July 23, 2004

Dr. Mohamad Al-Sheikhly, Director
Radiation Facilities
2309A Chemical and Nuclear Engineering Building
University of Maryland
College Park, MD 20742-2115

SUBJECT: INITIAL EXAMINATION REPORT NO. 50-166/OL-04-01
UNIVERSITY OF MARYLAND

Dear Dr. Al-Sheikhly:

During the week of June 28, 2004, the NRC administered operator licensing examinations at your Maryland University Training Reactor. The examination was conducted in accordance with NUREG-1478, "Non-Power Reactor Operator Licensing Examiner Standards," Revision 1.

In accordance with 10 CFR 2.790 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 document system (ADAMS). ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) http://www.nrc.gov/NRC/ADAMS/indesx.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 at 301-415-4094 or via Internet e-mail at pty@nrc.gov.

Sincerely,

/RA/

Patrick M. Madden, Section Chief
Research and Test Reactors Section
Operating Reactor Improvements Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No. 50-166

Enclosures: 1. Initial Examination Report No. 50-166/OL-04-01
2. Examination and answer key

cc w/enclosures:
Please see next page

cc:

Director, Dept. of Natural Resources
Power Plant Siting Program
Energy & Coastal Zone Administration
Tawes State Office Building
Annapolis, MD 21401

Mr. Roland Fletcher, Director
Center for Radiological Health
Maryland Department of Environment
201 West Preston Street
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Department of Materials and
Nuclear Engineering
University of Maryland
College Park, MD 20742

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ADAMS PACKAGE ACCESSION NO.: ML040710294
ADAMS REPORT ACCESSION NO.: ML042030302 **TEMPLATE #: NRR-074**

OFFICE	RNRP:CE		IEHB:LA	E	RNRP:SC	
NAME	PYoung:vxj		EBarnhill		PMadden	
DATE	07/ 20 /2004		07/ 20 /2004		07/ 23 /2004	

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

REPORT NO.: 50-166/OL-04-01

FACILITY DOCKET NO.: 50-166

FACILITY LICENSE NO.: R-70

FACILITY: University of Maryland

EXAMINATION DATES: 06/28/2004

EXAMINER: Warren J. Eresian, Chief Examiner

SUBMITTED BY: _____ 07/14/2004
Warren J. Eresian, Chief Examiner Date

SUMMARY:

During the week of June 28, 2004, NRC administered Operator Licensing examinations to 1 Reactor Operator (RO). The one RO candidate passed the examinations.

ENCLOSURE 1

REPORT DETAILS

1. Examiners:

   Warren J. Eresian, Chief Examiner
   Phillip T. Young

2. Results:

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

3. Exit Meeting:

   Personnel attending:

   Vince Adams, Operations Manager, Maryland University Training Reactor
   Phillip T. Young, NRC

   There were no generic concerns raised by the examiner. The examiner thanked the facility for their support in conducting the examinations.

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

FACILITY: MARYLAND UNIVERSITY TRAINING REACTOR

REACTOR TYPE: TRIGA

DATE ADMINISTERED: 2004/06/28

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 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	**33.3**	_____	____	**A.**	**REACTOR THEORY, THERMODYNAMICS**

					AND FACILITY OPERATING CHARACTERISTICS
20.00	**33.3**			**B.**	**NORMAL AND EMERGENCY OPERATING PROCEDURES AND RADIOLOGICAL CONTROLS**
20.00	**33.3**			**C.**	**FACILITY AND RADIATION MONITORING SYSTEMS**
60.00			**%**		**TOTALS**
		FINAL GRADE			

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

_____

Candidate's Signature

ENCLOSURE 2

QUESTION A.001 {1.0 point}

A control rod is withdrawn from the core.

Which of the following explains the reactivity addition from the rod?

a. Reactivity addition will be equal for each inch of withdrawal.
b. Reactivity addition per inch will be greatest in the top fourth of the core.
c. Reactivity addition per inch will be greatest from 40% to 60% withdrawn.
d. Reactivity addition per inch will be greatest in the bottom fourth of the core.

ANSWER A.001 c.
REFERENCE ENNU 320, section 7.4.1. ENNU 320, volume 2, figure 3-15 and 3-16. FSAR section 3.3.3.

QUESTION A.002 {1.0 point}

A reactor startup is in progress by withdrawing a control rod and then waiting until count rate stabilizes. The reactor is not critical. Assume that the control rod is being withdrawn in equal amounts each time and each control rod withdrawal adds equivalent amounts of reactivity.

Compare two consecutive control rod withdrawals.

a. Time for power to stabilize will be equal for both withdrawals and the power increase will be the same for both withdrawals.

b. The power increase will be the same for both withdrawals but time for power to stabilize will be longer for the second withdrawal.

c. The power increase will be the same for both withdrawals but the time for power to stabilize will be less for the second withdrawal.

d. The power increase will be larger for the second withdrawal and the time for power to stabilize will be longer for the second withdrawal.

ANSWER A.002 d.
REFERENCE ENNU 320, section 8.3.

QUESTION A.003 {1.0 point}

Which of the following is the MAJOR cause for negative reactivity insertion upon an increase in fuel temperature?

An increase in fuel temperature will increase the probability that:

a. thermal neutrons will gain energy from hydrogen atoms in the fuel.
b. fast neutrons will gain energy from hydrogen atoms in the fuel.
c. thermal neutrons will be absorbed by zirconium.
d. neutrons will be resonantly absorbed in the fuel.

ANSWER A.003 a.
REFERENCE FSAR section 3.3.2. page 3-6

QUESTION A.004 {1.0 point}

The term that considers the effects of both the fuel temperature coefficient of reactivity and the moderator temperature coefficient of reactivity is the:

a. effective temperature coefficient of reactivity.
b. combined temperature coefficient of reactivity.
c. transient coefficient of reactivity.
d. power coefficient of reactivity.

ANSWER A.004 d.
REFERENCE ENNU 320, Vol. 1, Sect 9.3.3

QUESTION A.005 {1.0 point}

Withdrawal of a control rod predominantly affects K_{eff} by changing the:

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

ANSWER A.005 b.
REFERENCE ENNU 320, Section 9.2.

QUESTION A.006 {1.0 point}

The first reactor startup of the week has been completed and the reactor has been operating at 240 kw using manual rod control for approximately one hour. The operator inserts the control rod in order to maintain power constant.

The rod must be inserted to compensate for which of the following conditions?

a. Increase in moderator temperature.
b. Decrease in fuel concentration.
c. Increase in fuel temperature.
d. Increase in xenon.

ANSWER A.006 a.
REFERENCE ENNU 320 section 9.3.2.

QUESTION A.007 {1.0 point}

Which of the following heat transfer mechanisms provides cooling for the core?

a. Conduction.
b. Mixed convection.
c. Forced convection.
d. Natural convection.

ANSWER A.007 d.
REFERENCE SAR section 4.6

QUESTION A.008 {1.0 point}

Reactor power is being raised from 100 milliwatts to 225 kW using manual reactor control. A positive reactor period was established at 100 milliwatts. Select the power at which fuel temperature coefficient will begin to be apparent.

a. 500 watts
b. 2 kW
c. 10 kw
d. 50 kw

ANSWER A.008 c.
REFERENCE OP 104, step 4.4.

QUESTION A.009 {1.0 point}

The end of the fuel cycle, or end of core life, for the reactor occurs when:

a. the reactor cannot become critical.
b. xenon concentration reaches equilibrium.
c. shim rods are fully withdrawn at rated power.
d. the regulating rod is fully withdrawn in automatic before reaching rated power.

ANSWER A.009 a.
REFERENCE ENNU 320, Sect. 9.4

QUESTION A.010 {1.0 point}

Doppler broadening provides what percentage of the effect of the prompt negative temperature coefficient?

a. 5 %
b. 10 %
c. 15 %
d. 20 %

ANSWER A.010 b.
REFERENCE FSAR section 3.3.2.

QUESTION A.011 {1.0 point}

In the MUTR reactor at full power, the thermal neutron flux is 2.5 E12 neutrons per square centimeter per second and the macroscopic fission cross-section is 0.1 per centimeter. The fission reaction rate is:

a. 2.5 E11 fissions/sec
b. 2.5 E13 fissions/sec
c. 2.5 E11 fissions/cubic cm/sec
d. 2.5 E13 fissions/cubic cm/sec

ANSWER A.011 c. Fission reaction rate = (flux)(macroscopic cross-section)
REFERENCE ENNU 320 MANUAL, VOL. 1, Page 6-4

QUESTION A.012 {1.0 point}

Which condition below describes a reactor which is exactly critical.

a. k = 1; delta k/k = 1
b. k = 1; delta k/k = 0
c. k = 0; delta k/k = 1
d. k = 0; delta k/k = 0

ANSWER A.012 b.
REFERENCE Standard NRC Question

QUESTION A.013 {1.0 point}

In the MUTR reactor, a reactivity insertion of 20 cents corresponds approximately to:

a. 0.0010 delta k/k
b. 0.0014 delta k/k
c. 0.0020 delta k/k
d. 0.0029 delta k/k

ANSWER A.013 b. reactivity($) = reactivity(delta k/k)/0.0070
REFERENCE ENNU 320 Section 7.4

QUESTION A.014 {1.0 point}

Thermalization of neutrons is accomplished most efficiently when the moderator has a:

a. LOW atomic mass number and HIGH scattering cross-section
b. HIGH atomic mass number and HIGH scattering cross-section
c. LOW neutron absorption cross-section and LOW scattering cross-section
d. LOW neutron absorption cross-section and HIGH atomic mass number

ANSWER A.014 a.
REFERENCE ENNU 320 Section 6.1

QUESTION A.015 {1.0 point}

As a result of beta decay:

a. The atomic mass number decreases by 1, and the number of protons remains constant.
b. The atomic mass number remains constant, and the number of protons increases by 1.
c. The atomic mass number decreases by 1, and the number of protons decreases by 1.
d. The atomic mass number remains constant, and the number of protons remains constant.

ANSWER A.015 b.
REFERENCE ENNU 320 MANUAL, VOL. 1, Page 5-1

QUESTION A.016 {1.0 point}

The principal reason for operating with thermal neutrons rather than fast neutrons is that:

a. neutron efficiency is increased since thermal neutrons are less likely to leak out of the core
b. reactors operating primarily on fast neutrons are inherently unstable and cannot be safely controlled
c. the fission cross section of the fuel is much higher for thermal neutrons
d. fuel temperature and moderator temperature coefficients become positive as neutron energy increases

ANSWER A.016 c.
REFERENCE ENNU 320 MANUAL, Page 6-1

QUESTION A.017 {1.0 point}

What is the stable reactor period which produces a power rise from 15 watts to 50 kilowatts in 243 seconds?

a. 10 seconds
b. 30 seconds
c. 40 seconds
d. 60 seconds

ANSWER A.017 b. $P(t)=P(0)\exp(t/T)$
REFERENCE ENNU 320 MANUAL VOL. 1, Page 9-3

QUESTION A.018 {1.0 point}

With the reactor on a constant period, which transient requires the LONGEST time to occur?

A reactor power change of:

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

ANSWER A.018 a.
REFERENCE ENNU 320 MANUAL VOL. 1, Page 9-3

QUESTION A.019 {2.0 points}

A 1/M plot is used to predict criticality during fuel bundle loading. From the data below and the graph provided, criticality will occur after which fuel bundle is loaded?

a. 20th bundle
b. 22nd bundle
c. 24th bundle
d. 26th bundle

Count Rate	# of Fuel Bundles
842	2
936	4
1123	7
1684	12
2807	16

ANSWER A.019 b.
REFERENCE ENNU 320 MANUAL VOL. 1, Page 8-3

QUESTION A.020 {1.0 point}

Which of the following elements has the highest neutron absorption cross section?

a. Uranium 235
b. Samarium 149
c. Boron 10
d. Xenon 135

ANSWER A.020 d.
REFERENCE ENNU 320 MANUAL Vol. 1, Page 9-7

QUESTION B.001 {1.0 point}

Which one of the following statements correctly describes the facility manning requirements for the conditions described in the statement?

a. One Senior Reactor Operator must be present in the Chemical & Nuclear Engineering building during the initial reactor startup of the day.

b. The duty Senior Reactor Operator must be present in the control room during the initial reactor startup of the day.

c. One other person must be present in the Chemical & Nuclear Engineering building when the reactor is critical.

d. The Reactor Director be present in the Chemical & Nuclear Engineering building during reactor operation.

ANSWER B.001 c.
REFERENCE OP 101

QUESTION B.002 {1.0 point}

The performance of routine experiments must be approved by:

a. the Reactor Director
b. the Reactor Safety Committee
c. the duty Senior Reactor Operator
d. the licensed Reactor Operator at the control console

ANSWER B.002 c.
REFERENCE OP 105, Page 3

QUESTION B.003 {1.0 point}

The initial startup checkout is required to be performed:

a. prior to the first startup of the week
b. prior to the first startup of the day of each day's operation
c. prior to the startup of an operation extending more than 8 hours
d. prior to each startup where irradiation experiments have been changed

ANSWER B.003 b.
REFERENCE OP 101

QUESTION B.004 {1.0 point}

How would an accessible area be posted if the radiation level in the area is 65 mR/hr?

a. CAUTION- RADIATION AREA
b. CAUTION- RESTRICTED AREA
c. CAUTION- HIGH RADIATION AREA
d. CAUTION- AIRBORNE RADIOACTIVITY AREA

ANSWER B.004 a.
REFERENCE ENNU 320 MANUAL Vol.1, Appendix A-29

QUESTION B.005 {1.0 point}

Which ONE of the following would be classified as an ALERT in accordance with the Emergency Plan?

a. Fire within the reactor building.
b. Bomb threat over the telephone.
c. Failure of an experiment involving release of radiation within the reactor building.
d. Significant loss of water from the reactor pool tank exceeding normal and emergency makeup capabilities.

ANSWER B.005 d.
REFERENCE Emergency Plan Page 4-2

QUESTION B.006 {1.0 point}

While the reactor is shutdown, work has been ongoing to set up a radiation experiment in an open beamport. The work group is breaking for lunch, which ONE of the following actions MUST be taken?

a. With the beamport left open, the Reactor Director has to ensure that a “High Radiation Area” is established with a control device which will activate a conspicuous audio or visual alarm.

b. Ropes or other barriers shall be placed so as to prevent personnel from entering and disturbing the experiment area.

c. No specific action(s) are required unless the beamport is to remain open while the reactor is critical.

d. Re-connect the interlocking safety cable to the outer plug.

ANSWER B.006 b.
REFERENCE OP 105

QUESTION B.007 {1.0 point}

Plant parameters (such as control rod positions, fuel temperature, etc.) are required to be logged in the Control Room Log Book at which ONE of the following intervals?

a. Every hour while critical
b. Every half-hour while critical
c. Every hour for steady-state operations of greater than one hour
d. Every half-hour for steady-state operations of greater than a half-hour

ANSWER B.007 d.
REFERENCE OP 104, Page 2

QUESTION B.008 {1.0 point}

The MUTR SHUTDOWN MARGIN of the shall not be less than:

a. $1.00, plus the reactivity value of the total reactivity worth of in-core experiments that effect reactivity.

b. $0.50, even if the highest worth control rod should remain in the fully withdrawn position.

c. $0.50, as long as the reactivity worth of all experiments is less than $1.00.

d. $1.00.

ANSWER B.008 b.
REFERENCE Technical Specifications Section 3.1, Page 7

QUESTION B.009 {1.0 point}

When a REPORTABLE OCCURRENCE as defined by Technical Specifications has been observed to occur, the operator should first:

a. Evacuate all personnel from the Reactor Building
b. Immediately notify the Reactor Director
c. Immediately notify the duty SRO
d. Secure the reactor console

ANSWER B.009 d.
REFERENCE EP 403, Page 2

QUESTION B.010 {1.0 point}

In accordance with 10 CFR 20, which ONE of the following is the radiation dose standard for individuals in restricted areas per calendar quarter (assume NRC Form 4 is on file)?

a. Whole body 3.75 Rem
   Hands and forearms 18.75 Rem

b. Lens of the eye 1.25 Rem
   Skin of whole body 18.75 Rem

c. Skin of whole body 5 Rem
   Hands and forearms 5 Rem

d. Whole body 1.25 Rem
   Lens of the eye 3.75 Rem

ANSWER B.010 d.
REFERENCE RADIATION SAFETY MANUAL, UNIVERSITY of MARYLAND, 2.2.1. Occupational Dose Limits

QUESTION B.011 {1.0 point}

SAFETY LIMITS, as defined by MUTR Technical Specifications, are:

a. Settings for automatic protective devices related to those variables having significant safety functions

b. Administratively established constraints on equipment and operational characteristics which shall be adhered to during operation of the facility

c. Limits on important process variables which are found to be necessary to reasonably protect the integrity of certain physical barriers which guard against the uncontrolled release of radioactivity

d. Systems which are designed to initiate automatic reactor protection or to provide information for initiation of manual protective action.

ANSWER B.011 c.
REFERENCE Technical Specifications Section 1.0 item 1.30, Page 4

QUESTION B.012 {1.0 point}

For a situation which requires the evacuation of personnel from the Reactor Building, the control room operator should FIRST:

a. Secure the reactor console

b. Activate the building evacuation alarm

c. Assemble all personnel at the Evacuation Assembly Area

d. Notify the duty SRO

ANSWER B.012 a.
REFERENCE EP 401, Page 1

QUESTION B.013 {1.0 point}

Which of the following experiment configurations would be allowed?

a. A single non-secured experiment having a reactivity worth of 1.15 dollars.

b. Three non-secured experiments having a reactivity worth of 0.85 dollars each.

c. Two in-core experiments, one having a reactivity worth of 1.25 dollars and the other having a reactivity worth of 0.50 dollars.

d. Four in-core experiments, two having a reactivity worth of 0.80 dollars each and the other two having a reactivity worth of 0.70 dollars each.

ANSWER B.013 b.
REFERENCE Technical Specification 3.5, pg. 13.

QUESTION B.014 {1.0 point}

A radioactive sample which initially was reading 50 R/hr has decayed over 8 hours to 25 R/hr. What will the sample read in another 4 hours?

a. 12.5 R/hr

b. 17.8 R/hr

c. 18.8 R/hr

d. 22.9 R/hr

ANSWER B.014 b.
REFERENCE ENNU 320 Manual, Nuclear Reactor Operations, Section 5.1.2, pg. 5-2.
A = AO * e exp(-lambda * time)
25 = 50 * e exp(-lambda * 8 * 3600); lambda = 2.4 exp-5/sec
A = 25 * e exp(-2.4 exp-5 * 4 * 3600); A = 17.7

QUESTION B.015 {1.0 point}

Which of the following types of radiation has the largest quality factor?

a. Neutron
b. X-ray
c. Gamma
d. Alpha

ANSWER B.015 d.
REFERENCE 10CFR20.104(b)

QUESTION B.016 {1.0 point}

During routine performance of the reactor room air sample gamma ray analysis, which of the following would be indicative of possible cladding failure?

a. Krypton
b. Argon
c. Nitrogen
d. Radon

ANSWER B.016 a.
REFERENCE SP 210, Reactor Room Air Sample Gamma Ray Analysis, Step 3.2, pg. 1.

QUESTION B.017 {1.0 point}

A "Controlled Copy" of the MUTR Operating Procedures (OPs) is maintained in which one of the following locations?

a. MUTR Reactor Files
b. Reactor Director's Office
c. MUTR Training Manual
d. Reactor Emergency Box Nos. 1 & 2

ANSWER B.017 b.
REFERENCE OP 100, Control And Maintenance Of Procedures, Step 2.4, pg. 1.

QUESTION B.018 {1.0 point}

Which ONE of the following Senior Reactor Operator (SRO) and Reactor Operator (RO) staffing requirements must be satisfied before moving fuel?

a. An SRO must supervise the movement from the reactor bridge; an RO must monitor from the control console.

b. An SRO must be in the Chemical and Nuclear Engineering Building; an RO must supervise the fuel movement from the reactor bridge.

c. Two (2) SROs must be present - one supervising from the reactor bridge and the other available in the Chemical and Nuclear Engineering Building.

d. An SRO must be accessible on the College Park campus; two (2) ROs must be available to move fuel - one supervising from the reactor bridge and the other monitoring from the control console.

ANSWER B.018 a.
REFERENCE MP-303, Sect. 2.1

QUESTION B.019 {1.0 point}

To determine the Primary Coolant ion exchanger inlet conductivity, the:

a. Primary Coolant pump is used and the conductivity is measured from a local sample.
b. Diffuser Pump is used and the conductivity is measured from a local sample.
c. Primary Coolant Pump is used and the resistivity is read on the reactor console.
d. Diffuser Pump is used and the resistivity is read on the reactor console.

ANSWER B.019 c.
REFERENCE SP 206, Pool Water Conductivity Determination, Step 4.1 & 4.7, pg. 2.

QUESTION B.020 {1.0 point}

Upon completion of fuel movement, the fuel handling tool is secured and locked:

a. inside the hot room.
b. inside the water room.
c. to the reactor bridge rail.
d. to a wall bracket on the balcony level.

ANSWER B.020 c.
REFERENCE MP 303, Fuel Movement, Step 4.5, pg. 3.

QUESTION C.001 {1.0 point}

The compensated ion chamber is able to discriminate between:

a. Gamma and Beta radiation
b. Gamma and Alpha radiation
c. Neutrons and fission fragments
d. Neutrons and Gamma radiation

ANSWER C.001 d.
REFERENCE ENNU 320 MANUAL VOL. 1, Page 10-3

QUESTION C.002 {1.0 point}

While attempting to pull rods for a reactor startup, the reactor operator realizes that the rods are not withdrawing. Which one of the following conditions could be the cause of the rods not moving?

a. Beam Tube interlock bypass key switch is in “BYPASSED.”

b. Beam Tube interlock bypass amber light on the console is illuminated.

c. Beam Tube cover is in place with the interlock bypass key switch OFF.

d. Beam Tube interlock bypass amber light is OFF and the cover is NOT in place

ANSWER C.002 d.
REFERENCE Technical Specifications Table 3.2

QUESTION C.003 {1.0 point}

A Compensated Ion Chamber is used as a detector in the:

a. Safety Channel #1
b. Safety Channel #2
c. Wide Range Linear Channel
d. Wide Range Log Power Channel

ANSWER C.003 c.
REFERENCE: SAR Section 7.4.1.2

QUESTION C.004 {1.0 point}

The instrumented fuel rod will measure a core temperature that is:

a. lower than the temperature at the core hot spot by no more than ½ .
b. the highest fuel rod temperature during accident conditions.
c. the highest fuel rod temperature during normal conditions.
d. equal to the average of all fuel rod temperatures.

ANSWER C.004 a.
REFERENCE Technical Specifications 2.2 & SAR 4.6

QUESTION C.005 {1.0 point}

Which ONE of the following will result in a Shim rod withdrawal inhibit?

a. Log power level = 0.5 counts/second
b. Regulating rod = fully withdrawn
c. Fuel temperature = 350 deg C
d. Reactor period = 10 seconds

ANSWER C.005 a.
REFERENCE SAR Section 7 and Technical Specification Table 3.2: Reactor Safety Channels: Interlocks

QUESTION C.006 {1.0 point}

Which ONE of the following type of detector is used in the Radiation Area Monitoring System?

a. Geiger-Mueller tube
b. Scintillation Detector
c. Ionization Chamber
d. Proportional Counter

ANSWER C.006 a.
REFERENCE SAR 7.1.5, Radiation Monitoring Systems

QUESTION C.007 {2.0 points}

For the items labeled A through E on Figure 1 and listed in Column I, select the proper component from the item list in Column II. (Items in Column II may be used once, more than once, or not at all. Only one answer may occupy a space in Column I.) (5 required at 0.40 each)

COLUMN I (Figure Label)	COLUMN II (Component Item List)
_____A.	1. Compensated Ion Chamber
_____B.	2. Instrumented Fuel Rod
_____C.	3. Shim Rod
_____D.	4. Uncompensated Ion Chamber
_____E.	5. Fission Chamber
	6. Regulating Rod
	7. Startup Source

ANSWER C.007 A,6; B,4 ; C,1 ; D,2 ; E,7
REFERENCE SAR Figure 4-9

QUESTION C.008 {1.0 points}

Which ONE of the following methods is used to measure the flow rate through the primary coolant pump?

D. The change in pressure across a Venturi is converted to a flow signal.

E. The change in pressure across a flow orifice is converted to a flow signal.

f. The force of water through a transparent tube lifts a metal plug in the tube.

g. An inline rotary paddle connected to a permanent magnet generator produces a signal proportional to flow.

ANSWER C.008 b.
REFERENCE SAR Section 5.2

QUESTION C.009 {2.0 point}

For the items labeled A through E on Figure 2 and listed in Column I, select the proper component from the item list in Column II. (Items in Column II may be used once, more than once, or not at all. Only one answer may occupy a space in Column I) (5 required at 0.40 each)

COLUMN I (Figure Label)	COLUMN II (Component Item List)
_____A.	1. Magnet
_____B.	2. Connecting Rod
_____C.	3. Pull Rod
_____D.	4. Barrel
_____E.	5. Armature
	6. Magnet Draw Tube
	7. Foot
	8. Pull Rod Housing

ANSWER C.009 A,6 ; B,1; C,5; D,2; E, 3
REFERENCE SAR Figure 4-12

QUESTION C.010 {1.0 point}

Which ONE of the following is the full flow through the primary loop and the demineralizer loop?

a. 90 GPM total flow with 15 GPM through the demineralizer loop
b. 100 GPM total flow with 20 GPM through the demineralizer loop
c. 110 GPM total flow with 30 GPM through the demineralizer loop
d. 120 GPM total flow with 12 GPM through the demineralizer loop

ANSWER C.010 d.
REFERENCE SAR Section 5.2

QUESTION C.011 {1.0 point}

Which ONE of the following conditions will result in a reactor scram?

a. Fuel temperature = 400 deg F
b. Reactor period = 6 seconds
c. Bridge radiation = 40 mR/hr
d. Power = 125%

ANSWER C.011 d.
REFERENCE Technical Specifications Table 3.1: Reactor Safety Channels: Scram Channels

QUESTION C.012 {1.0 point}

Which ONE of the following is the definition of a REM? A REM is

a. a measure of the dose of any ionizing radiation to body tissues in terms of the energy absorbed per unit mass of the tissue.

b. a quantity of radiation absorbed, per unit of mass, by the body or by any portion of the body.

c. is equal to an absorbed dose of 100 ergs/gram or 0.01 joule/kilogram.

d. equal to the absorbed dose in rads multiplied by the quality factor.

ANSWER C.012 d.
REFERENCE 10 CFR 20

QUESTION C.013 {1.0 point}

Which ONE of the following conditions describe the onset of reactor criticality during a reactor startup?

A. No rod motion, positive period, increasing count rate
B. No rod motion, infinite period, stable count rate
C. No rod motion, infinite period, increasing count rate
D. Rod withdrawing, positive period, increasing counts

ANSWER C.013 a.
REFERENCE OP 103, Page 2

QUESTION C.014 {1.0 point}

Select the setpoint for the high radiation scram that is initiated by the building exhaust vent radiation monitor.

a. 8 mrem/hr
b. 10 mrem/hr
c. 30 mrem/hr
d. 50 mrem/hr

ANSWER C.014 b.
REFERENCE SP 205

QUESTION C.015 {1.0 point}

It is desired to raise power to 30 kW in automatic. Which of the following would be the correct setting for the %-Demand control and reactor power range switch?

a. 100 with the range switch in 30 kw position.
b. 30 with the range switch in 30 kw position.
c. 30 with the range switch in 10 kw position.
d. 33 with the range switch in the 10 kw position.

ANSWER C.015 c.
REFERENCE MUTR OP-104 step 6.2 Caution.

QUESTION C.016 {1.0 point}

The reactor is at 100% power when the RO inadvertently depresses the CONT/ON pushbutton for shim rod 1. Five minutes later which one of the following represents the status of the indicating lights for shim rod 1? (Assume no other operator performed actions)

a. Rod Up Light ON
   Contact Light OFF
   Down Light OFF
   Magnet Current Light ON

b. Rod Up Light ON
   Contact Light OFF
   Down Light ON
   Magnet Current Light ON

c. Rod Up Light OFF
   Contact Light ON
   Down Light ON
   Magnet Current Light OFF

d. Rod Up Light OFF
   Contact Light ON
   Down Light ON
   Magnet Current Light ON

ANSWER C.016 d.
REFERENCE SAR 7.3, REACTOR CONTROL SYSTEM

Question C.017 {1.0 point}

Air contamination greater than the setpoint has been detected by the exhaust air radiation monitor. Which one of the following is the ventilation system response?

a. The supply system will automatically stop.

b. The exhaust system will be secured automatically.

c. The exhaust system will automatically stop, dampers will direct air through filters purging the room at 150 cfm.

d. The supply system will automatically stop, dampers will direct air through filters purging the room at 150 cfm.

ANSWER C.017 b.
REFERENCE SAR 7.5, ENGINEERED SAFETY FEATURES ACTUATION SYSTEMS

Question C.018 {1.0 point}

Which choice correctly completes the following statement?

The fuel in the MUTR is a homogeneous mixture of uranium-_____ hydride alloy containing _____% by weight of uranium enriched to <_____%.

a. graphite, 20, 8.5

b. graphite, 8.5 , 20

c. zirconium, 20, 8.5

d. zirconium, 8.5, 20

ANSWER C.018 d.
REFERENCE FSAR {1984} 3.3.1, Fuel Moderator Elements & SAR 4.2.1.1, Fuel Moderator Elements