July 25, 2006

Mr. Tim DeBey
U.S. Geological Survey
6th and Kipling
Denver Federal Center, Building 15, MS 974
Denver, Colorado 80225

SUBJECT: INITIAL EXAMINATION REPORT NO. 50-274/OL-06-01, U.S. GEOLOGICAL SURVEY

Dear Mr. DeBey:

During the week of June 12, 2006, the NRC administered an operator licensing examination at the United States Geological Survey 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 Phillip T. Young, or via 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. 50-274

Enclosures:
1. Initial Examination Report No. 50-274/OL-06-01
2. Facility comments with NRC resolution
3. Examination and answer key (RO/SRO)

cc w/encls:
Please see next page

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ADAMS ACCESSION #: ML061940264 **TEMPLATE #:NRR-074**

OFFICE	PRTB:CE	IOLB:LA	PRTB:SC
NAME	PYoung:tls*	EBarnhill*	JEads:tls*
DATE	07/21/2006	07/24/2006	07/25/2006

OFFICIAL RECORD COPY

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Test, Research, and Training
Reactor Newsletter
University of Florida
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U. S. NUCLEAR REGULATORY COMMISSION
OPERATOR LICENSING INITIAL EXAMINATION REPORT

REPORT NO.: 50-274/OL-06-01

FACILITY DOCKET NO.: 50-274

FACILITY LICENSE NO.: R-113

FACILITY: U.S. Geological Survey

EXAMINATION DATES: June 13, 2006

SUBMITTED BY: _____/RA/_____ ___7/21/12006___
Phillip T. Young, Chief Examiner Date

SUMMARY:

On June 13, 2006, the NRC administered an Operator Licensing Examination to a Reactor Operator license candidate at the U.S. Geological Survey. The candidate passes all applicable portions of the examination.

REPORT DETAILS

1. Examiner: Phillip T. Young, Chief Examiner

2. Results:

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

3. Exit Meeting:
Phillip T. Young, NRC, Examiner
Mr. Tim DeBey, U.S. Geological Survey, Reactor Supervisor

During the exit meeting the examiner thanked Mr. DeBey for his support of the examinations and discussed the fact that written exam comments were due one week from the administration of the examination. Examination comments are included in Enclosure 2 to this report.

ENCLOSURE 1

Facility comments on USGS RO exam given to Paul Lietz on 6/13/06.

FACILITY COMMENT #1. Question B.009 (page 10 of 20)

The question is concerning the maximum contamination level that is tolerated without further decontamination, and the answer given is 30 pCi/100 in2 beta and 15 pCi/100 in2 alpha. The reference for the answer is the GSTR Emergency Procedures. This answer was true in an old version of the Emergency Procedures, but the current version (dated 5/98) states on page 8 that the maximum tolerated contamination levels are 450 pCi/100 cm2 beta and 200 pCi/100 cm2 alpha. None of the answer choices match the current procedural values. I request that this question be removed.

NRC RESOLUTION

The examiner agrees with the facility comment. Question B.009 will be removed from the examination.

FACILITY COMMENT #2. Question C.010 (page 17 of 20)

The question concerns the description of a fuel-moderator element. This description was modified by license amendment 11, dated 1/30/2006, wherein the GSTR was authorized to use fuel-moderator elements that were 20% enriched uranium with either stainless steel cladding or aluminum cladding. Because of that amendment, two answer choices (a and c) are both correct. I request that either (or both) of these answers be accepted as correct.

NRC RESOLUTION

The examiner agrees with the facility comment. On Question C.010 either answer choices a or c are both correct. Either of these answers will be accepted as correct.

FACILITY COMMENT #3. Question C.014 (page 18 of 20)

The question concerns the approximate worth of all control rods and transient rod. The specified answer of “c.” 8.4% delta k/k (or $12.00) is taken from the Hazards Summary Report and that is an estimated, pre-operational value. The current operational value is 7.2% delta k/k (or $10.33), so the closest answer is “b.” 6.3% delta k/k. I request that answer “b.” be accepted as the correct answer.

NRC RESOLUTION

The examiner agrees with the facility comment. On Question C.014 answer “b.” will be accepted as the correct answer.

FACILITY COMMENT #4. Question C.015 (page 19 of 20)

The question concerns what events happen during automatic model operation when the associated neutron detector fails. The specified answer “c.” is taken from the Hazards Summary Report that was written prior to the installation of the digital control console in 1991. As a result of the console change, three of the four answer choices are now potentially correct. I request that this question be removed.

NRC RESOLUTION

The examiner agrees with the facility comment. Question C.015 will be removed from the examination.

USGS

WRITTEN EXAMINATION and ANSWER KEY

OPERATOR LICENSING EXAMINATION

June 13, 2006

QUESTION: A.001 (1.0 point) {1.0}

At the beginning of a reactor startup, Keff is 0.90 with a count rate of 30 CPS. Power is increased to a new, steady value of 60 CPS. The new Keff is:

a. 0.910

b. 0.925

c. 0.950

d. 0.975

Answer: A.001 c.
Reference: (CR2/CR1) = (1-Keff1)/(1-Keff2)
(60/30) = (0.90)(1-Keff2) Keff2 = 0.95

QUESTION: A.002 (1.0 point) {2.0}

Which ONE of the following is true concerning the differences between prompt and delayed neutrons?

a. Prompt neutrons account for less than one percent of the neutron population while delayed neutrons account for approximately ninety-nine percent of the neutron population

b. Prompt neutrons are released during fast fissions while delayed neutrons are released during thermal fissions

c. Prompt neutrons are released during the fission process while delayed neutrons are released during the decay process

d. Prompt neutrons are the dominating factor in determining the reactor period while delayed neutrons have little effect on the reactor period

Answer: A.002 c.
Reference: Lamarsh, Intro to Nuclear Eng, 2nd ed., pg. 73

QUESTION: A.003 (1.0 point) {3.0}

Which ONE of the following will be the resulting stable reactor period when a $0.25 reactivity insertion is made into an exactly critical reactor core? (Assume a beta of .0070 and a lambda of .1 sec-1)

a. 50 seconds

b. 38 seconds

c. 30 seconds

d. 18 seconds

Answer: A.003 c.
Reference: Glasstone & Sesonske, pg 239, Sec 5.28 $T = (\beta_{eff} - \rho)/(\rho \lambda)$
$T = (.0070 - .00175)/.1 \times .00175$ T = 30 seconds

QUESTION: A.004 (1.0 point) {4.0}

Reactor power doubles in 0.66 minutes. Which ONE of the following is the time required for power to increase from 10 watts to 800 watts? (Assume a positive step change in reactivity.)

a. 10.1 minutes

b. 6.4 minutes

c. 4.2 minutes

d. 2.8 minutes

Answer: A.004 c.
Reference: $P_f = P_o e^{(t/\tau)}$ Y $\tau = (\ln P_f/P_o)$ t Y τ = 0.66 min / ln2 = 0.952
t = ln(800/10) 0.952 = 4.17 min

QUESTION: A.005 (1.0 point) {5.0}

The purpose of the installed neutron source is to:

a. Compensate for neutrons absorbed in non-fuel materials in the core.

b. Provide a means to allow reactivity changes to occur in a subcritical reactor.

c. Generate a sufficient neutron population to start the fission chain reaction for each startup.

d. Generate a detectable neutron source level for monitoring reactivity changes in a shutdown reactor.

Answer: A.005 d.
Reference: GSTR Requal Exam 2/89

QUESTION: A.006 (1.0 point) {6.0}

Which ONE of the following defines the maximum excess reactivity and minimum Shutdown Margin (SDM) for the TRIGA MARK I reactor?

a. Excess reactivity of 4.9% delta K/K, SDM of 1.5% delta K/K

b. Excess reactivity of 4.9% delta K/K, SDM of 0.4% delta K/K

c. Excess reactivity of $5.0, SDM of 0.4% delta K/K

d. Excess reactivity of $3.0, SDM of 0.4% delta K/K

Answer: A.006 b.
Reference: GSTR T.S.

QUESTION: A.007 (1.0 point) {7.0}

Which ONE of the following coefficients will be the first one to start turning reactor power after a power excursion from full power?

a. Zr-Fuel Temperature

b. Moderator Temperature

c. Power

d. Void

Answer: A.007 a.
Reference: GSTR Requal Exam 1/90

QUESTION: A.008 (1.0 point) {8.0}

Approximately how much reactivity would have to be added to go from 100 kw to 900 kw?

a. $3.20

b. $2.10

c. $1.20

d. $0.50

Answer: A.008 a.
Reference: GSTR Nuc Eng. Data pg. 11-15
(500 - 100) x $0.5 = $2.00
(900 - 500) x $0.3 = $1.20
$3.20

QUESTION: A.009 (1.0 point) {9.0}

Which ONE of the following is a correct statement concerning the factors affecting control rod worth?

a. The withdrawal of a rod causes the rod worth of the remaining inserted rods to increase.

b. Fuel burn up causes the rod worth to increase in the center of the core.

c. Fuel burn up causes the rod worth for periphery rods to decrease.

d. As Rx power increases rod worth increases.

Answer: A.009 a.
Reference: Lamarsh, Introduction to Nuclear Engineering, 2nd ed., pg. 303
Glasstone and Sesonske, Nuclear Reactor Eng., 3rd ed., Sect. 5.183

QUESTION: A.010 (1.0 point) {10.0}

Which alteration or change to the core will most strongly affect the thermal utilization factor.

a. Build up of fission products in fuel.

b. Removal of a control rod.

c. Removal of moderator.

d. Addition of U-238

Answer: A.010 b
Reference: Lamarsh, Introduction to Nuclear Engineering, 2nd ed., pg. 305

QUESTION: A.011 (1.0 point) {11.0}

Which ONE of the following describes how the effective delayed neutron fraction varies over core life?

a. Decreases due to the burnup of U-238

b. Increases due to the burnup of U-238

c . Decreases due to the buildup of PU-239

d. Increases due to the buildup of PU-239

Answer: A.011 c.
Reference: Glasstone and Sesonske, Nuclear Reactor Eng., 3rd ed., Sect. 2.183

QUESTION: A.012 (1.0 point) {12.0}

Which one of the following describes the MAJOR contributor to the production and depletion of Xenon respectively in a STEADY-STATE OPERATING reactor?

	Production	Depletion
a.	Radioactive decay of Iodine	Radioactive Decay
b.	Radioactive decay of Iodine	Neutron Absorption
c.	Directly from fission	Radioactive Decay
d.	Directly from fission	Neutron Absorption

Answer: A.012 b.
Reference: Burn, R., *Introduction to Nuclear Reactor Operations*, © 1988, §§ 8.1 —8.4, pp. 8-3 — 8-14.

QUESTION: A.013 (1.0 point) {13.0}

You perform two initial startups a week apart. Each of the startups has the same starting conditions, (core burnup, pool and fuel temperature, and count rate are the same). The only difference between the two startups is that during the SECOND one you stop for 10 minutes to answer the phone. For the second startup compare the critical rod height and count rate to the first startup.

	Rod Height	Count Rate
a.	Higher	Same
b.	Lower	Same
c.	Same	Lower
d.	Same	Higher

Answer: A.013 d.
Reference: Burn, R., *Introduction to Nuclear Reactor Operations*, © 1982, § 5.7, pp. 5-28 — 5-38.

QUESTION: A.014 (1.0 point) {14.0}

Which one of the following factors has the LEAST effect on K_{eff}?

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

Answer: A.014 a.
Reference: Burn, R., *Introduction to Nuclear Reactor Operations*, © 1982, § 3.3.2, p. 3-18.

QUESTION: A.015 (1.0 point) {15.0}

Which one of 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 take longer to reach thermal equilibrium.
c. Delayed neutrons increase the average neutron generation time.
d. Delayed neutrons born at higher energies than prompt neutrons & therefore have a greater effect.

Answer: A.015 c.
Reference: Burn, R., *Introduction to Nuclear Reactor Operations*, © 1982, § 3.2.4, p. 3-12.

QUESTION: A.016 (1.0 point) {16.0}

Which ONE of the following describes the response of the reactor to EQUAL amounts of reactivity insertion as the reactor approaches critical (K_{eff} =1.0)?

a. The change in neutron population per reactivity insertion is smaller, and it requires a longer time to reach a new equilibrium count rate.

b. The change in neutron population per reactivity insertion is larger, and it requires a longer time to reach a new equilibrium count rate.

c. The change in neutron population per reactivity insertion is smaller, and it requires a shorter time to reach a new equilibrium count rate.

d. The change in neutron population per reactivity insertion is larger, and it takes an equal amount of time to reach a new equilibrium count rate.

Answer: A.016 b.
Reference: UT-TRIGA Trn Man, Vol. IV, Nuclear Physics & Rx Theory, Module 4, pg. 7.

QUESTION: A.017 [1.0 point] {17.0}

Which ONE of the following describes the difference between a moderator and reflector?

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

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

c. A reflector decreases the thermal utilization factor and a moderator increases the fast fission factor.

d. A reflector decreases the neutron production factor and a moderator decreases the fast non-leakage factor.

Answer: A.017 a.
Reference: Burn, R., Introduction to Nuclear Reactor Operations, © 1985, § 2.8.9, pp. 2-63.

QUESTION: A.018 [1.0 point] {18.0}

About two minutes following a reactor scram, period has stabilized, and is decreasing at a CONSTANT rate. If reactor power is 10^{-5} % full power what will the power be in three minutes.

a. 5×10^{-6} % full power

b. 2×10^{-6} % full power

c. 1×10^{-6} % full power

d. 5×10^{-7} % full power

Answer: A.018 c.
Reference: $P = P_0 e^{-T/\tau} = 10^{-5} \times e^{(-180sec/80sec)} = 10^{-5} \times e^{-2.25} = 0.1054 \times 10^{-5} = 1.054 \times 10^{-6}$

QUESTION: A.019 [1.0 point] {19.0}

Which ONE of the following factors is the most significant in determining the differential worth of a control rod?

a. The rod speed.
b. Reactor power.
c. The flux shape.
d. The amount of fuel in the core.

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

QUESTION: A.020 [1.0 point] {20.0}

Which ONE of the following isotopes has the largest microscopic cross-section for absorption for thermal neutrons?

a. Sm^{149}
b. U^{235}
c. Xe^{135}
d. B^{10}

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

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

QUESTION: B.001 (1.0 point) {1.0}

Which ONE of the following is NOT a required condition for the reactor to be considered "Shutdown"?

a. No work is in progress involving fuel handling or maintenance of control mechanisms.

b. The console key is in the "OFF" position and the key is removed from the console and under the control of a licensed operator.

c. The minimum shutdown margin, with the most reactive of the operable control elements withdrawn shall be $1.10

d. Sufficient control rods are inserted so as to assure the reactor is subcritical by a margin greater than $0.70, cold without Xenon.

Answer: B.001 c.
Reference: USGS T.S. App. A

QUESTION: B.002 (1.0 point) {2.0}

Which ONE of the following would be a Class I experiment?

a. A new experiment.

b. A previously run experiment.

c. A major modification of a previous experiment.

d. An experiment with a reactivity worth greater than necessary to produce a prompt critical condition in the reactor.

Answer: B.002 b.
Reference: Administrative Procedures, Section 4.5.

QUESTION: B.003 (2.0 point, 0.5 each) {4.0}

Match the USGS Requalification Plan requirements in Column A for an actively licensed operator with the correct time period from Column B. Column B answers may be used once, more than once, or not at all.

Column A	Column B
a. License Expiration	1. 1 year
b. Medical Examination	2. 2 years
c. Requalification Written Examination	3. 3 years
d. Requalification Operating Test	4. 6 years

Answer: B.003 a. = 4; b.= 2; c. = 1; d. = 1
Reference: 10 CFR 55; USGS Requalification Program.

QUESTION: B.004 (1.0 point) {5.0}

A survey instrument with a window probe was used to measure an irradiated experiment. The results were 100 mrem/hr window open 40 mrem/hr window closed. What was the gamma dose?

a. 140 mrem/hr

b. 100 mrem/hr

c. 60 mrem/hr

d. 40 mrem/hr

Answer: B.004 d.
Reference: Window closed shield beta. 40 mrem/hr must be gamma

QUESTION: B.005 (1.0 point) {6.0}

A cobalt-60 source has been dropped. Thirty (30) feet from the source a beta-gamma detector reads 100 mr/hr. What is the curie content of the source? (Assume a 1.2 and a 1.3 Mev gamma emission.)

a. 90 curies

b. 30 curies

c. 6 curies

d. 2.5 curies

Answer: B.005 c.
Reference: Eq. sheet

QUESTION: B.006 (1.0 point) {7.0}

Preparations are being made to measure the elongation and bending of many fuel elements. Which ONE of the following staffing requirements applies at the start of the fuel movement?

a. A Senior Reactor Operator in charge

b. A Senior Reactor Operator in charge
A Reactor Operator at the console

c. A Senior Reactor Operator in charge
A Reactor Operator at the console
A reactor Health Physicist

d. A Senior Reactor Operator in charge
A Reactor Operator at the console
The Reactor Supervisor

Answer: B.006 c.
Reference: Procedure for Fuel Loading and Unloading

QUESTION: B.007 (1.0 point) {8.0}

If a complete loss of water was to occur with the reactor having been operating at 1000 Kw power, which ONE of the following would be the primary hazard of concern?

a. Keeping the reactor shutdown.

b. Core meltdown due to loss of cooling.

c. Clean up of the highly radioactive coolant water.

d. The vertical beam of radiation from the uncovered core.

Answer: B.007 d.
Reference: Safety Analysis pg. 9-7

QUESTION: B.008 (1.0 point) {9.0}

The reactor is operating at 950 Kw. The Reactor Operator receives a request for a central thimble experiment of $1.25 worth. Which ONE of the following best describes the actions required by the RO prior to loading the sample?

a. Check the sample classification and estimated reactivity. Shutdown the reactor prior to loading the sample.

b. Check the sample estimated reactivity and effects on SDM. Reduce Rx power to approximately 900 KW prior to inserting the sample.

c. Check the sample classification. Ensure the sample is firmly fixed in position and make appropriate entry in logbook prior to loading the sample.

d. Consider possible effects on SDM. Ensure the sample is a Class II experiment. Closely monitor reactor power while the sample is being loaded.

Answer: B.008 a.
Reference: GSTR procedure: Loading and Unloading the Central Thimble.

THIS QUESTION DELETED FROM THE EXAMINATION

~~**QUESTION**: B.009 (1.0 point) {10.0}~~
~~Following a spill in the reactor bay, what is the MAXIMUM contamination level that may be tolerated without further decontamination efforts?~~
~~a. 15 pCi/100 in^2 beta and 100 pCi/100 in^2 alpha activity~~
~~b. 100 pCi/100 in^2 alpha and 30 pCi/100 in^2 beta activity~~
~~c. 30 pCi/100 in^2 alpha and 30 pCi/100 in^2 beta activity~~
~~d. 30 pCi/100 in^2 beta and 15 pCi/100 in^2 alpha activity~~
~~Answer: B.009 d.~~
~~Reference: Emergency Procedures Pg. 7-12~~

QUESTION: B.010 (2.0 points, 0.5 each) {12.0}

Match the radiation reading from column A with its corresponding radiation area classification (per 10 CFR 20) listed in column B. (Assume gamma radiation)

COLUMN A	COLUMN B
a. 10 mRem/hr	1. Unrestricted Area
b. 150 mRem/hr	2. Radiation Area
c. 10 Rem/hr	3. High Radiation Area
d. 550 Rem/hr	4. Very High Radiation Area

Answer: B.010 a, 2; b, 3; c, 3; d, 4
Reference: 10 CFR 20.1003, Definitions

QUESTION: B.011 (1.0 point) {13.0}

Which one of the following does NOT require NRC approval for changes?

a. Facility License

b. Emergency Plan

c. Requalification plan

d. Emergency Implementation Procedures

Answer: B.011 d.
Reference: 10 CFR 50.54 (q); 10 CFR 50.59; 10 CFR 55.59

QUESTION: B.012 (1.0 point) {14.0}

The CURIE content of a radioactive source is a measure of

a. the number of radioactive atoms in the source.

b. the number of nuclear disintegrations per unit time.

c. the amount of damage to soft body tissue per unit time.

d. the amount of energy emitted per unit time by the source.

Answer: B.012 b.
Reference: Standard Health Physics Definition.

QUESTION: B.013 (1.0 point) {15.0}

Following an evacuation due to a radiological emergency, who by procedure may authorize re-entry?

a. Senior Reactor Operator on Duty with concurrence of the Health Physicist

b. University Police with the concurrence of the Health Physicist

c. Emergency Director with concurrence of the Health Physicist

d. Emergency Director

Answer: B.013 d.
Reference: Emergency Plan, § 2.1.1, 4th ¶.

QUESTION: B.014 [1.0 point, 0.25 each] {16.0}

Identify the PRIMARY source (irradiation of **air**, irradiation of **water**, or **fission** product) of EACH of the radioisotopes listed.

a. $_{1}H^{3}$

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

c. $7N^{16}$

d. $_{54}Xe^{135}$

Answer: B.014 a. = Water; b. = Air; c. = Water; d. = Fission
Reference: Standard NRC Question.

QUESTION: B.015 [1.0 point] {17.0}

In the event of an area evacuation, personnel should proceed to the emergency assembly area, located in:

a. Parking lot on south side of Building 15.

b. Reactor staff office.

c. The control room.

d. Room 153

Answer: B.015 a.
Reference: Emergency Plan

QUESTION: B.016 [2.0 points, ½ each] {19.0}

Match type of radiation (a thru d) with the proper penetrating power (1 thru 4)

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.016 a. = 4; b. = 2; c. = 1 d. = 3
Reference: Standard NRC Question

QUESTION: B.017 [1.0 point] {20.0}

Which ONE of the listed radio-isotopes produces the highest ionizing energy gamma?

a. H^3

b. N^{16}

c. Ar^{41}

d. U^{235}

Answer: B.017 b.
Reference: Chart of the Nuclides

QUESTION: B.018 [1.0 points, ¼ point each] {21.0}

Common radioisotopes associated with research reactors are N16, Ar4l, H3 and Na24. The half-life for each is seconds (**sec**), minutes (**min**) hours (**hr**) or years (**yr**).

a. N^{16} is 7 _____.

b. Ar^{41} is 1.9 _____.

c. H^3 is 12 _____.

d. Na^{24} is 15 _____.

Answer: B.021 a. = sec; b. = hr; c. = yr; d. = hr;
Reference: Standard NRC question

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

QUESTION: C.001 (1.00 point) {1.0}

Which ONE is NOT an input to the Regulating Rod Servo?

a. Linear power channel

b. % demand potentiometer

c. Rod raising interlock

d. Period channel

Answer: C.001 c.
Reference: GA TRIGA Instrumentation Maintenance Manual

QUESTION: C.002 (1.00 point) {2.0}

Limit switches mounted on each drive assembly provide switching for console lights. What is the significance of a "MAGENTA" rod color and a "BLACK" magnet box?

a. Rod and drive completely withdrawn, magnet making contact.

b. Reactor scram, control rod drive down.

c. Drive between limits, rod down, no magnet current.

d. Drive completely up, rod is down, no magnet contact.

Answer: C.002 d.
Reference: GA Control Console Operator's Manual pg. 1-5

QUESTION: C.003 (1.00 point) {3.0}

Which ONE of the following statements is NOT a reason for maintaining a minimum reactor pool level during reactor operation?

a. Provide Net Positive Suction Head (NPSH) to the reactor water pump

b. Proper "Dash Pot" action for the control rods during a scram

c. Ensure proper operation of the pool skimmer

d. Provide shielding from the core

Answer: C.003 a.
Reference: GA TRIGA Mechanical Maintenance and Operating Manual pg. 4-13

QUESTION: C.004 (1.00 point) {4.0}

Which ONE of the following describes the action of the rod control system to drive the magnet draw tube down after a dropped rod?

a. Resetting the scram signal initiates the rod down motion of the draw tube.

b. Deenergizing the rod magnet initiates the rod down motion of the draw tube.

c. Actuation of the MAGNET DOWN limit switch initiates the rod down motion of the draw tube.

d. Actuation of the ROD DOWN limit switch initiates the rod down motion if the rod drive is withdrawn.

Answer: C.004 d.
Reference: GA TRIGA Mech. Maint. & Operating Manual pg 2-18

QUESTION: C.005 (1.00 point) {5.0}

Which ONE of the following statements describes the moderating properties of Zirconium Hydride?

a. Elevation of the hydride temperature increases the probability that a thermal neutron will escape the fuel-moderator element before being captured.

b. The probability that a neutron will return to the fuel element before being captured elsewhere is a function of the temperature of the hydride.

c. The ratio of hydrogen atoms to zirconium atoms affects the moderating effectiveness for slow neutrons.

d. The hydride mixture is very effective in slowing down neutrons with energies below 0.025 eV.

Answer: C.005 a.
Reference: GA TRIGA Mark I Reactor Hazards Analysis.

QUESTION: C.006 (1.00 point) {6.0}

The Air Particulate Monitor "Alert" alarm is activated at:

a. 1000 cps

b. 3000 cps

c. 3000 cpm

d. 10K cpm

Answer: C.006 c.
Reference: GSTR Reactor Data

QUESTION: C.007 (1.00 point) {7.0}

Complete the following sentence. Placing the CSC mode switch in the PULSE MODE:

a. fires the transient rod.

b. disables the DAC watchdog timer.

c. changes the gain of the NPP-1000 to full scale.

d. removes air from the transient rod in preparation for firing

Answer: C.007 c.
Reference: GA Control Console Operator's Manual pg. 1-6

QUESTION: C.008 (1.00 point) {8.0}

Which one of the following set of devices is tested when the TRIGA control system is in the PRESTART mode?

a. Fuel temperature scram circuits
NM1000 scram circuits
Interlock preventing control rod withdrawal with low neutron level

b. DAC Watchdog timer
NPP High Voltage Scram
NM1000 power level calibration

c. Interlock preventing simultaneous withdrawal of two control rods
Fuel temperature scram circuits
NPP1000 High % power scram

d. NM1000 scram circuits
Key Switch in the OFF position
DAC Watchdog timer

Answer: C.008 b.
Reference: GA Control Console Operator's Manual pg. 2-5

QUESTION: C.009 (1.00 point) {9.0}

The meter of the Continuous Air Monitor is periodically calibrated using:

a. a Cs-137 source

b. a pulse signal generator

c. an internal check source

d. comparison readings obtained from portable instruments

Answer: C.009 b.
Reference: CAM Calibration Procedure

QUESTION: C.010 (1.00 point) {10.0}

Which ONE of the following describes a fuel-moderator element?

a. 20% enriched uranium contained within stainless steel cladding.

b. 12% enriched uranium contained within aluminum cladding.

c. 20% enriched uranium contained within aluminum cladding.

d. 12% enriched uranium contained within stainless steel cladding.

Answer: C.010 a. OR c. {either answer is acceptable} *
Reference: USGS Reactor Reference Material, Reactor Data.

QUESTION: C.011 (1.00 point) {11.0}

Which ONE of the following temperatures is measured by the thermocouples in the instrumented fuel element?

a. Inside surface of the fuel element cladding.

b. Outer surface of the fuel.

c. Interior of the fuel.

d. Center of the zirconium rod.

Answer: C.011 c.
Reference: Hazards Summary Report, Section 5.2.

QUESTION: C.012 (1.00 point) {12.0}

Pool water conductivity in the purification system is measured:

a. at the inlet to the demineralizer.

b. at the outlet of the flow meter.

c. at the discharge of the pump.

d. at the inlet of the filter.

Answer: C.012 a.
Reference: GSTR Cooling and Purification Systems diagram.

QUESTION: C.013 (1.00 point) {13.0}

The standard control rods have vents in the lower end of the barrel. The purpose of these vents is to:

a. provide viscous damping during reactor scrams.

b. provide a cooling water path through the barrel.

c. provide points where a lifting tool can be attached.

d. smooth out the thermal neutron flux distribution at the bottom of the barrel.

Answer: C.013 a.
Reference: Hazards Summary Report, Section 5.4.1.

QUESTION: C.014 (1.00 point) {14.0}

Which ONE of the following is the approximate worth of all control rods and transient rod?

a. 2.1% delta k/k.

b. 6.3% delta k/k.

c. 8.4% delta k/k.

d. 10.5% delta k/k.

Answer: C.014 ~~c.~~ Per facility comment, “b.” is the only acceptable answer *
Reference: Hazards Summary Report, Section 5.3.2.

THIS QUESTION DELETED FROM THE EXAMINATION

~~**QUESTION**: C.015 (1.00 point) {15.0}~~
~~Which ONE of the following is true for all control rods (i.e., safety, shim, regulating and transient rods)?~~
~~a. Contain graphite in the top and bottom sections.~~
~~b. Contain a fuel follower of about 15 inches.~~
~~c. Total length of about 43 inches.~~
~~d. Has a stroke of about 15 inches.~~
~~Answer: C.015 d.~~
~~Reference: USGS Reactor Reference Material, Reactor Data.~~

QUESTION: C.016 (1.00 point) {16.0}

The reactor is in the AUTOMATIC mode at a power level of 500 kW. The neutron detector from which the control system receives its input signal fails low (signal suddenly goes to zero). As a result:

a. the control system inserts the regulating rod to reduce power, to try to match the power of the failed detector.

b. the control system drops out of the AUTOMATIC mode into the MANUAL mode.

c. the control system withdraws the regulating rod to try to increase power.

d. the reactor scrams.

Answer: C.016 c.
Reference: Hazards Summary Report, Section 5.5.2.

QUESTION: C.017 (1.00 point) {17.0}

Which ONE of the following is the purpose of the bottom grid plate?

a. Provides support for core components.

b. Acts as a safety plate to prevent the possibility of a fuel rod dropping out of the core.

c. Acts as a safety plate to prevent the possibility of a control rod dropping out of the core.

d. Provides a catch plate for small tools and hardware which may have dropped into the core.

Answer: C.017 a.
Reference: Hazards Summary Report, Section 5.1.

QUESTION: C.018 (1.00 point) {18.0}

Water which has been treated by the Purification system is returned:

a. to the outlet of the heat exchanger.

b. to the inlet of the heat exchanger.

c. to the outlet of the primary pump.

d. directly to the reactor tank.

Answer: C.018 d.
Reference: USGS Reactor Reference Material, Training Resources.

QUESTION: C.019 (1.00 point) {19.0}

Which ONE of the following statements correctly describes the purpose of the potentiometer in the control rod drive assembly?

a. Provides voltage to relatch the connecting rod to the electromagnet.
b. Provides voltage as required for resetting the electromagnet current.
c. Provides a variable voltage to the rod drive motor for regulating control rod speed.
d. Provides rod position indication when the electromagnet engages the connecting rod armature.

Answer: C.019 d.
Reference: Hazards Summary Report, Section 5.4.1.

QUESTION: C.020 (1.00 point) {20.0}

Which ONE of the following describes the purpose of the Pull Rod in a control rod drive assembly?

a. Actuates the rod down microswitch.
b. Provides rod full out position indication.
c. Automatically engages the control rod on a withdraw signal.
d. Provides a means for manually adjusting the rod position by pulling rod out.

Answer: C.020 a.
Reference: Hazards Summary Report, Section 5.4.

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