



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

January 21, 2026

Mr. Jere Jenkins, Director  
Nuclear Science Center  
Texas A&M Engineering Experiment Station  
1095 Nuclear Science Road, MS 3575  
College Station, TX 77843-3575

SUBJECT: EXAMINATION REPORT NO. 50-128/OL-26-01, TEXAS A&M UNIVERSITY

Dear Mr. Jenkins:

During the week of January 5, 2026, the U.S. Nuclear Regulatory Commission (NRC) administered an operator licensing examination at your Texas A&M Engineering Experiment Station. The examination was conducted according to NUREG-1478, "Operator Licensing Examiner Standards for Research and Test Reactors," Revision 2. 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 Title 10 of the *Code of Federal Regulations*, Section 2.390, 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 component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC website at <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 Michele DeSouza at 301-415-0747 or via email at [Michele.DeSouza@nrc.gov](mailto:Michele.DeSouza@nrc.gov).

Sincerely,

A handwritten signature in black ink, appearing to read "Tony Brown".

Signed by Brown, Tony  
on 01/21/26

Tony Brown, Chief  
Non-Power Production and Utilization Facility  
Oversight Branch  
Division of Advanced Reactors and Non-Power  
Production and Utilization Facilities  
Office of Nuclear Reactor Regulation

Docket No. 50-128

Enclosures:

1. Examination Report No. 50-128/OL-26-01
2. Written examination

cc: w/enclosures to GovDelivery Subscribers

SUBJECT: EXAMINATION REPORT NO. 50-128/OL-26-01, TEXAS A&M UNIVERSITY  
DATED: JANUARY 21, 2026

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NAME	MDeSouza	NJones	TBrown
DATE	1/21/2026	1/21/2026	1/21/2026

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

REPORT NO.: 50-128/OL-26-01  
FACILITY DOCKET NO.: 50-128  
FACILITY LICENSE NO.: R-83  
FACILITY: Texas A&M Engineering Experiment Station  
EXAMINATION DATES: Week of January 5, 2026  
SUBMITTED BY: Michele C. DeSouza 1/13/2026  
Michele C. DeSouza, Chief Examiner Date

**SUMMARY:**

During the week of January 5, 2026, the NRC administered operator licensing examinations to two Reactor Operator (RO), two Senior Reactor Operator-Upgrade (SROU), and one SRO-Instant (SROI) candidates. The candidates passed all applicable portions of the examinations.

REPORT DETAILS

1. Examiner: Michele C. DeSouza, Chief Examiner, NRC

2. Results:

	<b>RO PASS/FAIL</b>	<b>SRO PASS/FAIL</b>	<b>TOTAL PASS/FAIL</b>
Written	2/0	1/0	3/0
Operating Tests	2/0	3/0	5/0
Overall	2/0	3/0	5/0

3. Exit Meeting:  
Michele C. DeSouza, NRC, Chief Examiner  
Jere Jenkins, TEES, Director  
Richard C. Kurwitz, TEES, Interim Associate Director

Prior to administration of the written examination, based on facility comments, adjustments were accepted. Comments provided corrections and additional clarity to questions/answers and identified where changes were appropriate based on current facility conditions.

Upon completion of all operator licensing examinations, the NRC examiner met with facility staff representatives to discuss the results. At the conclusion of the meeting, the NRC examiner thanked the facility for their support in the administration of the examination.



Texas A&M Engineering Experiment Station

Operator Licensing Examination

Week of January 5, 2026

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

FACILITY: Texas A&M Engineering  
Experiment Station

REACTOR TYPE: TRIGA

DATE ADMINISTERED: 01/08/2026

CANDIDATE: \_\_\_\_\_

**INSTRUCTIONS TO CANDIDATE:**

Answers are to be written on the Answer sheet provided. Attach all Answer sheets to the examination. Point values are indicated in parentheses for each question. A 70% in each category and 70% or greater overall is required to pass the examination. Examinations will be picked up three (3) hours after the examination starts.

<u>CATEGORY</u>	<u>% OF</u>	<u>% OF</u>	<u>CATEGORY</u>
<u>VALUE</u>	<u>TOTAL</u>	<u>SCORE</u>	<u>VALUE</u>
<u>20.00</u>	<u>33.3</u>	_____	<b>A. REACTOR THEORY, THERMODYNAMICS AND FACILITY OPERATING CHARACTERISTICS</b>
<u>20.00</u>	<u>33.3</u>	_____	<b>B. NORMAL AND EMERGENCY OPERATING PROCEDURES AND RADIOLOGICAL CONTROLS</b>
<u>20.00</u>	<u>33.3</u>	_____	<b>C. FACILITY AND RADIATION MONITORING SYSTEMS</b>
<u>60.00</u>		_____	<b>% TOTALS</b>
		<b>FINAL GRADE</b>	

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

\_\_\_\_\_  
Candidate's Signature

Category A – Reactor Theory, Thermodynamics, & Facility Operating Characteristics

**ANSWER SHEET**

Multiple Choice (Circle your choice, or write on the line)

If you change your answer, write your selection on the line. Answers written on the line will be taken as the final answer.

A01 a b c d \_\_\_\_

A02 a b c d \_\_\_\_

A03 a b c d \_\_\_\_

A04 a b c d \_\_\_\_

A05 a b c d \_\_\_\_

A06 a \_\_\_\_\_ b \_\_\_\_\_ c \_\_\_\_\_ d \_\_\_\_\_ (0.25 each)

A07 a b c d \_\_\_\_

A08 a b c d \_\_\_\_

A09 a b c d \_\_\_\_

A10 a b c d \_\_\_\_

A11 a b c d \_\_\_\_

A12 a b c d \_\_\_\_

A13 a b c d \_\_\_\_

A14 a b c d \_\_\_\_

A15 a b c d \_\_\_\_

A16 a b c d \_\_\_\_

A17 a b c d \_\_\_\_

A18 a b c d \_\_\_\_

A19 a b c d \_\_\_\_

A20 a b c d \_\_\_\_

(\*\*\*\*\* END OF CATEGORY A \*\*\*\*\*)

Category B – Normal/Emergency Operating Procedures and Radiological Controls

**ANSWER SHEET**

Multiple Choice (Circle your choice, or write on the line)

If you change your answer, write your selection on the line. Answers written on the line will be taken as the final answer.

B01 a b c d \_\_\_\_

B02 a b c d \_\_\_\_

B03 a b c d \_\_\_\_

B04 a b c d \_\_\_\_

B05 a b c d \_\_\_\_

B06 a \_\_\_\_\_ b \_\_\_\_\_ c \_\_\_\_\_ d \_\_\_\_\_ (0.25 each)

B07 a b c d \_\_\_\_

B08 a b c d \_\_\_\_

B09 a b c d \_\_\_\_

B10 a b c d \_\_\_\_

B11 a b c d \_\_\_\_

B12 a b c d \_\_\_\_

B13 a b c d \_\_\_\_

B14 a b c d \_\_\_\_

B15 a b c d \_\_\_\_

B16 a b c d \_\_\_\_

B17 a b c d \_\_\_\_

B18 a b c d \_\_\_\_

B19 a b c d \_\_\_\_

B20 a b c d \_\_\_\_

(\*\*\*\*\* END OF CATEGORY B \*\*\*\*\*)

Category C – Facility and Radiation Monitoring Systems

**ANSWER SHEET**

Multiple Choice (Circle your choice, or write on the line)

If you change your answer, write your selection on the line. Answers written on the line will be taken as the final answer.

C01 a b c d \_\_\_\_

C02 a b c d \_\_\_\_

C03 a b c d \_\_\_\_

C04 a b c d \_\_\_\_

C05 a b c d \_\_\_\_

C06 a b c d \_\_\_\_

C07 a b c d \_\_\_\_

C08 a b c d \_\_\_\_

C09 a b c d \_\_\_\_

C10 a b c d \_\_\_\_

C11 a b c d \_\_\_\_

C12 a b c d \_\_\_\_

C13 a b c d \_\_\_\_

C14 a b c d \_\_\_\_

C15 a b c d \_\_\_\_

C16 a b c d \_\_\_\_

C17 a b c d \_\_\_\_

C18 a b c d \_\_\_\_

C19 A \_\_\_\_\_ B \_\_\_\_\_ C \_\_\_\_\_ D \_\_\_\_\_

E \_\_\_\_\_ F \_\_\_\_\_ G \_\_\_\_\_ H \_\_\_\_\_

(0.29 each)

(\*\*\*\* END OF CATEGORY C \*\*\*\*)  
(\*\*\*\*\* END OF EXAMINATION \*\*\*\*\*)

## 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 neither received nor 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 and each Answer sheet.
6. Mark your Answers on the Answer sheet provided. **USE ONLY THE PAPER PROVIDED AND DO NOT WRITE ON THE BACK SIDE OF THE PAGE.**
7. The point value for each question is indicated in [brackets] after the question.
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. Ensure all information you wish to have evaluated as part of your Answer is on your Answer sheet. Scrap paper will be disposed of immediately following the examination.
11. To pass the examination you must achieve a grade of 70 percent or greater in each category and a 70 percent overall.
12. There is a time limit of three (3) hours for completion of the examination.

EQUATION SHEET

$$Q = mc_p \Delta T = m \Delta H = UA \Delta T$$

$$P_{\max} = \frac{(\beta - \rho)^2}{(2\alpha \lambda)}$$

$$\lambda_{\text{eff}} = 0.1 \text{ sec}^{-1}$$

$$P = P_0 e^{t/T}$$

$$SCR = \frac{S}{-\rho} \cong \frac{S}{1 - K_{\text{eff}}}$$

$$\lambda^* = 1 \times 10^{-4} \text{ sec}$$

$$SUR = 26.06 \left[ \frac{\lambda_{\text{eff}} \rho + \beta}{\beta - \rho} \right]$$

$$CR_1(-\rho_1) = CR_2(-\rho_2)$$

$$P = P_0 10^{SUR(t)}$$

$$P = \frac{\beta(1-\rho)}{\beta-\rho} P_0$$

$$CR_1(1 - K_{\text{eff}_1}) = CR_2(1 - K_{\text{eff}_2})$$

$$T = \frac{\lambda^*}{\rho - \beta}$$

$$M = \frac{1 - K_{\text{eff}_1}}{1 - K_{\text{eff}_2}}$$

$$M = \frac{1}{1 - K_{\text{eff}}} = \frac{CR_2}{CR_1}$$

$$\Delta\rho = \frac{K_{\text{eff}_2} - K_{\text{eff}_1}}{K_{\text{eff}_1} K_{\text{eff}_2}}$$

$$T = \frac{\ell^*}{\rho} + \left[ \frac{\beta - \rho}{\lambda_{\text{eff}} \rho} \right]$$

$$SDM = \frac{1 - K_{\text{eff}}}{K_{\text{eff}}}$$

$$T_{\frac{1}{2}} = \frac{0.693}{\lambda}$$

$$\rho = \frac{K_{\text{eff}} - 1}{K_{\text{eff}}}$$

$$DR_1 d_1^2 = DR_2 d_2^2$$

$$DR = \frac{6 \text{ Ci } E(n)}{R^2}$$

$$DR = DR_0 e^{-\lambda t}$$

$$\frac{(\rho_2 - \beta)^2}{\text{Peak}_2} = \frac{(\rho_1 - \beta)^2}{\text{Peak}_1}$$

DR – Rem, Ci – curies, E – Mev, R – feet

1 Curie = 3.7 x 10<sup>10</sup> dis/sec

1 kg = 2.21 lb

1 Horsepower = 2.54 x 10<sup>3</sup> BTU/hr

1 Mw = 3.41 x 10<sup>6</sup> BTU/hr

1 BTU = 778 ft-lb

°F = 9/5 °C + 32

1 gal (H<sub>2</sub>O) ≈ 8 lb

°C = 5/9 (°F - 32)

c<sub>p</sub> = 1.0 BTU/hr/lb/°F

c<sub>p</sub> = 1 cal/sec/gm/°C

Category A – Reactor Theory, Thermodynamics, and Facility Operating Characteristics

**QUESTION A.01 [1.00 point]**

The reactor is critical and increasing in power. Power has increased from 10 watts to 800 watts in 90 seconds. How long, at this rate, will it take power to increase from 4 kW to 10 kW? Note: Neglect any negative temperature coefficient.

- a. 1.9 seconds
- b. 6.8 seconds
- c. 14 seconds
- d. 19 seconds

**QUESTION A.02 [1.00 point]**

Which one of the following terms is associated with the definition, '*the resonance peaks of the neutron absorption cross section increase in width due to thermal motion of the nuclei*'?

- a. Mass Defect
- b. Doppler Broadening
- c. Spectrum Hardening
- d. Moderator Negative Temperature Coefficient

**QUESTION A.03 [1.00 point]**

Which ONE of the following is NOT a characteristic of an effective neutron moderator?

- a. low atomic density
- b. low neutron absorption cross section
- c. large neutron scattering cross section
- d. large neutron energy loss per collision

**QUESTION A.04 [1.00 point]**

Which ONE of the following statements best defines '*reactor excess reactivity*'?

- a. A measure of the additional fuel loaded to overcome fission product poisoning.
- b. A measure of remaining control blade worth when the reactor is exactly critical.
- c. The combined control blade negative reactivity worth required to keep the reactor shutdown.
- d. The maximum reactivity by which the reactor can be shutdown with one control blade fully withdrawn.

Category A – Reactor Theory, Thermodynamics, and Facility Operating Characteristics

**QUESTION A.05 [1.00 point]**

Given a reactor period of 48 seconds, approximately how long will it take for power to quadruple?

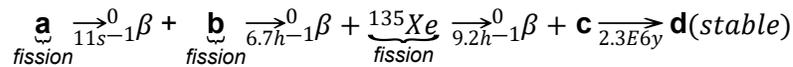
- a. 23 seconds
- b. 39 seconds
- c. 67 seconds
- d. 81 seconds

**QUESTION A.06 [1.00 point, 0.25 each]**

Match the items in Column A with the isotopes in Column B.

The most important fission product poison is  $^{135}\text{Xe}$ . The process that shows how this isotope is formed and its decay is: (Answers used only once)

**Column A**



**Column B**

- 1.  $^{135}\text{I}$
- 2.  $^{135}\text{Ba}$
- 3.  $^{135}\text{Te}$
- 4.  $^{135}\text{Cs}$

**QUESTION A.07 [1.00 point]**

Following a reactor scram, the period meter will indicate \_\_\_\_\_ because \_\_\_\_\_.

- a. Zero seconds; the reactor is subcritical, and reactor power is decreasing.
- b. -80 seconds; of the decay constant for the longest-lived neutron precursor.
- c. Slightly positive; the neutron source is providing detectable neutron count rate to keep the reactor slightly supercritical.
- d. -80 seconds; the fuel temperature coefficient adds positive reactivity as a result of the decrease in fuel temperature following a scram.

**QUESTION A.08 [1.00 point]**

Which ONE of the following describes the Integral Rod Worth?

- a. The reactivity change per unit movement of a rod.
- b. The total reactivity worth of the rod at a particular degree of withdrawal.
- c. The summation of all the reactivity worth of a rod up to the point of withdrawal.
- d. The plot of the slope of the change in reactivity over the change in rod position ( $\Delta\rho/\Delta x$ ).

Category A – Reactor Theory, Thermodynamics, and Facility Operating Characteristics

**QUESTION A.09 [1.00 point]**

Which ONE of the following decay chains correctly describes the production and removal of Xenon - 135 from the reactor?

- a.  $I^{135} \rightarrow \beta^- + Te^{135} \rightarrow \beta^- + Xe^{135} \rightarrow \beta^- + Cs^{135} \rightarrow \beta^- + Ba^{135}$
- b.  $Te^{135} \rightarrow \beta^- + I^{135} \rightarrow \beta^- + Xe^{135} \rightarrow \beta^- + Cs^{135} \rightarrow \beta^- + Ba^{135}$
- c.  $Te^{135} \rightarrow \beta^- + I^{135} \rightarrow \beta^- + Xe^{135} \rightarrow \beta^- + Ba^{135} \rightarrow \beta^- + Cs^{135}$
- d.  $Te^{135} \rightarrow \beta^- + Cs^{135} \rightarrow \beta^- + Xe^{135} \rightarrow \beta^- + I^{135} \rightarrow \beta^- + Ba^{135}$

**QUESTION A.10 [1.00 point]**

While bringing the reactor critical, which ONE of the following describes how a subcritical reactor responds to equal insertions of positive reactivity?

- a. Each reactivity insertion results in a larger increase in neutron flux resulting in a longer time to stabilize.
- b. Each reactivity insertion results in a smaller increase in neutron flux resulting in a shorter time to stabilize.
- c. Each reactivity insertion results in a larger increase in neutron flux resulting in a shorter time to stabilize.
- d. Each reactivity insertion results in a smaller increase in neutron flux resulting in a longer time to stabilize.

**QUESTION A.11 [1.00 point]**

Given the thermal neutron flux ( $\phi$ ) is  $1.0 \times 10^{13}$  neutrons/cm<sup>2</sup>/second, and the macroscopic cross-section ( $\Sigma_f$ ) for fission is  $0.1 \text{ cm}^{-1}$ . Which ONE of the following is the fission rate?

- a.  $1.0 \times 10^{12}$  fissions/cm<sup>3</sup>/second
- b.  $1.0 \times 10^{14}$  fissions /cm<sup>3</sup> /second
- c.  $1.0 \times 10^{14}$  fissions /cm<sup>2</sup> /second
- d.  $1.0 \times 10^{12}$  fissions /cm/second

Category A – Reactor Theory, Thermodynamics, and Facility Operating Characteristics

**QUESTION A.12 [1.00 point]**

During fission of Uranium-235, which ONE of the following accounts for the majority of energy released?

- a. Neutrinos
- b. Fission neutrons
- c. Capture gamma rays
- d. Fission fragments

**QUESTION A.13 [1.00 point]**

Which ONE of the following BEST describes a supercritical reactor?

- a.  $K_{\text{eff}} > 1$  based on prompt neutrons alone
- b.  $K_{\text{eff}} < 1$  based on delayed and prompt neutrons
- c.  $K_{\text{eff}} = 1$  based on delayed neutrons alone
- d.  $K_{\text{eff}} > 1$  based on prompt and delayed neutrons

**QUESTION A.14 [1.00 point]**

Which ONE of the following has a long-term effect on  $K_{\text{eff}}$  but is of no consequence during short term and transient operation?

- a. Fuel burnup
- b. Increase in fuel temperature
- c. Increase in moderator temperature
- d. Xenon and Samarium fission products

**QUESTION A.15 [1.00 point]**

The neutron microscopic cross-section for absorption  $\sigma_a$  generally:

- a. increases as neutron energy increases
- b. decreases as neutron energy increases
- c. increases as neutron velocity increases
- d. decreases as target nucleus mass increases

Category A – Reactor Theory, Thermodynamics, and Facility Operating Characteristics

**QUESTION A.16 [1.00 point]**

Which ONE of the following is the definition of Thermal Utilization Factor?

- a. The ratio of the number of fast neutrons absorbed in fuel to the number of fast neutrons absorbed in the reactor material.
- b. The ratio of the number of fast neutrons produced by thermal fission to the number of thermal neutrons absorbed in the fuel.
- c. The ratio of the number of thermal neutrons absorbed in the fuel to the number of thermal neutrons absorbed in all reactor materials.
- d. The ratio of the number of thermal neutrons produced by fission in a generation to the number of total neutrons produced by fission in the previous generation.

**QUESTION A.17 [1.00 point]**

How high will the reactor power get given the following: the lowest of the reactor high power scram set points is 120%, the scram delay time is 0.7 seconds, the reactor is operating at 100% power prior to the scram, and the reactor period is positive 30 seconds?

- a. 101%
- b. 110%
- c. 123%
- d. 167%

**QUESTION A.18 [1.00 point]**

If  $(1 - \beta_{\text{eff}}) * K_{\text{eff}} = 1$ , the reactor is:

- a. Subcritical
- b. Critical
- c. Supercritical
- d. Prompt Critical

**QUESTION A.19 [1.00 point]**

Which type of neutron interaction (light nuclei) is most important in MODERATING fast neutrons to thermal neutrons?

- a. Fission
- b. Neutron Capture
- c. Elastic Scattering
- d. Inelastic Scattering

Category A – Reactor Theory, Thermodynamics, and Facility Operating Characteristics

**QUESTION A.20 [1.00 point]**

Which ONE of the following is the stable reactor period that will result in a power rise from 50% to 100% power in 45 seconds?

- a. 21 seconds
- b. 34 seconds
- c. 56 seconds
- d. 65 seconds

(\*\*\*\*\* END OF CATEGORY A \*\*\*\*\*)

Category B - Normal/Emergency Operating Procedures and Radiological Controls

**QUESTION B.01 [1.00 point]**

In accordance with SOP D-2, *Implementing Procedure for an Explosion involving reactor or Radioactive Material*, which ONE of the following is NOT immediate action required by the Emergency Director in response?

- a. Notify a member of NSC management.
- b. Visually inspect to determine if shutdown is required.
- c. Account for personnel and direct them to a safe area.
- d. Health Physics monitor the area to determine if radioactivity is present.

**QUESTION B.02 [1.00 point]**

In accordance with 10 CFR 55.59 and TEES operator requalification plan, which ONE of the following is the operating test frequency requirement for maintaining an active operator license?

- a. Annually
- b. Every 2 years
- c. 4 years
- d. 6 years

**QUESTION B.03 [1.00 point]**

According to the TEES Emergency Plan, which ONE of the following is an action level associated with an Alert?

- a. Security threat affecting the reactor.
- b. Deep dose equivalent of 0.75 mSv.
- c. Committed effective dose equivalent of 15 mrem.
- d. Tornado observed adjacent to the parking lot.

**QUESTION B.04 [1.00 point]**

Reactor Operator works in a high radiation area for eight (8) hours a day. The dose rate in the area is 100 mrem/hour. Which ONE of the following is the MAXIMUM number of days in which Reactor Operator may perform his duties WITHOUT exceeding 10 CFR 20 limits?

- a. 5 days
- b. 6 days
- c. 7 days
- d. 12 days

Category B - Normal/Emergency Operating Procedures and Radiological Controls

**QUESTION B.05 [1.00 point]**

Which ONE of the following defines the term '*Radiation Area*'?

- a. Any area where access is limited for any reason.
- b. Any area to which access is limited for the purpose of protecting individuals against undue risks from exposure to radiation and radioactive materials.
- c. Area where radiation exposure rates would result in a dose equivalent in excess of 5 mrem in one hour at 30 centimeters from the radiation source.
- d. Area where radiation exposure rates would result in a dose equivalent in excess of 1 mSv in one hour at 30 centimeters from the radiation source.

**QUESTION B.06 [1.00 point, 0.25 each]**

For each of the below, identify the required number of operable channels during steady state operating mode.

- a. High Power Level Scram
- b. Pool Water Temperature Scram
- c. Fuel Element Temperature Scram
- d. High Power Level Detector Power Supply Scram

**QUESTION B.07 [1.00 point]**

In accordance with 10 CFR 55.53 and TEES requalification plan, what is the minimum number of hours required to reinstate an individual's license if the licensed operator could not meet their quarterly requirements?

- a. 4 hours
- b. 5 hours
- c. 6 hours
- d. 8 hours

**QUESTION B.08 [1.00 point]**

Which ONE of the following NRC Forms requires completion during initial licensure and every two years subsequently?

- a. NRC Form 3, Notice to Employees
- b. NRC Form 4, Cumulative Occupational Dose History
- c. NRC Form 396, Certification of Medical Examination by Facility Licensee
- d. NRC Form 398, Personal Qualification Statement - Licensee

Category B - Normal/Emergency Operating Procedures and Radiological Controls

**QUESTION B.09 [1.00 point]**

Which ONE of the following is the definition of a '*Channel Check*'?

- a. The introduction of a signal into the channel for verification that is operable.
- b. A qualitative verification of acceptable performance by observation of channel behavior.
- c. The combination of sensor, line, amplifier, and output device which are connected for the purpose of measuring the value of a parameter.
- d. An adjustment of the channel such that its output corresponds with acceptable accuracy to known values of the parameter which the channel measures.

**QUESTION B.10 [1.00 point]**

Which ONE of the following changes would require submittal to the Nuclear Regulatory Commission for approval prior to implementation?

- a. Add a new limit to the pre-start checklist procedure.
- b. Replace the primary coolant pump with an identical one.
- c. Delete section 6.3, Radiation Safety listed in the TEES Technical Specifications.
- d. Add more responsibilities to the Radiation Safety Officer in the Radiation Safety Program.

**QUESTION B.11 [1.00 point]**

In accordance with 10 CFR 20, individual members of the public are limited to a dose in any unrestricted area from external sources, the dose in any one hour shall not exceed:

- a. 2 mrem.
- b. 10 mrem.
- c. 50 mrem.
- d. 500 mrem.

Category B - Normal/Emergency Operating Procedures and Radiological Controls

**QUESTION B.12 [1.00 point]**

Which ONE of the following is NOT a requirement *“to prevent damage to the reactor or excessive release of radioactivity by limiting materials quantity and radioactive material inventory of the experiment”* in the event of an experiment failure?

- a. Corrosive materials shall be doubly encapsulated.
- b. Cryogenic liquids shall not be used in any experiment in the reactor pool.
- c. Explosive materials shall not be limited if the detonation pressure is less than half the design pressure of the container.
- d. The absolute value of the reactivity worth of each unsecured experiments which are in the reactor shall be less than \$1.00.

**QUESTION B.13 [1.00 point]**

Which ONE of the following is the definition of a ‘Curie’?

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

**QUESTION B.14 [1.00 point]**

You are currently a licensed operator at TEES. Which ONE of the following would be a violation of 10 CFR Part 55.53 “Conditions of licenses”?

- a. Your last written examination was 18 months ago.
- b. Your last requalification operating test was 11 months ago.
- c. Last quarter you were on console as the licensed operator for 3 hours.
- d. The new requalification program cycle started 18 months ago.

**QUESTION B.15 [1.00 point]**

During a reactor operation, a small fire occurs on the control room console. Which ONE of the following classes of fire extinguisher would most likely be used for this type of fire?

- a. Class A: Fires in ordinary combustibles, such as wood, paper, plastic, etc.
- b. Class B: Fires in flammable or combustible liquids, flammable gases, greases.
- c. Class C: Fires in live electrical equipment.
- d. Class D: Fires involving combustible metals such as magnesium.

Category B - Normal/Emergency Operating Procedures and Radiological Controls

**QUESTION B.16 [1.00 point]**

A radiation survey of an area reveals a general radiation reading of 1 mRem/hr. However, an irradiated experiment sample (point source) is brought into the area that reads 10 mRem/hr at 1 meter. Which ONE of the following is the required posting for the area, in accordance with 10 CFR Part 20?

- a. CAUTION – RADIATION AREA
- b. CAUTION – HIGH RADIATION AREA
- c. GRAVE DANGER – VERY HIGH RADIATION AREA
- d. CAUTION – AIRBORNE RADIOACTIVITY AREA

**QUESTION B.17 [1.00 point]**

In accordance with TEES Technical Specifications, which ONE of the following is the correct frequency for visual inspection of the regulating rod and transient rod drive inspection?

- a. Monthly, annually
- b. Every six months, every year
- c. Every year, every year
- d. Every two years, every six months

**QUESTION B.18 [1.00 point]**

Per TEES Technical Specifications, the shutdown margin must be greater than \_\_\_\_\_.

- a. \$0.25
- b. \$0.40
- c. \$0.50
- d. \$0.75

**QUESTION B.19 [1.00 point]**

An experiment reading 40 rem/hr was removed from the reactor. Five hours later, it reads 8 rem/hr. What is the half-life of the experiment?

- a. 1.23 hours
- b. 2.15 hours
- c. 3.43 hours
- d. 5.98 hours

Category B - Normal/Emergency Operating Procedures and Radiological Controls

**QUESTION B.20 [1.00 point]**

In accordance with the TEES Emergency Plan, which ONE of the following defines the term '*Emergency Planning Zone*'?

- a. Area where the Emergency Coordinator can initiate emergency activities.
- b. The area where organizing is done to assure prompt and effective actions to protect the public in the event of an accident.
- c. Area where Emergency Coordinator has complete and total authority over all activities.
- d. An area where access is limited to protect individuals from exposure to radiation or radioactive materials in the event of an emergency.

(\*\*\*\*\* END OF CATEGORY B \*\*\*\*\*)

Category C - Facility and Radiation Monitoring Systems

**QUESTION C.01 [1.00 point]**

In accordance with TEES Radiation Safety Program, quantities of special nuclear material of 0.5 grams or greater shall require which ONE of the following?

- a. Must be secured in unrestricted areas if they do not contain special identification.
- b. Must not be secured and should be used only with direct supervision by the Facility Director.
- c. Shall be located in restricted areas or under the control of authorized individuals only and must have a unique identification.
- d. Shall be labeled with the type of radioactive material, date, and individual's information that is responsible for securing the material.

**QUESTION C.02 [1.00 point]**

Which ONE of the following is NOT used as an external personal monitoring device?

- a. Bioassay
- b. Pocket Dosimeter
- c. Thermoluminescent Dosimeter
- d. Optically Stimulated Luminescent Dosimeter

**QUESTION C.03 [1.00 point]**

In accordance with the TEES SAR, which ONE of the following is used in combination with water as a neutron moderator?

- a. Lead
- b. Steel
- c. Bismuth
- d. Graphite

**QUESTION C.04 [1.00 point]**

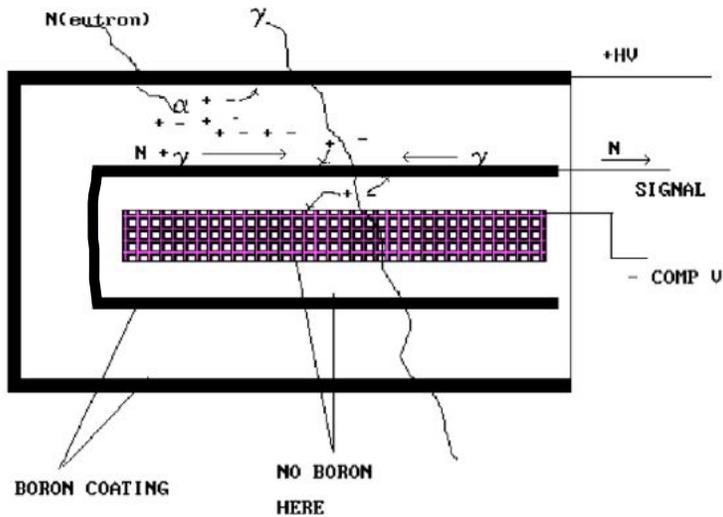
In automatic mode, which ONE of the following is correct?

- a. The log drawer provides power output to generate the signal to the preselected control rod.
- b. The source range indicates the direct connection to the predetermined power level.
- c. The wide range linear drawer provides the power level to the servo controller that generates the signal to drive the rod.
- d. The safety drawer indications generate the signal to the servo controller that is converted to a digital indication for the movement of the rod.

Category C - Facility and Radiation Monitoring Systems

**QUESTION C.05 [1.00 point]**

The figure below depicts which ONE of the following nuclear instrumentation detectors?



- a. Fission Chamber
- b. Geiger-Mueller Detector
- c. Compensated Ion Chamber
- d. Uncompensated Ion Chamber

**QUESTION C.06 [1.00 point]**

Which ONE of the following is the complete system description of the Log Power Channel?

- a. Safety drawer and voltage readout power supply
- b. Compensated ion chamber, digital output, and direct feed indicator
- c. Wide range liner drawer, converter, and analog neutron rate counter
- d. Fission chamber, preamp, amplifier, log meter, and digital neutron rate counter

**QUESTION C.07 [1.00 point]**

In accordance with the TEES SAR, building gas activity is monitored by \_\_\_\_\_ to document the release of \_\_\_\_\_.

- a. Compensated Ionization detector, Uranium-233
- b. Geiger-Mueller, Iodine-131
- c. Particulate Detector, all radioactive releases
- d. NaI Scintillation crystal detector, Argon-41

Category C - Facility and Radiation Monitoring Systems

**QUESTION C.08 [1.00 point]**

Which ONE of the following is NOT a purpose of the demineralizer system?

- a. Convert city water into potable water.
- b. Maintain the pool surface free of dust and debris.
- c. Directs the water through the diffuser to ensure the clarity and purity is maintained.
- d. Provide the direct shielding needed to maintain the water within safe radiological levels.

**QUESTION C.09 [1.00 point]**

Which ONE of the following is correct? The Air Handler Shutdown button in the control room \_\_\_\_\_.

- a. engages the cool air conditioning units to ensure proper interior temperatures.
- b. shifts the direction of the air through the ports designed to monitor the amount of radioactivity.
- c. isolates the building by closing the dampers and shutting off the air handlers.
- d. move air directionally opposite to decrease the amount of radioactivity and dilute for release.

**QUESTION C.10 [1.00 point]**

Which ONE of the following monitors receives its signal from the Compensated Ion Chamber (CIC)?

- a. Wide Range Linear Channel
- b. Power Range Log Monitor
- c. Source Range Monitor
- d. Pulse Range Channel

**QUESTION C.11 [1.00 point]**

To prevent the spread of radioactive contamination such as airborne radioactive materials, the ventilation system maintains the reactor containment and laboratory buildings at which ONE of the following?

- a. Slightly positive pressure to clear the air from reactor-related areas
- b. Slightly negative pressure to push or contain the air within the reactor related areas
- c. Complete balance of pressure so all areas maintain their own air pressure in each area
- d. Pressure is not of concern; all areas release through ventilation hoods with monitoring

Category C - Facility and Radiation Monitoring Systems

**QUESTION C.12 [1.00 point]**

In accordance with TEES Technical Specifications, which ONE of the following is the objective of the primary coolant purity system?

- a. Maximize the shielding and minimize monitoring requirements.
- b. Minimize the exterior residual exposures and maximize the density of the materials.
- c. Minimize corrosion of the fuel element cladding and minimize neutron activation.
- d. Maximize corrosion and direct it through the necessary components for filtration and proper handling.

**QUESTION C.13 [1.00 point]**

Which ONE of the following indications are provided from the Pulse Channel after firing a pulse?

- a. Peak power and Energy
- b. Peak power and 1 kW Interlock
- c. Energy and Fuel Temperature
- d. Percent power and Reactor period

**QUESTION C.14 [1.00 point]**

Which ONE of the following is true about the operation of the Stack Isolation Dampers?

- a. Spring to close, air to open
- b. Motor to open, spring assisted motor to close
- c. Motor to close, air to open
- d. Motor to close, spring to open

**QUESTION C.15 [1.00 point]**

In accordance with TEES Technical Specifications, if the pool level is \_\_\_\_\_, the reactor shall not be operated.

- a. below 1 foot from the reference operating level
- b. greater than 1 foot from the reference operating level
- c. below 3 feet from the reference operating level
- d. greater than 3 feet from the reference operating level

Category C - Facility and Radiation Monitoring Systems

**QUESTION C.16 [1.00 point]**

Which ONE of the following is true concerning reviews and reports of limiting safety system setting violations?

- a. records to be retained for at least one certification cycle
- b. records to be retained for a minimum of five years or until the change is implemented to correct
- c. records to be retained for the lifetime of the reactor facility
- d. no requirement to maintain the records

**QUESTION C.17 [1.00 point]**

Which ONE of the following is the material of the pneumatic system tube?

- a. Aluminum
- b. Cadmium lined steel
- c. Stainless steel
- d. Polyethylene

**QUESTION C.18 [1.00 point]**

In accordance with TEES Radiation Safety Program, what is the MINIMUM calibration frequency of radiation safety instruments?

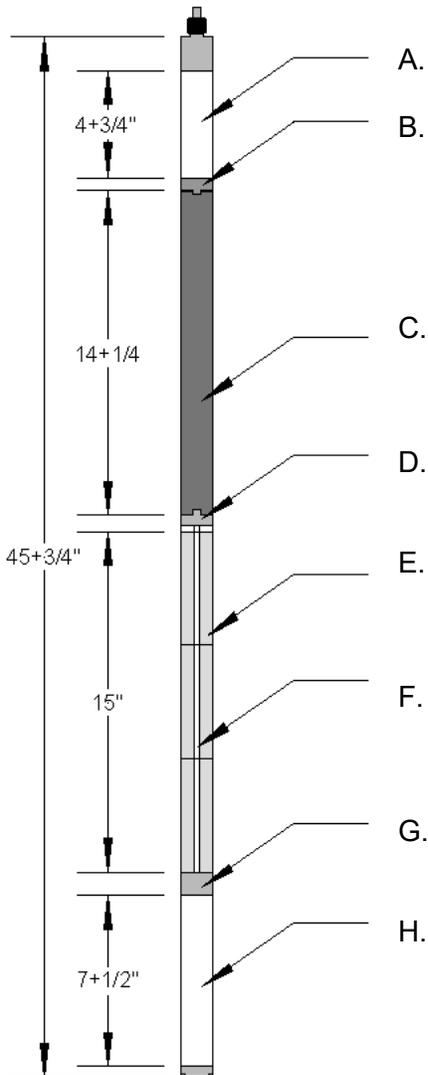
- a. Weekly
- b. Monthly
- c. Quarterly
- d. Annually

Category C - Facility and Radiation Monitoring Systems

**QUESTION C.19 [2.00 points, 0.50 each]**

In the control rod diagram below, identify the parts (A-H) from this list (1-6):  
Items in the list may be used once, more than once, or not at all.

1. Fuel
2. Void
3. Stainless Steel Plug
4. Borated Graphite
5. Zirconium Rod
6. Spacer



(\*\*\*\* END OF CATEGORY C \*\*\*\*)  
((\*\*\*\*\* END OF EXAMINATION \*\*\*\*\*))

## Category A – Reactor Theory, Thermodynamics, & Facility Operating Characteristics

### **A.01**

Answer: d  
Reference:  $P = P_0 e^{t/T}$   
 $800 = 10 * e^{(90 \text{ sec}/T)}$   
 $T = 20.54 \text{ sec}$   
 $10 \text{ kW} = 4 \text{ kW} * e^{(t/20.54)}$   
 $t = 19 \text{ seconds}$

### **A.02**

Answer: b  
Reference: DOE Fundamentals Handbook, *Nuclear Physics and Reactor Theory* Volume 2, Module 3, page 4

### **A.03**

Answer: a  
Reference: DOE Fundamentals Handbook, *Nuclear Physics and Reactor Theory*, Volume 2, Module 3, page 24

### **A.04**

Answer: b  
Reference: Burn, *Introduction to Nuclear Reactor Operations*, Section 6.2

### **A.05**

Answer: c  
Reference:  $P = P_0 e^{t/T}$   
 $4 = 1 \cdot e^{t/48}$   
 $t = 48 \cdot \ln(4)$   
 $t = 66.5 \text{ seconds} \rightarrow 67 \text{ seconds}$

### **A.06**

Answer: a. 3; b. 1; c. 4; d. 2  
Reference: Burn, *Introduction to Nuclear Reactor Operations*, Section 5.5

### **A.07**

Answer: b  
Reference: DOE Fundamentals Handbook, *Nuclear Physics & Reactor Theory*, Volume 1, Module 2, page 7

### **A.08**

Answer: b  
Reference: Burn, *Introduction to Nuclear Reactor Operations*, Section 3.4, page 3-32

### **A.09**

Answer: b  
Reference: Burn, *Introduction to Nuclear Reactor Operations*, Figure 8-1, page 8-6

### **A.10**

Answer: a  
Reference: Burn, *Introduction to Nuclear Reactor Operations*, Section 5.3, page 5-12

Category A – Reactor Theory, Thermodynamics, & Facility Operating Characteristics

**A.11**

Answer: a

Reference: Fission rate = thermal flux ( $\phi$ ) x macroscopic cross-section.  $(\Sigma f) = 1.0 \times 10^{13}$  neutrons/cm<sup>2</sup>/second x 0.1 cm<sup>-1</sup> =  $1.0 \times 10^{12}$  neutrons/cm<sup>3</sup>/second  
Burn, *Introduction to Nuclear Reactor Operations*, Section 2.6.2

**A.12**

Answer: d

Reference: Burn, *Introduction to Nuclear Reactor Operations*, Section 3.2.1, Table 3.2, page 3-5

**A.13**

Answer: d

Reference: DOE Fundamentals Handbook, *Nuclear Physics and Reactor Theory*, Volume 1, Module 2, page 30

**A.14**

Answer: a

Reference: Standard NRC question

**A.15**

Answer: b

Reference: Burn, *Introduction to Nuclear Reactor Operations*, Section 2.5

**A.16**

Answer: c

Reference: DOE Fundamentals Handbook, *Nuclear Physics and Reactor Theory*, Volume 2, Module 3, page 4

**A.17**

Answer: c

Reference:  $P/P_0 = 120\%$ ,  $T = 30$  seconds,  $t = 0.7$ ,  $P/P_0 = 120 e^{\lambda 0.7/30} = 123\%$

**A.18**

Answer: d

Reference: Burn, *Introduction to Nuclear Reactor Operations*, Section 4.2

**A.19**

Answer: c

Reference: LaMarsh, 3<sup>rd</sup> Ed., Section 3.6, page 345

**A.20**

Answer: d

Reference:  $P = P_0 e^{t/T} \rightarrow T = t/\ln(P/P_0)$   
 $T = 45/\ln(100/50)$ ;  $T = 64.9$  seconds or 65 seconds

(\*\*\*\*\* END OF CATEGORY A \*\*\*\*\*)

## Category B - Normal/Emergency Operating Procedures and Radiological Controls

### **B.01**

Answer: b  
Reference: TEES SOP D-2, Implementing Procedure for an Explosion Involving Reactor or Radioactive Material

### **B.02**

Answer: a  
Reference: 10 CFR 55.59(a)(2) and TEES Operator Requalification Plan 5.0

### **B.03**

Answer: b  
Reference: TEES Emergency Plan Appendix 2, Table I

### **B.04**

Answer: b  
Reference: 10CFR20.1201(a)(1)  $\frac{[5000 \text{ mr} \times 1 \text{ hr} \times \text{day}]}{100 \text{ mr} \times 8 \text{ hr}} = 6.25 \text{ days} = 6 \text{ days};$

### **B.05**

Answer: c  
Reference: 10 CFR 20.1003

### **B.06**

Answer: a. 2; b. 1; c. 1; d. 2  
Reference: TEES Technical Specifications Table 2a

### **B.07**

Answer: c  
Reference: 10 CFR 55.53 and TEES Operator Requalification Plan 6.2

### **B.08**

Answer: c  
Reference: 10 CFR 55.21, 55.31 and NRC Form 396

### **B.09**

Answer: b  
Reference: TEES Technical Specifications Definitions

### **B.10**

Answer: c  
Reference: TEES Technical Specifications changes require an amendment

### **B.11**

Answer: a  
Reference: 10 CFR 20.1301

### **B.12**

Answer: c  
Reference: TEES Technical Specifications 3.6

### **B.13**

Answer: b  
Reference: Standard NRC question

Category B - Normal/Emergency Operating Procedures and Radiological Controls

**B.14**

Answer: c  
Reference: 10 CFR 55.53

**B.15**

Answer: c  
Reference: Standard NRC question

**B.16**

Answer: b  
Reference: 10 CFR 20.1003, 10 CFR 20.1902  
 $(DR_1)(D_1)^2 = (DR_2)(D_2)^2$   
 $(10 \text{ mrem/hr})(100 \text{ cm})^2 / (30 \text{ cm})^2 = 111.1 \text{ mrem/hr}$

**B.17**

Answer: c  
Reference: TEES Technical Specifications Section 4.2.3

**B.18**

Answer: c  
Reference: TEES Technical Specifications 3.1.3

**B.19**

Answer: b  
Reference:  $DR = DR_0 e^{-\lambda t}$ ,  $T_{1/2} = \frac{0.693}{\lambda}$   
 $DR = DR_0 e^{-0.693/T_{1/2}}$   
 $8 = 40 e^{-(0.693)(5)/T_{1/2}}$   
 $0.2 = e^{-(0.693)(5)/T_{1/2}}$   
 $\ln(0.2) = \ln(e^{-(0.693)(5)/T_{1/2}})$   
 $-1.609 = -3.465 / T_{1/2}$   
 $T_{1/2} = -3.465 / -1.609$   
 $T_{1/2} = 2.15 \text{ hr}$

**B.20**

Answer: b  
Reference: TEES Emergency Plan, Definitions

(\*\*\*\*\* END OF CATEGORY B \*\*\*\*\*)

**C.01**

Answer: c  
Reference: TEES NESC Radiation Safety Program 6.2

**C.02**

Answer: a  
Reference: TEES NESC Radiation Safety Program 6.3

**C.03**

Answer: d  
Reference: TEES NESC SAR 4.2.3

**C.04**

Answer: c  
Reference: TEES NESC SAR 7.2, page 106

**C.05**

Answer: c  
Reference: Standard NRC question

**C.06**

Answer: d  
Reference: TEES NESC SAR 7.2.3, page 106

**C.07**

Answer: d  
Reference: TEES NESC SAR 11.1.1.1, page 144

**C.08**

Answer: b  
Reference: TEES NESC SAR 5.4, page 97

**C.09**

Answer: c  
Reference: TEES NESC SAR 6.2.1, page 103

**C.10**

Answer: a  
Reference: TEES NESC SAR 7.2.3.3, page 107

**C.11**

Answer: b  
Reference: TEES NESC SAR 9.1.2, page 127

**C.12**

Answer: c  
Reference: TEES Technical Specifications 3.8.1

**C.13**

Answer: a  
Reference: TEES NESC SAR 7.2.3.2, page 107

**C.14**

Answer: b  
Reference: Standard TEES question and knowledge

**C.15**

Answer: c  
Reference: TEES Technical Specifications 3.8.2

**C.16**

Answer: c  
Reference: TEES Technical Specifications 6.8.3

**C.17**

Answer: d  
Reference: TEES NESC SAR 10.1.3, page 137

**C.18**

Answer: d  
Reference: TEES NESC Radiation Safety Program 7.3

**C.19**

Answer: A. 2, Void; B. 3, Stainless Steel Plug; C. 4, Borated Graphite; D. 3, Stainless Steel Plug; E. 1, Fuel; F. 5, Zirconium Rod; G. 3, Stainless Steel Plug; H. 2, Void  
Reference: TEES NESC SAR 4.2.2, Figure 4-10, page 29

(\*\*\*\*\* END OF CATEGORY C \*\*\*\*\*)  
((\*\*\*\*\* END OF EXAMINATION \*\*\*\*\*))