scale as does the Linear Channel.

NRC's Resolution 15:

The intent of this question was made clear to the candidates while they were taking the test. Both candidates answered the question correctly. The question will be rewritten for future use.

MASTER

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Nuclear Regulatory Commission
Operator Licensing
Examination

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Official Use Only category on
date of examination.

NRC Official Use Only

U. S. NUCLEAR REGULATORY COMMISSION
NON-POWER REACTOR LICENSE EXAMINATION

FACILITY: Texas A&M

REACTOR TYPE: TRIGA

DATE ADMINISTERED: 92/04/13

REGION: 4

CANDIDATE: _____

LICENSE APPLIED FOR: _____

INSTRUCTIONS TO CANDIDATE:

Answers are to be written on the exam page itself, or the answer sheet provided. Write answers one side ONLY. Attach any answer sheets to the examination. Points for each question are indicated in parentheses for each question. A 70% in each section is required to pass the examination. Examinations will be picked up three (3) hours after the examination starts.

CATEGORY VALUE	% OF TOTAL	CANDIDATE'S SCORE	% OF CATEGORY VALUE	CATEGORY
20.00	100.00			B. NORMAL AND EMERGENCY OPERATING PROCEDURES AND RADIOLOGICAL CONTROLS
20.00				TOTALS
			%	
		FINAL GRADE		

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

Candidate's Signature

NRC RULES AND GUIDELINES FOR LICENSE EXAMINATIONS

During the administration of this examination the following rules apply:

1. Cheating on the examination means an automatic denial of your application and could result in more severe penalties.
2. After the examination has been completed, you must sign the statement on the cover sheet indicating that the work is your own and you have not received or given assistance in completing the examination. This must be done after you complete the examination.
3. Restroom trips are to be limited and only one candidate at a time may leave. You must avoid all contacts with anyone outside the examination room to avoid even the appearance or possibility of cheating.
4. Use black ink or dark pencil only to facilitate legible reproductions.
5. Print your name in the blank provided in the upper right-hand corner of the examination cover sheet.
6. Fill in the date on the cover sheet of the examination (if necessary).
7. The point value for each question is indicated in parentheses after the question. The amount of blank space on an examination question page is NOT an indication of the depth of answer required.
8. If the intent of a question is unclear, ask questions of the examiner only.
9. When turning in your examination, assemble the completed examination with examination questions, examination aids and answer sheets. In addition, turn in all scrap paper.
10. To pass the examination, you must achieve at least 70%.
11. There is a time limit of (1) hour for completion of the examination.
12. When you are done and have turned in your examination, leave the examination area as defined by the examiner. If you are found in this area while the examination is still in progress, your license may be denied or revoked.

QUESTION: 001 (1.2 J)

On Wednesday afternoon, an experimenter transfers a rabbit into the core, requiring the operator to fully insert the regulating rod from its 50% position and to insert shim rod #4 approximately half way from its 70% position to maintain a constant power level. What action is required?

- a. Make sure the experiment is secured before completing operation for the day. Notify the NSC Director and the experimenter of the change in experiment status.
- b. Withdraw the rods in sequence to restore them to the normal banked position; then remove the experiment from the core. Notify the Health Physicist so that he can monitor the sample movement.
- c. Shutdown the reactor and notify the NSC Director. Removal of the experiment and restart of the reactor require NSC Director approval.
- d. Shutdown the reactor and evacuate the facility. Re-entry into the facility requires Emergency Director approval. Restart of the reactor requires NRC approval.

(***** CONTINUED ON NEXT PAGE *****)

QUESTION: 002 (1.00)

Which ONE of the following describes the relationship between the Safety Limit (SL) and the Limiting Safety System Setting (LSSS)?

- a. The SL is a maximum operationally limiting value that prevents the LSSS from being reached during normal runs.
- b. The SL is a parameter that ensures the integrity of the fuel cladding. The LSSS initiates protective action to preclude reaching the SL.
- c. The LSSS is a parameter that ensures the integrity of the fuel cladding. The SL initiates protective action to preclude reaching the LSSS.
- d. The SL is a maximum setpoint for instrumentation response. The LSSS is the minimum number of channels required to be operable.

(***** CONTINUED ON NEXT PAGE *****)

QUESTION: 003 (1.00)

Which ONE of the following is NOT part of the calculated Shutdown Margin?

- a. transient rod pulse stop worth
- b. highest non-secured experiment worth
- c. regulating rod worth
- d. most reactive rod worth

(***** CONTINUED ON NEXT PAGE *****)

QUESTION: 004 (1.00)

A CHANNEL CHECK is:

- a. the introduction of a signal into the channel for verification that it is operable.
- b. a qualitative verification of acceptable performance by observation of channel behavior.
- c. an adjustment of the channel such that its output corresponds with acceptable accuracy to known values of the parameter which the channel measures.
- d. a temporary modification to the channel circuits to allow signals to be bypassed such that inadvertent protective action is precluded.

(***** CONTINUED ON NEXT PAGE *****)

QUESTION: 005 (1.00)

Which ONE of the following reactor safety system channels is required to be operable in BOTH the steady state and pulse modes of operation?

- a. Low Power Interlock
- b. Log Power 1 KW Interlock
- c. Detector Power Supply Isolation
- d. Fuel Element Temperature

(***** CONTINUED ON NEXT PAGE *****)

QUESTION: 006 (1.00)

Work is to be performed near a source of radiation emitting a field of 2 Mev gamma measuring 500 Mrem/hr. Considering linear attenuation coefficients of 1.15 in.⁻¹ and 0.575in.⁻¹, respectively, estimate the thickness of lead and steel (separately) in inches to reduce the radiation level to 5 Mrem/hr.

- | | lead | steel | |
|----|------|-------|--------|
| a. | 2 | 4 | inches |
| b. | 4 | 8 | inches |
| c. | 2 | 10 | inches |
| d. | 4 | 20 | inches |

(***** CONTINUED ON NEXT PAGE *****)

QUESTION: 007 (1.00)

During a tour of the facility, the operator finds a portable survey instrument with an orange calibration sticker. This instrument should be stored in:

- a. the emergency instrument cabinet in the reception room.
- b. the Health Physics and Radiation Safety Emergency Support Office.
- c. the emergency kit located beneath the steps to the mezzanine level.
- d. the emergency kit in the Laboratory Building.

(***** CONTINUED ON NEXT PAGE *****)

QUESTION: 008 (1.00)

Which ONE of the following areas is defined as "... any area, accessible to personnel, in which there exists radiation, originating in whole or in part within licensed material, at levels that a major portion of the body could receive in one hour a dose in excess of 5 millirem, or in any 5 consecutive days a dose in excess of 100 millirem".

- a. Radiation Area
- b. Restricted Area
- c. High Radiation Area
- d. Airborne Radioactivity Area

(***** CONTINUED ON NEXT PAGE *****)

QUESTION: 009 (1.00)

A 23 year old individual has accumulated a lifetime occupational dose of 24 rem of whole body exposure documented in accordance with 10CFR20 and has received no exposure during the present calendar quarter.

How long may this person be assigned to an 8 hour per day shift in a 3 mrem/hr area?

- a. 14 days
- b. 25 days
- c. 41 days
- d. 52 days

(***** CONTINUED ON NEXT PAGE *****)

QUESTION: 010 (1.00)

What is the half life of the isotope contained in a sample which produces the following count rates?

Time, Minutes	Counts per Minute
initial count	900
30	740
60	615
90	512
180	294

- a. 551 minutes
- b. 312 minutes
- c. 111 minutes
- d. 88 minutes

(***** CONTINUED ON NEXT PAGE *****)

QUESTION: 011 (1.00)

You wish to store a small radioactive source temporarily in the reactor building. The source strength is estimated to be 500 millicuries and it emits gamma rays of an average energy of 1.3 Mev.

Approximately how far from the source would you have to erect a "CAUTION - HIGH RADIATION AREA" barrier?

- a. 780 feet
- b. 39 feet
- c. 15 feet
- d. 6 feet

(***** CONTINUED ON NEXT PAGE *****)

QUESTION: 012 (1.00)

An experiment failure that results in radiological consequences requiring notification of and response by the emergency organization would be classified as:

- a. an alert
- b. an unusual event
- c. an operational event
- d. a site emergency

(***** CONTINUED ON NEXT PAGE *****)

QUESTION: 013 (1.00)

Shortly after an evacuation of the reactor building, an NSC management representative arrives at the facility. Which ONE of the statements below describes a situation that warrants his/her assumption of the Emergency Director responsibilities?

- a. The management representative immediately assumes the responsibilities of the Emergency Director in all cases.
- b. The management representative assumes the responsibilities of the Emergency Director when the health and safety of the public are in jeopardy.
- c. The management representative assumes the responsibilities of the Emergency Director only in cases where the SRO requests to be relieved.
- d. The management representative assumes the responsibilities of the Emergency Director at the point where interaction with outside support organizations becomes necessary.

(***** CONTINUED ON NEXT PAGE *****)

QUESTION: 014 (1.00)

A maintenance technician has completed an authorized modification to the control rod drive electrical system. Which ONE of the following staffing requirements applies to the subsequent startup?

- a. A Reactor Operator and a trainee may conduct the startup if the Senior Reactor Operator is available in the facility.
- b. The maintenance technician may conduct the startup to evaluate proper response under direction of a Senior Reactor Operator.
- c. A Senior Reactor Operator may conduct the startup alone to verify operability prior to normal operations.
- d. A Reactor Operator and a Senior Reactor Operator may conduct the startup if the Senior Health Physicist is in the facility.

(***** CONTINUED ON NEXT PAGE *****)

QUESTION: 015 (1.00)

During pre-startup checkouts in preparation for pulsing operations, the operator sets the Log Power Channel test signal for an indicated 50% on the 300 W scale and attempts to fire the transient rod. He hears the transient rod pneumatic system fire. Which ONE of the following statements describes the status of the pre-startup checks?

- a. The pre-startup checkouts requirements ARE satisfied. Audible indication of the pneumatic system operation is sufficient to verify operability of the system since actual rod motion is not yet permitted.
- b. The pre-startup checkouts requirements ARE satisfied if the transient rod position indication confirms that the rod did, in fact, withdraw. Both audible indication and position feedback indicating withdrawal are required to satisfy the checkouts requirements.
- c. The pre-startup checkouts requirements are NOT satisfied. The indicated Log Power Channel power levels should be set higher than the interlock level. A procedural error has been made.
- d. The pre-startup checkouts requirements are NOT satisfied. The pneumatic system should not have fired since the Log Power Channel test signal should have prevented pneumatic system operation at this setting. A system malfunction has occurred.

(***** CONTINUED ON NEXT PAGE *****)

QUESTION: 016 (1.00)

How does the critical position of the shim/safety rods during a startup for steady state operation compare with a startup prior to pulsing operations?

- a. The critical position will be the same since pulsing is conducted at a power level above the critical level.
- b. The critical position will be lower during a startup for pulsing since pulsing adds positive reactivity.
- c. The critical position will be higher during a startup for pulsing to compensate for negative reactivity response of the fuel due to temperature increases during the pulse.
- d. The critical position will be higher during a startup for pulsing since the transient rod is initially left fully inserted in the core.

(***** CONTINUED ON NEXT PAGE *****)

QUESTION: 017 (1.00)

Consider the plant conditions:

- all rods fully inserted
- reactor is subcritical
- shim/safety rod #1 uncoupled from the drive
- regulating rod controller in MANUAL
- rod motion switches in neutral
- appropriate log entries made
- reactor key in the console
- shim/safety rod #1 drive motor being replaced

Which ONE of the following statements describes the status of the plant?

- a. The reactor is operating.
- b. The reactor is shutdown and the console is secured.
- c. The reactor is secured but the console is not secured.
- d. The reactor is shutdown and the console is not secured.

(***** CONTINUED ON NEXT PAGE *****)

QUESTION: 018 (1.00)

Which ONE of the following describes the yellow light associated with the beam port water shutters?

- a. An illuminated yellow light indicates that the shutter tube is evacuated and the beam is active.
- b. An illuminated yellow light indicates that a shutter flood permissive has been selected by the reactor operator.
- c. The yellow light tells the experimenter that the beam has been cut off.
- d. The yellow light warns the experimenter of the commencement of a reactor startup.

(***** CONTINUED ON NEXT PAGE *****)

QUESTION: 019 (1.00)

A Channel Test of each of the reactor safety system channels is required
(Ignore exceptions cited in Technical Specifications)

- a. daily
- b. weekly
- c. monthly
- d. annually

(***** CONTINUED ON NEXT PAGE *****)

QUESTION: 020 (1.00)

During a core loading operation, what is the required MINIMUM number of operable, scrammable control rods to load eight (8) fuel bundles?

- a. one
- b. two
- c. three
- d. four

(***** END OF EXAMINATION *****)

ANSWER: 001 (1.00)

c.

REFERENCE:

- 1) Technical Specifications 3.6.1 (a) defines maximum reactivity for movable experiment as \$1.0
- 2) from facility characteristics:
 - worth of shim rod motion = approx (\$4.7) (.7)/2 = approx. \$1.6
 - worth of reg rod motion = approx (\$0.8) (.5) = approx. \$0.4
 - total = approx. \$2.0
- 3) SOP II-N, Response to abnormal reactivity changes defines reactivity changes greater than \$1.0 as reportable occurrences per Tech Specs 6.5.2, requiring shutdown and NSC Director approval for restart.

ANSWER: 002 (1.00)

b.

REFERENCE:

Technical Specifications, 1.13 and 1.35

ANSWER: 003 (1.00)

a.

REFERENCE:

Technical Specifications, 3.1.3; SOP III-M, NSC Form 576

ANSWER: 004 (1.00)

b.

REFERENCE:

Technical Specifications, 1.3.3

ANSWER: 005 (1.00)

d.

REFERENCE:

Technical Specifications, Sect. 3.2.2, Table 1

ANSWER: 006 (1.00)

b.

REFERENCE:

$$\begin{aligned} D &= D_0 e^{-\mu x} \\ \ln D/D_0 &= -\mu x \\ x &= -4.605 / -\mu \end{aligned}$$

-or-

2 tenth thickness required
tenth thickness for lead is 2 inches
tenth thickness for steel is 4 inches

ANSWER: 007 (1.00)

a.

REFERENCE:

SOP VII-B13, Sect. 13.a

ANSWER: 008 (1.00)

a.

REFERENCE:

10CFR20, Part 20.202

ANSWER: 009 (1.00)

c.

REFERENCE:

$$5(N-18) = 5(23-18) = 25$$

$$25 - 24 = 1.0 \text{ Rem} = \text{Max. Dose}$$

$$\text{Max. Dose} = \text{Dose Rate} \times \text{Time}$$

$$1.00 \text{ Rem} = 0.003 \text{ Rem/hr} \times 8 \text{ hr/day} \times \text{No. of Days}$$

$$\text{No. of Days} = 41.6 \text{ days}$$

ANSWER: 010 (1.00)

d.

REFERENCE:

$$A = A_0 e^{-\lambda t}$$

$$294 = 900 e^{-180\lambda}$$

$$180\lambda = -\ln 0.327$$

$$\lambda = 0.00623 \text{ min}^{-1}$$

$$\begin{aligned} t_{1/2} &= 0.693 / \lambda \\ &= 0.693 / 0.00623 \text{ min}^{-1} \\ &= 111 \text{ minutes} \end{aligned}$$

ANSWER: 011 (1.00)

d.

REFERENCE:

High radiation area - 100 mr per hour.

$$R/\text{hr} = 6E / d^2$$

$$d^2 = (6)(.5)(1.3) / 0.1 = 39$$

$$d = 6.25 \text{ feet}$$

ANSWER: 012 (1.00)

a.

REFERENCE:

SOP IX-A, Sect. 4.c

ANSWER: 013 (1.00)

b.

REFERENCE:

SOP IX-C, Sect. i

ANSWER: 014 (1.00)

d.

REFERENCE:

SOP II-C.1, para. 4; Tech Specs 6.1.3

ANSWER: 015 (1.00)

c.

REFERENCE:

SOP II-C.2.b; NSC Form 531, Pre-startup Checklist, Sect. D, Step 5

ANSWER: 016 (1.00)

d.

REFERENCE:

SOP II-C.4.b

ANSWER: 017 (1.00)

d.

REFERENCE:

SOP II-F; Technical Specifications, 1.24, 1.25, 1.27, and 1.28

ANSWER: 018 (1.00)

a.

REFERENCE:

SOP IV-D.3.b.10

ANSWER: 019 (1.00)

a.

REFERENCE:

Technical Specifications, 4.3.2.a

ANSWER: 020 (1.00)

a.

REFERENCE:

SOP II-I.1.e.(2)

(***** END OF EXAMINATION *****)

ANSWER SHEET

Multiple Choice (Circle or X your choice)

If you change your answer, write your selection in the blank.

MULTIPLE CHOICE

- 001 a b c d ___
002 a b c d ___
003 a b c d ___
004 a b c d ___
005 a b c d ___
006 a b c d ___
007 a b c d ___
008 a b c d ___
009 a b c d ___
010 a b c d ___
011 a b c d ___
012 a b c d ___
013 a b c d ___
014 a b c d ___
015 a b c d ___
016 a b c d ___
017 a b c d ___
018 a b c d ___
019 a b c d ___
020 a b c d ___

(***** END OF EXAMINATION *****)

ANSWER KEY

MULTIPLE CHOICE

001 c
002 b
003 a
004 b
005 d
006 b
007 a
008 a
009 c
010 ~~a~~ c
011 d
012 a
013 b
014 d
015 c
016 d
017 d
018 a
019 e
020 a

(***** END OF EXAMINATION *****)