ENCLOSURE 1

EXAMINATION REPORT - 50-160/OL-85-01

Facility Licensee: Georgia Institute of Technology
225 North Avenue
Atlanta, GA 30332

Facility Name: Georgia Tech Research Center

Facility Docket No. 50-160

Written and operating examinations were administered at the Georgia Tech Research Reactor in Atlanta, Georgia.

Chief Examiner: Thomas Rogers — Date Signed: 7/25/85

Approved by: Bruce A. Wilson, Section Chief — Date Signed: 7/30/85

Summary:

Examinations on July 10 - 11, 1985

Written and operating examinations were administered to one senior reactor operator candidate who passed.

Written examinations were administered to two reactor operator candidates; both of whom failed. One reactor operator candidate withdrew his application for a license prior to completion of the oral examination and the other withdrew his application prior to commencement of his oral examination.

REPORT DETAILS

1. Facility Employees Contacted:

*Dr. R. A. Karam, Director of Nuclear Research Center
*D. McDowell, Reactor Supervisor

*Attended Exit Meeting

2. Examiners:

*T. Rogers, USNRC

*Chief Examiner

3. Examination Review Meeting

At the conclusion of the written examinations, the examiners met with Dr. Karam, and Mr. Dean McDowell to review the written examination and answer key. The following comments were made by the facility reviewers:

a. SRO Exam

Question J.02

Facility Comment: The setpoint indicated for J.02.3(b) should be 137F instead of 125F. Reference material was provided by the reviewers.

NRC Resolution: The answer key has been changed to 137F.

b. RO Exam

(1) Question B.03

Facility Comment: The Bismuth gamma shield cooling medium has been changed to light water. Reference material was provided by the reviewers.

NRC Resolution: The answer key has been changed to light water.

(2) Question C.05

Facility Comment: The gasoline generator is now powered by natural gas. The reviewers agreed, however, that the fuel supply had no bearing on the answer or the validity of the question.

NRC Resolution: No change is required for this question.

(3) Question E.07

Facility Comment: The question is confusing because reactivity increases are not caused by steam void formation.

NRC Resolution: The question was incorrectly stated since it should have been directed to the collapsing of steam voids. The question has been deleted from the examination.

4. NRC Post Grading Review

Following the review of graded examinations in accordance with NUREG-1021, ES-108, Quality Assurance Program for Review of Graded Examinations, the following changes were made to the answer key and the effected examinations were regraded accordingly:

SRO Examination

Question K.06

The responses listed below were also accepted as correct since they correctly answered the question in accordance with the GTRR Operating Procedure 1500.

CR-1
DO
Area monitors
Kanne air monitors
Gas monitors
Rod position
Log N
Scaler
Count rate

5. Exit Meeting

At the conclusion of the site visit the examiners met with representatives of the plant staff to discuss the results of the examination. Those individuals who clearly passed the operating examination were identified.

There were generic weaknesses noted during the oral examination. The areas of below normal performance were familiarity with the facility both in and outside of the control room and emergency and operating procedures.

The licensee did not identify as proprietary any of the material provided to or reviewed by the examiners.

ENCLOSURE 3

U. S. NUCLEAR REGULATORY COMMISSION
REACTOR OPERATOR LICENSE EXAMINATION

FACILITY: GEORGIA INSTITUTE OF TECH.

REACTOR TYPE: TEST

DATE ADMINISTERED: 85/07/10

EXAMINER: TOM ROGERS

APPLICANT: MASTER

INSTRUCTIONS TO APPLICANT:

Use separate paper for the answers. Write answers on one side only. Staple question sheet on top of the answer sheets. Points for each question are indicated in parentheses after the question. The passing grade requires at least 70% in each category and a final grade of at least 80%. Examination papers will be picked up six (6) hours after the examination starts.

CATEGORY VALUE	% OF TOTAL	APPLICANT'S SCORE	% OF CATEGORY VALUE	CATEGORY
14.00	14.00			A. PRINCIPLES OF REACTOR OPERATION
14.00	14.00			B. FEATURES OF FACILITY DESIGN
14.00	14.00			C. GENERAL OPERATING CHARACTERISTICS
14.50	14.50			D. INSTRUMENTS AND CONTROLS
14.50	14.50			E. SAFETY AND EMERGENCY SYSTEMS
14.50	14.50			F. STANDARD AND EMERGENCY OPERATING PROCEDURES
14.50	14.50			G. RADIATION CONTROL AND SAFETY
100.00	100.00			TOTALS

FINAL GRADE _____%

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

_____
APPLICANT'S SIGNATURE

QUESTION A.01 (1.00)

Reactor buckling has the greatest effect on the

a. neutron leakage from the core.

b. resonance escape probability.

c. fast fission factor.

d. thermal utilization factor.

QUESTION A.02 (1.00)

The units of neutron flux are

a. neutrons/sec.

b. (neutrons-cm)/(cm cubed-sec).

c. neutrons/cm squared.

d. neutrons/(cm-sec).

QUESTION A.03 (1.00)

A subcritical reactor with a neutron source strength of 20 cps and a source range count rate of 200 cps has a keff of (assume a proportionality constant of 1.0)

a. 0.85.

b. 0.90

c. 0.95

d. 0.99.

(***** CATEGORY A CONTINUED ON NEXT PAGE *****)

QUESTION A.04 (1.00)

Delayed neutrons allow an operator more control of the reactor because

a. there are more delayed neutrons than prompt neutrons.

b. delayed neutrons are born at a higher energy level than prompt neutrons.

c. delayed neutrons decrease the average neutron generation time.

d. delayed neutrons increase the average neutron generation time.

QUESTION A.05 (1.00)

During a power escalation on the Log N channel, it takes 30 seconds to double reactor power level. Which of the following is the stable reactor period that would cause this rate of change?

a. 21 seconds

b. 30 seconds

c. 39 seconds

d. 43 seconds

QUESTION A.06 (1.00)

Which of the following is the correct definition of microscopic cross section?

a. The actual target area of the nucleus.

b. The effective target area of the nucleus.

c. The total actual target area of all nuclei within the core.

d. The total effective target area of all nuclei within the core.

(***** CATEGORY A CONTINUED ON NEXT PAGE *****)

QUESTION A.07 (1.00)

Which of the following is defined as 'the fractional change in neutron population per generation'?

a. keff

b. Delta k

c. Reactivity

d. Delta reactivity

QUESTION A.08 (1.00)

A 1/M curve that predicts criticality early is referred to as which of the following?

a. Useless

b. Conservative

c. Non-conservative

d. Ideal

QUESTION A.09 (1.00)

Which of the following can be defined as 'the number of neutrons causing fission that were originally born delayed divided by the total number of neutrons causing fission?

a. Lambda effective

b. Rho

c. Beta effective

d. Tau

(***** CATEGORY A CONTINUED ON NEXT PAGE *****)

QUESTION A.10 (1.00)

Which of the following terms is defined as 'the energy equivalent of the mass defect'?

a. Excitation energy

b. Binding energy

c. Fission energy

d. Critical energy

QUESTION A.11 (1.00)

Which of the following terms of the six-factor formula has the highest value?

a. Fast Fission Factor

b. Reproduction Factor

c. Thermal Utilization Factor

d. Thermal Non-leakage Probability

QUESTION A.12 (1.00)

List the variables associated with core thermal and hydraulic performance considered in determining the Safety Limits of Tech Specs for forced convection flow.

QUESTION A.13 (1.00)

What two power calculations must be performed to get total power for a Reactor Power Calibration?

(***** CATEGORY A CONTINUED ON NEXT PAGE *****)

QUEST [illegible] A.14 (1.00)

The heat transfer mechanism from the fuel to the coolant becomes film boiling at what DNBR?

a. 0.0

b. 1.0

c. 1.3

d. 1.7

***** END OF CATEGORY A *****

QUESTION B.01 (1.00)

The atmosphere above the moderator is maintained free of water vapor by a(n)

a. nitrogen gas blanket.

b. helium gas blanket.

c. hydrogen gas blanket.

d. argon gas blanket.

QUESTION B.02 (1.00)

List the four materials used to makeup the biological shield surrounding the graphite reflector.

QUESTION B.03 (1.00)

What is the cooling medium for the bismuth gamma shield for the bio-medical research shielded room?

QUESTION B.04 (1.00)

How is neutron attenuation accomplished for the bio-medical research shielded room?

QUESTION B.05 (.50)

Which type of control rod has vertical motion through the reactor core?

QUESTION B.06 (.50)

Which type of control rod has the highest reactivity worth per rod?

(***** CATEGORY B CONTINUED ON NEXT PAGE *****)

QUESTION 8.07 (1.00)

What means of ingress is available to the bio-medical research shielded room in the event of the shield door failing shut?

QUESTION 8.08 (1.00)

Explain how a constant water level is maintained in the reactor vessel.

QUESTION 8.09 (1.00)

What is the purpose of the reactor vessel dump line?

QUESTION 8.10 (1.00)

Why does the shield cooling system have two sets of parallel cooling tubes?

QUESTION 8.11 (1.00)

How is criticality prevented from occuring in the spent fuel pool?

QUESTION 8.12 (1.00)

What is the minimum number of shim-safety blades that must be inserted to ensure reactor subcriticality?

QUESTION 8.13 (1.00)

The uranium fuel in the GTRR has been enriched to:

a. 2%.

b. 5%.

c. 93%.

d. 97%.

(***** CATEGORY 8 CONTINUED ON NEXT PAGE *****)

QUESTION B.14 (1.00)

The neutron absorbing material of the shim-safety blades is

a. boron.

b. hafnium.

c. indium.

d. cadmium.

QUESTION B.15 (1.00)

What is the normal operating pressure of the GTRR?

a. 15 psia.

b. 15 psig.

c. 25 psia.

d. 25 psig.

***** END OF CATEGORY B *****

QUESTION C.01 (1.00)

If a scram did not occur directly from the service air pressure signal during a loss of air pressure, what would eventually shut down the reactor? Assume no operator action and no faulty instrument indication.

QUESTION C.02 (1.50)

What will happen to the following systems/components on a loss of power?

a. Regulating rod.
b. Top reflector.
c. Containment ventilation.

QUESTION C.03 (2.00)

A. Give three indications in the control room that a loss of substation B has occured. (1.5)

B. What indication in the control room is available for a loss of substation A? (0.5)

QUESTION C.04 (1.00)

What isotope would be found in the H2O system indicating a D2O/H2O heat exchanger leak? Assume no clad leaks.

a. Cesium 139.

b. Tritium.

c. Iodine 131.

d. Krypton 88.

QUESTION C.05 (.50)

On a loss of power the gasoline generator will automatically start but will not supply power to the controls of the Emergency Cooling System controls. TRUE or FALSE?

(***** CATEGORY C CONTINUED ON NEXT PAGE *****)

QUESTION C.06 (3.00)

For each of the following independent conditions, describe the response of the regulating rod. Include in your answer the reason for the stated response.

a. The reactor has been operating in automatic control at 2 MW with equilibrium conditions established when a decrease in the H2O inlet temperature occurs for the D2O/H2O heat exchanger.

b. The reactor is operating in automatic control set at 2 MW two hours after a cold startup.

c. The reactor is operating in automatic control set at 2 MW when the instrument supplying the reference power to the automatic control system fails low.

QUESTION C.07 (1.00)

What is the maximum fuel centerline temperature under normal operation of the GTRR?

a. 211F.

b. 426F.

c. 475F.

d. 502F.

QUESTION C.08 (1.00)

The small D2O circulating pump

a. must be run in parallel with the main D2O pump to increase power to 5 MW.

b. is to be used only below 50 KW to minimize pump heat added to the moderator.

c. is to be used in the event of the main D2O pump failing and then only for reduced power operation.

d. is an emergency system powered from an independent power supply to allow forced flow during a loss of normal power.

(***** CATEGORY C CONTINUED ON NEXT PAGE *****)

QUESTION C.09 (1.00)

What is the normal flow rate of the DID purification system?

a. 1 gpm.

b. 7 gpm.

c. 15 gpm.

d. 30 gpm.

QUESTION C.10 (1.00)

What is the expected life of a DID purification resin bed?

a. 7 days.

b. 30 days.

c. 2 months.

d. 1 year.

QUESTION C.11 (1.00)

The pneumatic transport system allows samples to be recovered at the containment building basement station within (select the minimum achievable range)

a. 1 to 2 seconds.

b. 20 to 30 seconds.

c. 1 to 2 minutes.

d. 10 to 20 minutes.

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

QUESTION D.01 (2.00)

How many shim safety blades are dropped by one electronic scram circuit?

How are the remaining shim safety blades released?

QUESTION D.02 (1.00)

Which of the following alarm conditions is interlocked to prevent a reactor startup?

a. Emergency Cooling Tank Low.

b. Regulating Rod Low Limit.

c. Outside Automatic Controller Servo Range.

d. D2O Leak.

QUESTION D.03 (1.00)

State two different ways to verify that emergency cooling circulation exists in the core tank.

QUESTION D.04 (1.00)

Which system will provide the first indication of a fuel element failure?

QUESTION D.05 (1.00)

What are the two signal sources for the ECCS alarm?

QUESTION D.06 (1.00)

List two reasons for the low ion chamber voltage scram.

(***** CATEGORY D CONTINUED ON NEXT PAGE *****)

QUESTION D.07 (1.00)

What operator aid is available to help prevent a 'cold coolant slug' accident when starting a reactor coolant pump other than procedures?

QUESTION D.08 (1.00)

What indication of rod insertion is available during a loss of Primary Switchgear?

QUESTION D.09 (1.00)

The D2O water purity is constantly monitored in the Purification System by

a. salinity cells.

b. pH meters.

c. conductivity cells.

d. particulate cells.

QUESTION D.10 (1.00)

The signals generated by the Nuclear Instruments are pulses generated by

a. neutrons striking the sensing element.

b. neutrons and gamma rays striking the sensing element.

c. charged particles, caused by neutron interactions, striking the sensing element.

d. ionization, caused by charged particles, striking the sensing element.

QUESTION D.11 (1.00)

What are the B-10 proportional detectors used for in the Nuclear Instrumentation System?

(***** CATEGORY D CONTINUED ON NEXT PAGE *****)

QUESTION D.12 (.50)

The indicated power as detected by an overcompensated ion chamber will be lower than actual reactor power. TRUE or FALSE?

QUESTION D.13 (1.00)

The detector used for generating the period trip is

a. a compensated ion chamber.

b. an uncompensated ion chamber.

c. a BF-3 detector.

d. a GM tube.

QUESTION D.14 (1.00)

A major difference between an ion chamber and a GM detector is

a. the GM detector has a photo-multiplier tube to increase it's sensitivity

b. the ion chamber is pressurized with a gas and the GM dectector operates under a vacuum.

c. the ion chamber operates at such a low voltage that a significant number of ion pairs are lost by recombination, thereby decreasing it's sensitivity.

d. the GM detector operates at a much higher voltage causing gas multiplication to increase the charge collected to a value independent of the type of particle initiating it.

(***** END OF CATEGORY D *****)

QUESTION E.01 (1.00)

What conditions provide a 'fast' scram of all four shim safety blades?

QUESTION E.02 (1.00)

The Emergency Cooling System is capable of providing _____ total flow to the fuel elements for a period of at least _____, without operator action.

a. 15 gpm, 15 minutes

b. 8 gpm, 30 minutes

c. 12 gpm, 30 minutes

d. 8 gpm, 1 hour

QUESTION E.03 (2.00)

List 10 different conditions that will cause an electromechanical scram.

QUESTION E.04 (2.00)

List five different conditions that will cause a delayed scram.

QUESTION E.05 (1.50)

List two conditions that will automatically initiate Emergency Cooling Flow.

QUESTION E.06 (1.00)

What is the safety significance for recovering 02 and 03?

***** CATEGORY E CONTINUED ON NEXT PAGE *****

QUESTION E.07 (1.00)

How is the GTRR automatically protected from reactivity increases caused by the formation of steam voids within the coolant channels of the fuel assemblies?

QUESTION E.08 (1.00)

What automatic actions will occur upon exceeding the gaseous activity setpoint in the exhaust system?

QUESTION E.09 (1.00)

What automatic actions occur on ECCS initiation?

QUESTION E.10 (1.00)

An overpressure condition in the reactor vessel is relieved by:

a. a motor operated relief valve.

b. an air operated relief valve.

c. a pilot operated relief valve.

d. a rupture diaphragm.

QUESTION E.11 (1.00)

What is the internal design pressure of the reactor containment building?

a. 2 psig.

b. 15 psig.

c. 30 psig.

d. 50 psig.

(***** CATEGORY E CONTINUED ON NEXT PAGE *****)

QUESTION E.12 (1.00)

Where does the Overpressure Relief System discharge to?

***** END OF CATEGORY E *****

QUESTION F.01 (2.00)

List the immediate actions for performing Code ABLE. Include any remedial actions where applicable.

QUESTION F.02 (2.00)

List the immediate operator actions for performing Code BAKER.

QUESTION F.03 (1.00)

What is the appropriate operator action to secure emergency cooling flow when it is inadvertantly initiated?

QUESTION F.04 (1.00)

What is the backup emergency coolant supply and how is it initiated?

QUESTION F.05 (1.00)

How is spent fuel pool water supplied to the Spray System in an emergency?

a. An operator valves in the spent fuel pool allowing gravity drain to the Spray System.

b. An operator valves in the spent fuel pool and then starts a pump in the transfer piping.

c. An operator connects a temporary hose to allow gravity drain to the Spray System.

d. An operator connects a temporary hose and a temporary pump to transfer the water to the Spray System.

QUESTION F.06 (1.50)

What is the required operator action for a regulating rod low limit alarm condition?

(***** CATEGORY F CONTINUED ON NEXT PAGE *****)

QUESTION F.07 (1.00)

What is the maximum allowable deviation between the highest and lowest shim blades during normal operations above 50 KW?

a. 2 degrees.

b. 5 degrees.

c. 7 degrees.

d. 10 degrees.

QUESTION F.08 (1.00)

The minimum allowable reactor period during a reactor startup is

a. 5 seconds.

b. 10 seconds.

c. 15 seconds.

d. 20 seconds.

QUESTION F.09 (1.00)

When placing the reactor in automatic control, the power deviation must be less than (select minimum value)

a. 1%.

b. 2%.

c. 5%.

d. 10%.

QUESTION F.10 (1.00)

What is the required operator action in the event of an immovable shim blade?

***** CATEGORY F CONTINUED ON NEXT PAGE *****

QUESTION F.11 (1.00)

In the event of a low D2O temperature alarm, the temperature should be increased by

a. starting the standby D2O pump.

b. repositioning the shim blades and/or regulating rod as necessary.

c. increasing the H2O flow to the D2O/H2O heat exchanger.

d. adjusting the Cooling Tower System as necessary.

QUESTION F.12 (1.00)

The D2O low temperature limit is imposed because

a. of the poor moderating ability of D2O at low temperatures.

b. of the fairly high freezing temperature of D2O.

c. the D2O circulating pumps will overheat from pumping water with a higher density than the pump design limits.

d. of the uncertainty of the fast flux in the experiment penetrations caused by an increase in neutron back scattering.

***** END OF CATEGORY F *****

QUESTION G.01 (1.00)

What isotope is formed in the reactor's graphite region that is a potential radiation hazard?

QUESTION G.02 (1.00)

Given 28 grams of Al-28 with an activity of 1.86 E23 dis/min and a decay constant of .309/min, what would be the activity after 10 minutes?

a. 4.23 E22 dis/min

b. 8.46 E21 dis/min

c. 4.23 E21 dis/min

d. 8.46 E20 dis/min

QUESTION G.03 (1.00)

What is the required thickness of lead to reduce a 1 Mev gamma flux from 2 E3 mev/(cm squared-sec) down to 2 mev/(cm squared-sec)? Refer to the equation sheet for tenth and half thicknesses.

a. 3.45 inches.

b. 3.78 inches.

c. 4.11 inches.

d. 4.60 inches.

QUESTION G.04 (1.00)

If a point source of gamma radiation gives an exposure rate of 10mr/hr at 1 meter, what would be the exposure rate at 5 meters?

a. 5.0 mr/hr.

b. 2.5 mr/hr.

c. 2.0 mr/hr.

d. 0.4 mr/hr.

(***** CATEGORY G CONTINUED ON NEXT PAGE *****)

QUESTION G.05 (1.50)

How is environmental monitoring performed around the CTRR?

QUESTION G.06 (.50)

Where are the area survey records maintained?

QUESTION G.07 (1.00)

Match the following isotopes with the principal type of radiation exposure hazard. The choices may be used more that once.

1. Ar-41	a. gamma
2. tritium	b. alpha
3. N-16	c. neutron
4. Co-60	d. beta
	e. proton

QUESTION G.08 (1.50)

Name three ways that fresh fuel is controlled in order to prevent criticality.

QUESTION G.09 (1.00)

How is an open fuel position at the top of the reactor controlled to prevent personnel from inadvertantly being over exposed by the radiation beam during refueling?

QUESTION G.10 (1.00)

How is radiation streaming prevented from the experimental holes?

QUESTION G.11 (1.00)

How is the entrance into the pipe tunnel below the reactor controlled in order to prevent over exposure to personnel?

(***** CATEGORY G CONTINUED ON NEXT PAGE *****)

QUESTION G.12 (1.00)

How much radiation exposure is an undergraduate student normally limited to?

a. 10% of the 10 CFR 20 limit.

b. 25% of the 10 CFR 20 limit.

c. 50% of the 10 CFR 20 limit.

d. 75% of the 10 CFR 20 limit.

QUESTION G.13 (1.00)

Which of the following is a 10 CFR 20 exposure limit?

a. 5 rem/year-whole body.

b. 1 rem/quarter-whole body.

c. 18.75 rem/quarter-hands.

d. 7 rem/quarter-skin of whole body.

QUESTION G.14 (1.00)

If you are in a 100 mRad/hour gamma field for 45 minutes, what is your dose in mREM after 45 minutes?

a. 45

b. 75

c. 450

d. 750

END OF CATEGORY G *****

********** END OF EXAMINATION **********

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER A.01 (1.00)

a

REFERENCE
MNS OP-MC-SPS-RT-NMF. p.35.

ANSWER A.02 (1.00)

b

REFERENCE
MNS OP-MC-SPS-RT-FP. p.10.

ANSWER A.03 (1.00)

b

REFERENCE
MNS OP-MC-SPS-RT-SH.p.11.

ANSWER A.04 (1.00)

d

REFERENCE
MNS OP-MC-SPS-RT-RA. p.12.

ANSWER A.05 (1.00)

a (period = 1.443 * doubling time)

REFERENCE
NCSU. Reactor Operator Training. Exp. 3. p. 3

ANSWER A.06 (1.00)

c

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

REFERENCE
CP&L, Nuclear Reactor Theory, p. 5-2

ANSWER A.07 (1.00)

c

REFERENCE
NUS, Reactor Theory

ANSWER A.08 (1.00)

b

REFERENCE
NUS, Reactor Theory

ANSWER A.09 (1.00)

c

REFERENCE
NUS, Reactor Theory

ANSWER A.10 (1.00)

a

REFERENCE
CP&L, Nuclear Reactor Theory, p. 2-15

ANSWER A.11 (1.00)

b

REFERENCE
NUS, Reactor Theory

ANSWERS -- GEORGIA INSTITUTE OF TECH,-85/07/10-TOM ROGERS

ANSWER A.12 (1.00)

For 0.25 points each:

1. Reactor power.
2. Reactor coolant flow.
3. Reactor coolant temperature.
4. Moderator level.

REFERENCE
GTRR TS, 2.1.1.

ANSWER A.13 (1.00)

@ 0.5 points each:

1. D2O coolant.
2. Shield coolant.

REFERENCE
GTRR, OP 2015, p.3.

ANSWER A.14 (1.00)

b

REFERENCE
MNR Core Performance, pp.12-13.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER B.01 (1.00)

b

REFERENCE
GT SAR, p.43.

ANSWER B.02 (1.00)

@ 0.25 points each

1. boral
2. steel
3. lead
4. concrete

REFERENCE
GT SAR, p.55.

ANSWER B.03 (1.00)

~~DI~~ H_2O

REFERENCE
GT SAR, p.64.

ANSWER B.04 (1.00)

water tanks

REFERENCE
GT SAR, p.34.

ANSWER B.05 (1.00)

Regulating rod.

REFERENCE
GT SAR, p.52.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER B.06 (.50)

Shim safety blade.

REFERENCE
GT SAR, p.52.

ANSWER B.07 (1.00)

Via manway in ceiling of room.

REFERENCE
GT SAR, p.64.

ANSWER B.08 (1.00)

DCO is withdrawn from the storage tank via purification pump and injected into the main circ pump suction piping [0.5]. Excess water will be diverted back to the storage tank via overfloww line [0.5].

REFERENCE
GT SAR, p.78.

ANSWER B.09 (1.00)

It drains the top reactor reflector while ensuring that no fuel is uncovered.

REFERENCE
GT SAR, p.78.

ANSWER B.10 (1.00)

One is for normal use and one serves as a backup in the event of a tube rupture.

REFERENCE
GT SAR, p.82.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER B.11 (1.00)

Minimum distance between fuel elements.

REFERENCE
GT SAR, p.130.

ANSWER B.12 (1.00)

c

REFERENCE
GT SAR, p.137.

ANSWER B.13 (1.00)

c

REFERENCE
USNRC Research Reactors, p.55.

ANSWER B.14 (1.00)

c

REFERENCE
USNRC Research Reactors, p.33.

ANSWER B.15 (1.00)

a

REFERENCE
GTRR SAR, p.7.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER C.01 (1.00)

Reflector drain valves would open[0.5]
reactor would shutdown on loss of reflector reactivity or on a loss of overflow trip [0.5] (either way is accepted)

REFERENCE
GT EOP 5024, p.2.

ANSWER C.02 (1.50)

@ 0.5 points each.

a. Reg rod becomes inoperable at position when LOF occured.
b. Drains.
c. Is secured and containment building isolates.

REFERENCE
GT SAR, p.137.

ANSWER C.03 (2.00)

Any 3 @ 0.5 points each:

A. 1. Scram.
2. Loss of I&C power.
3. Loss of mercury lamps.
4. Emergency lights come on.

B. There is none. [0.5]

REFERENCE
GTRR OP 5105, p.1.

ANSWER C.04 (1.00)

b

REFERENCE
GTRR OP 5120, p.1.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOm ROGERS

ANSWER C.05 (.50)

TRUE.

ANSWER C.06 (3.00)

a. Reg rod will move in [0.5] to establish reactor power at setpoint. The increased cooling caused a power increase from the MTC [0.5]

b. Reg rod will move out [0.5] to compensate for xenon buildup [0.5].

c. Reg rod will not move [0.5] because the power control system automatically switched to manual on the >10% setpoint to reactor power deviation [0.5].

REFERENCE
GTRR SAR, p.69.

ANSWER C.07 (1.00)

a

REFERENCE
GTRR SAR, p.8.

ANSWER C.08 (1.00)

c

REFERENCE
GTRR SAR, p.75.

ANSWER C.09 (1.00)

c

REFERENCE
GTRR SAR, p.92.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER C.10 (1.00)

d

REFERENCE
GTRR SAR, p.83.

ANSWER C.11 (1.00)

a

REFERENCE
GTRR SAR, p.117.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER D.01 (2.00)

2[1.0]. By electromechanical circuit for a scram initiated by any instrument channel [1.0].

REFERENCE
GT SAR, p.47.

ANSWER D.02 (1.00)

a

REFERENCE
GT SAR, pp. 72-73.

ANSWER D.03 (1.00)

1. Boroscope (flow from manifold to emergency coolant ports) [0.5].
2. Coolant exit thermocouples [0.5].

REFERENCE
GT SAR, p.81.

ANSWER D.04 (1.00)

He sampling system

REFERENCE
GT SAR, p.10a.

ANSWER D.05 (1.00)

@ 0.5 points each, any

1. Mechanical limit switch for valve not fully open
2. TD-2 for low level

REFERENCE
GTRR, EOF 5059, p.2.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER D.06 (1.00)

@ 0.5 points each.

1. Erroneous signal to flux monitoring safety channels.
2. Power level trip amp 'self-check' cannot be satisfactorily completed.

REFERENCE
GTRR. EOF 5006. p.1.

ANSWER D.07 (1.00)

A low temperature interlock produces an alarm [0.5] if low coolant temp limit of 50F is reached [0.5]

REFERENCE
GTRR SAR. p.1Z0.

ANSWER D.08 (1.00)

Visual check of each drive mechanism.

REFERENCE
GTRR OP 5103. p.2.

ANSWER D.09 (1.00)

c

REFERENCE
GTRR SAR. p.83.

ANSWER D.10 (1.00)

c

REFERENCE
I&E Tech manual. West. PWR. p.8.1-37.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER D.11 (1.00)

Provides independent cross checks of NIs during a startup.

REFERENCE
GTRR SAR, p.66.

ANSWER D.12 (.50)

TRUE.

REFERENCE
Nuclear Rad. Detect., Price, p.320.

ANSWER D.13 (1.00)

a

REFERENCE
GTRR SAR, p.71.

ANSWER D.14 (1.00)

c

REFERENCE
Nuclear Rad. Detect., Price, p.42.

E. SAFETY AND EMERGENCY SYSTEMS

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER E.01 (1.00)

High power[0.5]
Short period[0.5]

REFERENCE
GT SAR, p.67.

ANSWER E.02 (1.00)

b

REFERENCE
GT SAR, p.79.

ANSWER E.03 (2.00)

Any 10 at 00.20 points each.

1. Loss of power to any instrument in the scram circuitry.
2. Power trip.
3. Period trip.
4. Low D2O temp.
5. Low D2O level in core tank.
6. Magnet actuator Amplifier.
7. Low ion chamber voltage.
8. Calibrate switches off operate position.
9. Reflector drain valves open.
10. No D2O overflow.
11. Containment doors open.
12. High H2O temp.

REFERENCE
GT SAR, p.71.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER E.04 (2.00)

Any 5 @ 0.4 points each.

1. Low H2O flow.
2. Control air low pressure.
3. Low shield coolant flow.
4. High shield coolant temp.
5. High bismuth coolant temp.
6. Low bismuth coolant flow.

REFERENCE
GT SAR, p.72.

ANSWER E.05 (1.50)

@ 0.50 points each.

1. Low D2O tank level from the #1 indicator.
2. Low D2O tank level from the #2 indicator.
3. Loss of electrical power.

REFERENCE
GT SAR, p.81.

ANSWER E.06 (1.00)

Preventing explosive concentrations of oxygen.

REFERENCE
GT SAR, p.84.

ANSWER E.07 (1.00)

A rupture diaphragm relieves to the expansion chamber. Deleted

REFERENCE
GT SAR, p.86.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER E.08 (1.00)

Isolates containment building supply and exhaust [0.5].
Isolates pneumatic transfer system and building vacuum system valves[0.5].

REFERENCE
GT SAR, p.130.

ANSWER E.09 (1.00)

@ 0.5 points each:

1. Reactor isolation valves close.
2. Spray valves open.

REFERENCE
GTRR, OP 2160, p.2.

ANSWER E.10 (1.00)

a

REFERENCE
GTRR, SAR, p.8a.

ANSWER E.11 (1.00)

a

REFERENCE
GTRR SAR, p.15a.

ANSWER E.12 (1.00)

To an expansion chamber beneath the basement floor near the center of the containment building.

REFERENCE
GTRR SAR, p.8a.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER F.01 (2.00)

Press SCRAM button[.25]
Press SHUTDOWN button[.25]
Check power decreasing[.25]
Check temperature decreasing[.25]

remedial action:
Press 'open' button for drain valves[.5]
Press individual 'open' buttons for clutch magnet circuit[.5]

REFERENCE
GTRR, EOP 5000, p.1.

ANSWER F.02 (2.00)

@ 0.5 points each.

1. Press manual ECCS initiation button.
2. Verify RX isolation valves close and LIC-1 stabilizes.
3. Verify ECCS spray valves open.
4. Dispatch operator to process room for locks-observe Manne Chamber for up-scale reading.

REFERENCE
GTRR, EOP p.1.

ANSWER F.03 (1.00)

Unlock and shut manual stop valve.

REFERENCE
GT EAR, p.31.

ANSWER F.04 1.00

Cut water[.5]
Quick connect spool-piece[.5]

REFERENCE
GT EAR, p.31.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER F.05 (1.00)

a

REFERENCE
GTRR OP 2150, p.3.

ANSWER F.06 (1.50)

@ 0.5 points each:

1. Stabilize power with shim blades.
2. Determine cause of reactivity addition.
3. Manually add reactivity to reposition reg. rod.

REFERENCE
GT OP 5061, p.1.

ANSWER F.07 1.00)

b

REFERENCE
GTRR OP2000, p.1.

ANSWER F.08 (1.00)

d

REFERENCE
GTRR OP 2000, p.1.

ANSWER F.09 (1.00)

c

REFERENCE
GTRR OP 2000, p.2.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER F.10 (1.00)

Shutdown the reactor [0.5] and notify the reactor supervisor [0.5].

REFERENCE
GTRR OP 5109, p.1.

ANSWER F.11 (1.00)

d

REFERENCE
GTRR OP 5063, p.1.

ANSWER F.12 (1.00)

b

REFERENCE
GTRR OP 5063, p.1.

ANSWERS -- GEORGIA INSTITUTE OF TECH,-85/07/10-TOM ROGERS

ANSWER G.01 (1.00)

Argon 41.

REFERENCE
GT SAR, p.44.

ANSWER G.02 (1.00)

A=Aoe(-^t)
A=(1.86E13)e-(.309)(10)=8.46E11.
b.

REFERENCE
NUS,NET, VOL 2, p.10.3-4.

ANSWER G.03 (1.00)

a
3 tenth thicknesses, 3(1.15)=3.45 inches.

REFERENCE
NUS, NET, Vol 2, Shielding.

ANSWER G.04 (1.00)

a

mr/hr=I/distance squared.
= 10/25=0.4 mr/hr.

REFERENCE
Rad Health Handbook, USDHEW, p.5a.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER G.05 (1.50)

@ 0.5 points each

1. (50) film badges outsite perimeter checked monthly.
2. (7) neutron plus beta-gamma detecting film badges check biweekly.
3. (2) fixed particulate air samplers.

REFERENCE
GT SAR, p.107-110.

ANSWER G.06 (.50)

Office of Radiological Safety.

REFERENCE
GT SAR, p.107.

ANSWER G.07 (1.00)

@ 0.25 points each.

1-a.
2-d.
3-a.
4-[illegible]

REFERENCE
Rad Health Handbook, USDHEW, Table [illegible]

ANSWER G.08 (1.50)

Any 3 @ 0.5 points each.

1. Locked access
2. Special storage [illegible]
3. Criticality monitors.
4. Limit number of elements in same area.

REFERENCE
GT SAR, p.130.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-95/07/10-TOM ROGERS

ANSWER G.09 (1.00)

By use of barricades(0.5) and stationed personnel(0.5).

REFERENCE
GT SAR - p.12?.

ANSWER G.10 (1.00)

Installing stepped shielding plugs.

REFERENCE
GT SAR, p.56.

ANSWER G.11 (1.00)

@ 0.25 points each.

1. Locked access door.
2. RP approval for entering.
3. RP must monitor area.
4. Minimum time after shutdown required prior to entering.

REFERENCE
GT SAR, p.56.

ANSWER G.12 (1.00)

a

REFERENCE
GT Rad Safety Manual, p.6.

ANSWER G.13 (1.00)

c

REFERENCE
10 CFR 20.101

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER C.14 (1.00)

D

DF=1 for gamma

100(45/60)(1)=75

REFERENCE
10 CFR 20.

ENCLOSURE 3

U. S. NUCLEAR REGULATORY COMMISSION
SENIOR REACTOR OPERATOR LICENSE EXAMINATION

FACILITY: GEORGIA INSTITUTE OF TECH.

REACTOR TYPE: TEST

DATE ADMINISTERED: 85/07/10

EXAMINER: TOM ROGERS

APPLICANT: MASTER

INSTRUCTIONS TO APPLICANT:

Use separate paper for the answers. Write answers on one side only. Staple question sheet on top of the answer sheets. Points for each question are indicated in parentheses after the question. The passing grade requires at least 70% in each category and a final grade of at least 80%. Examination papers will be picked up six (6) hours after the examination starts.

CATEGORY VALUE	% OF TOTAL	APPLICANT'S SCORE	% OF CATEGORY VALUE	CATEGORY
20.00	20.00			H. REACTOR THEORY
20.00	20.00			I. RADIOACTIVE MATERIALS HANDLING DISPOSAL AND HAZARDS
20.00	20.00			J. SPECIFIC OPERATING CHARACTERISTICS
20.00	20.00			K. FUEL HANDLING AND CORE PARAMETERS
20.00	20.00			L. ADMINISTRATIVE PROCEDURES, CONDITIONS AND LIMITATIONS
100.00	100.00			TOTALS

FINAL GRADE _____%

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

_____
APPLICANT'S SIGNATURE

QUESTION H.01 (1.00)

A constant subcritical multiplication count rate does not meet the definition of criticality (Keff=1.0) because

a. there are no delayed neutrons when subcritical.

b. there is a decrease in neutron population that is not detected by the source range detectors.

c. it has no effect on the reactor period indication.

d. the definition of criticality excludes source neutrons.

QUESTION H.02 (1.00)

The inhour equation discribes the relationship between reactivity and

a. reactor period.

b. moderator temperature.

c. fuel temperature.

d. shutdown margin.

QUESTION H.03 (1.00)

A subcritical reactor with a neutron source strength of 20 cps and a source range count rate of 200 cps has a keff of (assume a proportionality constant of 1.0)

a. 0.85.

b. 0.90.

c. 0.95.

d. 0.99.

(***** CATEGORY H CONTINUED ON NEXT PAGE *****)

QUESTION H.04 (1.00)

Delayed neutrons allow an operator more control of the reactor because

a. there are more delayed neutrons than prompt neutrons.

b. delayed neutrons are born at a higher energy level than prompt neutrons.

c. delayed neutrons decrease the average neutron generation time.

d. delayed neutrons increase the average neutron generation time.

QUESTION H.05 (1.00)

During a reactor startup, the first reactivity addition caused count rate to increase from 10 cps to 16 cps. The second reactivity addition caused count rate to increase from 16 cps to 32 cps. Which of the following statements describing the relationship between the reactivity values of the first and second reactivity additions is correct?

a. The first reactivity addition was larger.

b. The second reactivity was larger.

c. Both reactivity additions were equal.

d. There is not enough data given for anyone to determine the relationship between the two reactivity additions.

QUESTION H.06 (1.00)

Th notation Be-9(alpha, neutron)C-12 means

a. A Be-9 atom absorbs an alpha particle, resulting in the production of a C-12 atom and a neutron.

b. A Be-9 atom releases an alpha particle and a neutron, resulting in the production of a C-12 atom.

c. A Be-9 atom absorbs an alpha particle and a neutron, resulting in the production a C-12 atom.

d. A Be-9 atom absorbs a neutron, resulting in the production of an alpha particle and a C-12 atom.

(***** CATEGORY H CONTINUED ON NEXT PAGE *****)

QUESTION H.07 (1.00)

Which of the following is a correct statement concerning radioactive decay?

a. When a nuclide decays by beta emission, the new nuclide will have increased in atomic number by one and the mass number will be the same as the original nuclide.

b. When a nuclide decays by alpha emission, the new nuclide will have decreased in atomic number and mass number by two, from the original nuclide.

c. When a nuclide decays by neutron emission, the new nuclide will have increased in atomic number by one and decreased in mass number by one, from the original nuclide.

d. When an element decays by gamma emission, the new nuclide will have increased in atomic number by one and the mass number will remain the same as the original nuclide.

QUESTION H.08 (1.00)

Which of the following is a fissile nuclide?

a. Th-232.

b. U-235.

c. U-238.

d. Pu-240.

QUESTION H.09 (1.00)

Which of the following materials would require the highest number of neutron collisions to reduce the neutron's energy from 2Mev to 1ev?

a. H-1.

b. H2.

c. H2O.

d. D2O.

(***** CATEGORY H CONTINUED ON NEXT PAGE *****)

QUESTION H.10 (1.00)

A good neutron reflector will have

a. a low logarithmic energy decrement.

b. a high macroscopic scattering cross section.

c. a high macroscopic absorption cross section.

d. a high Fermi Age.

QUESTION H.11 (1.00)

The neutron flux in a reactor with a neutron density of 1.36 E8 neutrons per cm cubed and an average neutron speed of 2.20 E5 cm per second is

a. 6.18 E2 n/(cm squared-sec)

b. 1.62 E3 n/(cm squared-sec)

c. 8.40 E12 n/(cm squared-sec)

d. 2.99 E13 n/(cm squared-sec)

QUESTION H.12 (1.00)

During a power escalation on the Log N channel, it takes 30 seconds to double reactor power level. Which of the following is the stable reactor period that would cause this rate of change?

a. 21 seconds

b. 30 seconds

c. 39 seconds

d. 43 seconds

(***** CATEGORY H CONTINUED ON NEXT PAGE *****)

QUESTION H.13 (1.00)

Which of the following is NOT a gamma ray interaction?

a. Photoelectric interaction.

b. Compton collision.

c. Inelastic scattering.

d. Pair production.

QUESTION H.14 (1.00)

The heat transfer mechanism from the fuel to the coolant becomes film boiling at what DNBR?

a. 0.0

b. 1.0

c. 1.3

d. 1.7

QUESTION H.15 (1.00)

The thermal power to the D2O coolant is _____ with a core flow of 1800gpm, an inlet temperature of 114F and an outlet temperature of 125F.

a. 2891 kw

b. 2914 kw

c. 3208 kw

d. 3492 kw

(***** CATEGORY H CONTINUED ON NEXT PAGE *****)

QUESTION H.16 (1.00)

Which of the following correctly sequences the heat transfer mechanism for an increasing fuel cladding temperature from 110F to 2000F?

a. Single phase convection, nucleate boiling, partial film boiling, film boiling.

b. Nucleate boiling, single phase convection, partial film boiling, film boiling.

c. Single phase convection, partial film boiling, nucleate boiling, film boiling.

d. Single phase convection, partial film boiling, film boiling, nucleate boiling.

QUESTION H.17 (1.00)

Which of the following is an INCORRECT statement concerning heat exchangers?

a. Heat transfer is by both the conductive and convective methods of heat transfer.

b. The heat transfer rate for a parallel flow heat exchanger is higher than that of a counter flow heat exchanger if the inlet temperatures are the same.

c. The heat transfer rate is directly proportional to the heat transfer coefficient associated with the material the tubes are made of.

d. Higher thermal stresses across the tubes will accompany a higher tube thickness.

QUESTION H.18 (1.00)

Which of the following conditions, by itself, will reduce the margin to DNB when operating at 5MW?

a. The moderator level increasing.

b. The loss of the reactor coolant pump.

c. Increasing the H2O flow through the D2O/H2O heat exchanger.

d. Placing an experiment in the core.

(***** CATEGORY H CONTINUED ON NEXT PAGE *****)

QUESTION H.19 (1.00)

The mode of heat transfer across the fuel cladding is

a. conduction.

b. convection.

c. black body radiation.

d. white body radiation.

QUESTION H.20 (1.00)

The heat transfer rate through an aluminum slab is inversely proportional to

a. the temperature difference across the slab.

b. the thermal conductivity of aluminum.

c. the thickness of the slab.

d. the area of the slab.

(***** END OF CATEGORY H *****)

QUESTION I.01 (1.00)

What isotope is formed in the reactor's graphite region that is a potential radiation hazard?

QUESTION I.02 (1.00)

What is the required thickness of lead to reduce a 1 Mev gamma flux from 2 E3 Mev/(cm squared-sec) down to 1 Mev/(cm squared-sec)? Refer to the equation sheet for tenth and half thicknesses.

a. 3.45 inches.

b. 3.78 inches.

c. 4.11 inches.

d. 4.60 inches.

QUESTION I.03 (1.00)

Given 28 grams of Al-28 with an activity of 1.86 E23 dis/min and a decay constant of .309/min, what would be the activity after 10 minutes?

a. 4.23 E22 dis/min

b. 8.46 E21 dis/min

c. 4.23 E21 dis/min

d. 8.46 E20 dis/min

QUESTION I.04 (1.00)

An experienced operator is assigned to you. He is 28 years old. His NRC Form 4 indicates a 60 rem accumulation lifetime dose. His quarterly whole body dose is 1300 mr. Knowing this, would you allow him to work in a radiation area? Explain why or why not.

QUESTION I.05 (1.50)

List the normal permissible dose limts specified in 10 CFR 20 for whole body, hands, and skin.

(***** CATEGORY I CONTINUED ON NEXT PAGE *****)

QUESTION I.06 (1.00)

What is done with liquid wastes that cannot be significantly reduced in activity by radioactive decay to allow discharge to the sewerage system?

QUESTION I.07 (1.50)

Describe the procedure for allowing a discharge of the waste storage tanks to the city sanitary sewerage system.

QUESTION I.08 (.50)

Who maintains liquid waste discharge records?

QUESTION I.09 (1.50)

How is environmental monitoring performed around the GTRR?

QUESTION I.10 (.50)

Where are the area survey records maintained?

QUESTION I.11 (1.00)

Match the following isotopes with the principal type of radiation exposure hazard. The choices may be used more that once.

1. Ar-41	a. gamma
2. tritium	b. alpha
3. N-16	c. neutron
4. Co-60	d. beta
	e. proton

(***** CATEGORY I CONTINUED ON NEXT PAGE *****)

QUESTION I.12 (1.00)

What is the activity of 10 grams of Sr-90, given the decay constant for Sr-90 is 7 E-10/sec?

a. 6.02 E23 dis/sec.

b. 6.69 E22 dis/sec.

c. 4.68 E13 dis/sec.

d. 3.79 E13 dis/sec.

QUESTION I.13 (1.00)

Co-58 has a radioactive half-life of 72 days and a biological total body half-life of 9.5 days. What is the total body effective half-life?

a. 0.1 days.

b. 4.75 days.

c. 7.6 days.

d. 8.4 days.

QUESTION I.14 (1.00)

How are samples placed in the vertical incore positions (V21-V28) without overexposing personnel?

QUESTION I.15 (1.00)

How are you supposed to determine if a person is authorized to perform radiation surveys if he/she is not from Health Physics?

QUESTION I.16 (1.00)

List the four classifications of liquid wastes.

(***** CATEGORY I CONTINUED ON NEXT PAGE *****)

QUESTION I.17 (1.00)

If a person requires prompt professional medical attention due to a high level of skin contamination, he should be sent to

a. the GT infirmary.

b. Grady Hospital.

c. Georgia Baptist Hospital.

d. Emory.

QUESTION I.18 (1.00)

If you discover an uncontrolled spread of radioactive contamination, whom are you required to notify?

QUESTION I.19 (1.00)

If you are in a 100 mRad/hour gamma field for 45 minutes, what is your dose in mREM after 45 minutes?

a. 45

b. 75

c. 450

d. 750

QUESTION I.20 (.50)

The goal of ALARA can be achieved by allowing more personnel be exposed for shorter times than one person being exposed for a longer time provided the total time of exposure is the same. TRUE or FALSE?

(***** END OF CATEGORY I *****)

QUESTION J.01 (1.00)

If a scram did not occur directly from the service air pressure signal during a loss of air pressure, what would eventually shut down the reactor? Assume no operator action and no faulty instrument indication.

QUESTION J.02 (3.00)

Provide the trip setpoints for the following instruments for (a) Mode 1 and (b) Mode 2.

1. High level flux.

2. Low primary coolant flow channel 1.

3. Primary coolant high temperature channel 2.

QUESTION J.03 (1.00)

What is the minimum D2O level in the reactor vessel allowing an operator to start MD-2A?

a. 42 inches.

b. 48 inches.

c. 52 inches.

d. 58 inches.

QUESTION J.04 (.50)

The primary coolant purification pumps are normally operated with their priming valves opened. TRUE or FALSE?

QUESTION J.05 (1.00)

How is control power restored to MD-3 and MD-4 (reactor isolation valves) to allow opening them in order to refill the reflector when it is at dump level?

(***** CATEGORY J CONTINUED ON NEXT PAGE *****)

QUESTION J.06 (1.50)

What will happen to the following systems/components on a loss of power?

a. Regulating rod.
b. Top reflector.
c. Containment ventilation.

QUESTION J.07 (2.00)

List five different conditions that will cause a delayed scram.

QUESTION J.08 (3.00)

For each of the following independent conditions, describe the response of the regulating rod. Include in your answer the reason for the stated response.

a. The reactor has been operating in automatic control at 2 MW with equilibrium conditions established when a decrease in the H2O inlet temperature occurs for the D2O/H2O heat exchanger.

b. The reactor is operating in automatic control set at 2 MW two hours after a cold startup.

c. The reactor is operating in automatic control set at 2 MW when the instrument supplying the reference power to the automatic control system fails low.

QUESTION J.09 (1.00)

What automatic actions occur on ECCS initiation?

(***** CATEGORY J CONTINUED ON NEXT PAGE *****)

QUESTION J.10 (1.00)

Peak xenon following a shutdown from 5 MW equilibrium operations adds approximately _____ negative reactivity.

a. 9%

b. 6%

c. 4%

d. 1%

QUESTION J.11 (1.00)

The shim-safety blade calibration curves given as Figure J.11 shows the differential rod worth to be the highest at about

a. 5 degrees.

b. 15 degrees.

c. 30 degrees.

d. 55 degrees.

QUESTION J.12 (1.00)

The reactor should NOT be started or left unattended when the blanket gas system level indicator is outside the

a. 0-30% limits.

b. 30-60% limits.

c. 60-90% limits.

d. 90-100% limits.

(***** CATEGORY J CONTINUED ON NEXT PAGE *****)

QUESTION J.13 (1.00)

What is the maximum allowable deviation between the highest and lowest shim blades during normal operations above 50 KW?

a. 2 degrees.

b. 5 degrees.

c. 7 degrees.

d. 10 degrees.

QUESTION J.14 (1.00)

The minimum allowable reactor period during a reactor startup is

a. 5 seconds.

b. 10 seconds.

c. 15 seconds.

d. 20 seconds.

QUESTION J.15 (1.00)

When placing the reactor in automatic control, the power deviation must be less than (select minimum value)

a. 1%.

b. 3%.

c. 5%.

d. 10%.

(***** END OF CATEGORY J *****)

QUESTION K.01 (1.50)

Name three ways that fresh fuel is controlled in order to prevent criticality.

QUESTION K.02 (1.00)

How is criticality prevented from occuring in the spent fuel pool?

QUESTION K.03 (1.00)

How is an open fuel position at the top of the reactor controlled to prevent personnel from inadvertantly being over exposed by the radiation beam during refueling?

QUESTION K.04 (1.50)

Name three components that must be removed or disconnected in order to gain access and remove a fuel element.

QUESTION K.05 (1.00)

Why must the reactor be shutdown for at least 12 hours before a fuel element can be removed?

QUESTION K.06 (1.50)

List three instruments that must be operable during fuel handling in the core.

(***** CATEGORY K CONTINUED ON NEXT PAGE *****)

QUESTION K.07 (1.00)

If the signal from the neutron monitoring channel(s) increases by a factor of _____ during fuel movement, the operation must be terminated. (Select the minimum value for which it is applicable)

a. 2

b. 4

c. 5

d. 10

QUESTION K.08 (1.00)

If a fuel handling operation is secured due to a high neutron count rate, who must authorize the operation to continue?

QUESTION K.09 (1.00)

What is the minimum number of shim-safety blades that must be inserted to ensure reactor subcriticality?

QUESTION K.10 (1.00)

The reactivity worth of the regulating rod is about

a. 0.01%.

b. 0.4%.

c. 2.3%.

d. 4.2%.

(***** CATEGORY K CONTINUED ON NEXT PAGE *****)

QUESTION K.11 (1.00)

Following a week of 5 MW power operations, a reactor scram occurs. What is the expected decay heat immediately following the scram in percent of full power?

a. 8 to 9%

b. 5 to 6%

c. 3 to 4 %

d. 1 t0 2%

QUESTION K.12 (1.00)

Which of the following correctly describes the two group flux shapes (fast and thermal)in the GTRR?

a. Fast and thermal flux is higher in the fuel than in the moderator.

b. Fast and thermal flux is lower in the fuel than in the moderator.

c. Fast flux is lower in the fuel than in the moderator and thermal flux is higher in the fuel than in the moderator.

d. Fast flux is higher in the fuel than in the moderator and thermal flux is lower in the fuel than in the moderator.

QUESTION K.13 (1.00)

What is the minimum number of fuel assemblies necessary to have a critical mass in the reactor core?

a. 11

b. 14

c. 16

d. 19

(***** CATEGORY K CONTINUED ON NEXT PAGE *****)

QUESTION K.14 (1.00)

Which of the following is NOT a major reactivity coefficient in the GTRR due to the high enrichment of the fuel?

a. Void coefficient.

b. Moderator temperature coefficient.

c. Doppler coefficient.

d. Power coefficient.

QUESTION K.15 (.50)

The magnitude of the void coefficient will decrease for a given moderator channel if measured from the core center to the core edge. TRUE or FALSE?

QUESTION K.16 (1.00)

The reactivity calibration of the regulating rod is done by taking

a. doubling time data.

b. 1/M plot data.

c. shim blade motion data.

d. temperature change data.

QUESTION K.17 (1.00)

The standard fuel element is made up of

a. aluminum-uranium alloy plates cladded with an aluminum alloy.

b. aluminum-uranium alloy plates cladded with a zirconium alloy.

c. zirconium-uranium alloy plates cladded with an aluminum alloy.

d. zirconium-uranium alloy plates cladded with a zirconium alloy.

(***** CATEGORY K CONTINUED ON NEXT PAGE *****)

QUESTION K.18 (1.00)

A moderator temperature increase from 22C to 45C will add approximately

a. 0.5% positive reactivity.

b. 0.5% negative reactivity.

c. 1.5% positive reactivity.

d. 1.5% negative reactivity.

QUESTION K.19 (1.00)

What is the reactivity worth of equilibrium xenon and samarium?

a. 1.3%

b. 2.2%

c. 3.4%

d. 5.2%

(***** END OF CATEGORY K *****)

QUESTION L.01 (1.00)

How is the entrance into the pipe tunnel below the reactor controlled in order to prevent over exposure to personnel?

QUESTION L.02 (1.00)

The process of determining an instruments accuracy by visually comparing the indication to other independent instrument channels measuring the same parameter is defined in Tech Specs as a

a. Channel Calibration.

b. Channel Check.

c. Channel Functional Test.

d. Channel Source Check.

QUESTION L.03 (1.00)

"Reactor Shutdown" as defined in Tech Specs is

a. when all shim-safety blades are fully inserted.

b. when all shim-safety blades and the regulating rod is fully inserted.

c. when all shim-safety blades are fully inserted and the control rod power is off.

d. when all shim-safety blades are fully inserted and the required shutdown margin is satisfied.

QUESTION L.04 (1.50)

List the requirements to meet Containment Integrity.

QUESTION L.05 (2.00)

What are the Safety Limits when in (a) the forced convection Mode and (b) when in the natural convection Mode?

(***** CATEGORY L CONTINUED ON NEXT PAGE *****)

QUESTION L.06 (1.50)

According to Tech Specs, the shutdown margin relative to the cold xenon free critical condition shall be at least (a)___ delta k per k with the most reactive shim-safety blade and the regulating rod fully withdrawn.

The reactor shall be subcritical by more than (b)___ delta k per k during loading changes.

And the excess reactivity of the core shall be limited to (c)___ delta k per k.

QUESTION L.07 (2.00)

List four different conditions that Tech Specs requires Containment Integrity to be in affect.

QUESTION L.08 (1.50)

What are the Tech Spec sampling requirements for a release of liquid radioactive effluents?

QUESTION L.09 (1.00)

Which radiation monitors does Tech Specs require to be operable to perform a gaseous waste release?

QUESTION L.10 (1.00)

What is the basis for the Tech Spec limit for tritium released?

(***** CATEGORY L CONTINUED ON NEXT PAGE *****)

QUESTION L.11 (1.00)

To take the reactor critical, Tech Specs requires the primary coolant pH to be between

a. 3.5 and 7.5.

b. 4.0 and 7.0.

c. 4.5 and 7.5.

d. 5.5 and 8.5.

QUESTION L.12 (1.00)

The reactor _____ with the D2O Emergency Coolant System inoperable.

a. must be shutdown

b. can be operated up to a maximum of 1 kw

c. can be operated up to a maximum of 1 MW

d. can be operated at 5 MW for up to one hour

QUESTION L.13 (1.00)

What is the minimum crew required whenever the reactor is not secured. Include any eligibilty requirements.

QUESTION L.14 (1.00)

List two levels of approval required by Tech Specs to perform an experiment.

QUESTION L.15 (1.00)

List four of the five categories of experiments as grouped by the Quality Assurance Program.

(***** CATEGORY L CONTINUED ON NEXT PAGE *****)

QUESTION L.16 (1.00)

When conducting an inventory of Special Nuclear Material, (a) what is being inventoried and (b) how is it identified?

QUESTION L.17 (.50)

What must the Shift Supervisor do to satisfactorily verify the status of electrical jumpers to meet the requirement of the Shift Supervisor Startup Approval Checksheet?

(***** END OF CATEGORY L *****)
(********** END OF EXAMINATION **********)

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER H.01 (1.00)

d

REFERENCE
MNS OP-MC-SPS-RT-NMF, p.8.

ANSWER H.02 (1.00)

a

REFERENCE
NUS, NET, Vol. 3, 6.6-1.

ANSWER H.03 (1.00)

b

REFERENCE
MNS OP-MC-SPS-RT-RK, p.12.

ANSWER H.04 (1.00)

d

REFERENCE
MNS OP-MC-SPS-RT-RK, p.12.

ANSWER H.05 (1.00)

a

REFERENCE
HBR, Reactor Theory, Sessions 41 and 42

ANSWER H.06 (1.00)

a

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

REFERENCE
NUS, NET, Vol. 2, p. 11.3-1.

ANSWER H.07 (1.00)

a

REFERENCE
Nuclear Reactor Analysis, Duderstadt & Hamilton, 1976, p.13.

ANSWER H.08 (1.00)

b

REFERENCE
NUS, NET, Vol. 2, 12.2-2.

ANSWER H.09 (1.00)

d

REFERENCE
NUS, NET, Vol 2, 16.1-3.

ANSWER H.10 (1.00)

b

REFERENCE
NUS, NET, Vol 2, p. 16.5-1.

ANSWER H.11 (1.00)

d

$\Phi = NV = (1.36\ E8)(2.2\ E5) = 2.99\ E13$.

REFERENCE
NUS, NET, Vol 2, 14.5-4.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER H.12 (1.00)

d (period = 1.443 x doubling time)

REFERENCE
NCSU, Reactor Operator Training, Exp. 3, p. 3

ANSWER H.13 (1.00)

c

REFERENCE
Nuclear Rad. Detect., Price, pp. 25-29.

ANSWER H.14 (1.00)

b

REFERENCE
MNS Core Performance, pp.12-13.

ANSWER H.15 (1.00)

c

p=F(To-Ti)Cp

=1800(125-114)(.162)=3207.6kw.

REFERENCE
GRTT, OP 2015, p.1.

ANSWER H.16 (1.00)

a

REFERENCE
Nuclear Reactor Analysis, Duderstadt & Hamiltor, p.491.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER H.17 (1.00)

b

REFERENCE
General Physics, HTT&FF.

ANSWER H.18 (1.00)

b

REFERENCE
GTRR, TS 2.1.1.

ANSWER H.19 (1.00)

a

REFERENCE
General Physics, HTT&FF, p.99.

ANSWER H.20 (1.00)

c

REFERENCE
General Physics, HTT&FF, p.107.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER I.01 (1.00)

Argon 41.

REFERENCE
GT SAR, p.44.

ANSWER I.02 (1.00)

b.

3 tenth thicknesses will reduce it to 2, so then you need 1 half thickness to reduce it to 1.

3(1.15) + 1(0.33)=3.78 inches.

REFERENCE
NUS, NET, VOL 2, Shielding.

ANSWER I.03 (1.00)

A=Aoe(-^t)
A=(1.86E23)e-(.309)(10)=8.46E21.
b.

REFERENCE
NUS,NET, VOL 2, p.10.3-4.

ANSWER I.04 (1.00)

No[0.5]
He has exceeded 5(N-18) requirement.[0.5]
5(28-18)=50 rem, he has 60.

REFERENCE
10 CFR 20.102

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER I.05 (1.50)

@ 0.5 points each

wb-1.25 rem/qtr
hands-18.75 rem/qtr
skin-7.5 rem/qtr

REFERENCE
10 CFR 20.101.

ANSWER I.06 (1.00)

It is solidified and handled as solid waste.

REFERENCE
GT SAR p. 132.

ANSWER I.07 (1.50)

@ 0.5 points each

1. Isolate tanks.
2. Agitate contents.
3. Verify activity is within limits by sampling.

REFERENCE
GT SAR, p.107.

ANSWER I.08 (.50)

Health Physics.

REFERENCE
GT SAR, p.107.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER I.09 (1.50)

@ 0.5 points each

1. (50) film badges outsite perimeter checked monthly.
2. (7) neutron plus beta-gamma detecting film badges check biweekly.
3. (2) fixed particulate air samplers.

REFERENCE
GT SAR, p.109-110.

ANSWER I.10 (.50)

Office of Radiological Safety.

REFERENCE
GT SAR, p.109.

ANSWER I.11 (1.00)

@ 0.25 points each.

1-a.
2-d.
3-a.
4-a.

REFERENCE
Rad Health Handbook,USDHEW, Table VI.

ANSWER I.12 (1.00)

c.

A=YN, Y= 7 E-10

N=mass/mass/GAW X Na Atoms/GAW

N= 10/90 X 6.02 E23= 6.69 E22

A= (7 E-10)(6.69 E22)= 4.68 E13.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

REFERENCE
NUS, NET, Vol 2, p.478.

ANSWER I.13 (1.00)

d

(9.5)(72)/(9.5+72)=8.4

REFERENCE
CRC Rad. Nuclides, p.194.

ANSWER I.14 (1.00)

Via a fishing rod with a multi-prong hook and mirrors.

REFERENCE
GTRR, OP 3103, p.4.

ANSWER I.15 (1.00)

By verifying the person is on the Form RS-25, Self Monitoring Approval list.

REFERENCE
GTRR, HP Procedures, p.11.

ANSWER I.16 (1.00)

@ 0.25 points each:
1. Clean waste.
2. Low level waste.
3. Suspect waste.
4. High level waste.

REFERENCE
GTRR, HP Manual, p.14.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER I.17 (1.00)

b

REFERENCE
GTRR, HP Manual, p.22.

ANSWER I.18 (1.00)

@ 0.333 points each:

1. GT Police.
2. ED.
3. HP.

REFERENCE
HP Manual, p.20.

ANSWER I.19 (1.00)

b

QF=1 for gamma

100(45/60)(1)=75

REFERENCE
10 CFR 20.

ANSWER I.20 (.50)

FALSE- (ALARA is based on a total annual reduction)

REFERENCE
10 CFR 50, App. I.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER J.01 (1.00)

Reflector drain valves would open[0.5]
reactor would shutdown on loss of reflector reactivity or on a loss of overflow trip [0.5] (either way is accepted)

REFERENCE
GT EOP 5024, p.2.

ANSWER J.02 (3.00)

For 0.5 points each:

1. (a) 125% with 1000kw being 100% meter.
   (b) 110% with 5000kw being 100% meter.

2. (a) 1000 gpm (or 1625 gpm).
   (b) 1625 gpm.

3. (a) 123F.
   (b) ~~125F.~~ 137 F. Half credit given for Tech Spec values.

REFERENCE
GTRR, OP 7250, pp.1-2.

ANSWER J.03 (1.00)

b

REFERENCE
GTRR, OP 2150.

ANSWER J.04 (.50)

FALSE.

REFERENCE
GTRR, OP 2050.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER J.05 (1.00)

Push ECCS OVERRIDE button.

REFERENCE
GTRR, OP 2050, p.2.

ANSWER J.06 (1.50)

@ 0.5 points each.

a. Reg rod becomes inoperable at position when LOP occured.
b. Drains.
c. Is secured and containment building isolates.

REFERENCE
GT SAR, p.137.

ANSWER J.07 (2.00)

Any 5 @ 0.4 points each.

1. Low H2O flow.
2. Control air low pressure.
3. Low shield coolant flow.
4. High shield coolant temp.
5. High bismuth coolant temp.
6. Low bismuth coolant flow.

REFERENCE
GT SAR, p.72.

ANSWER J.08 (3.00)

a. Reg rod will move in [0.5] to establish reactor power at setpoint. The increased cooling caused a power increase from the MTC [0.5]

b. Reg rod will move out [0.5] to compensate for xenon buildup [0.5].

c. Reg rod will not move [0.5] because the power control system automatically switched to manual on the >10% setpoint to reactor power deviation [0.5].

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

REFERENCE
GTRR SAR, p.69.

ANSWER J.09 (1.00)

@ 0.5 points each:

1. Reactor isolation valves close.
2. Spray valves open.

REFERENCE
GTRR, OP 2160, p.2.

ANSWER J.10 (1.00)

a

REFERENCE
GTRR SAR, p.92.

ANSWER J.11 (1.00)

b

REFERENCE
GTRR SAR, p.53.

ANSWER J.12 (1.00)

b

REFERENCE
GTRR, OP 8350, p.2.

ANSWER J.13 (1.00)

b

REFERENCE
GTRR OP2000, p.1.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER J.14 (1.00)

d

REFERENCE
GTRR OP 2000, p.1.

ANSWER J.15 (1.00)

b

REFERENCE
GTRR, OP 2000, p.2.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER K.01 (1.50)

Any 3 @ 0.5 points each.

1. Locked access.
2. Special storage boxes.
3. Criticality monitors.
4. Limit number of elements is same area.

REFERENCE
GT SAR, p.130.

ANSWER K.02 (1.00)

Minimum distance between fuel elements.

REFERENCE
GT SAR, p.130.

ANSWER K.03 (1.00)

By use of barricades[0.5] and stationed personnel[0.5].

REFERENCE
GT SAR , p.129.

ANSWER K.04 (1.50)

@ 0.5 points each-any 3.

1. Lead cover removed.
2. Upper top-shield port plug removed.
3. Thermocouples disconnected.
4. Top reflector drained.

REFERENCE
GT SAR, p.128.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER K.05 (1.00)

Allows decay time to limit temperature (below 450 C) before transferring to dry coffin.

ANSWER K.06 (1.50)

@ 0.5 points each.

1. Startup channel.
2. Picoammeter channel 1.
3. Picoammeter channel 2.

CR-1
D_2O level
Area monitors
Kanne air

Gas monitor
Rod position
Log N

Scaler
Countrate

REFERENCE
GTRR OP 1502, p.2., OP 1500 p.1

ANSWER K.07 (1.00)

a

REFERENCE
GTRR, OP 1502, p.2.

ANSWER K.08 (1.00)

Reactor Supervisor.

REFERENCE
GTRR, OP 1502, p.2.

ANSWER K.09 (1.00)

2

REFERENCE
GT SAR, p.137.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER K.10 (1.00)

b

REFERENCE
GT SAR, p.52.

ANSWER K.11 (1.00)

b

REFERENCE
GTRR SAR, p.80.

ANSWER K.12 (1.00)

d

REFERENCE
GTRR SAR, p.95.

ANSWER K.13 (1.00)

a

REFERENCE
GTRR SAR, p.93.

ANSWER K.14 (1.00)

c

REFERENCE
GTRR SAR, p.10.

ANSWER K.15 (.50)

TRUE.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

REFERENCE
GTRR SAR, p.98.

ANSWER K.16 (1.00)

a

REFERENCE
GTRR, OP 7246, p.1.

ANSWER K.17 (1.00)

a

REFERENCE
GTRR SAR, p.48.

ANSWER K.18 (1.00)

b

REFERENCE
GTRR SAR, p.102.

ANSWER K.19 (1.00)

c

REFERENCE
GTRR SAR, p.102.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER L.01 (1.00)

@ 0.25 points each.

1. Locked access door.
2. HP approval for entering.
3. HP must monitor area.
4. Minimum time after shutdown required prior to entering.

REFERENCE
GT SAR, p.56.

ANSWER L.02 (1.00)

b

REFERENCE
GTRR, TS, 1.5.

ANSWER L.03 (1.00)

c

REFERENCE
GTRR, TS, 1.9.

ANSWER L.04 (1.50)

@ 0.5 points.

1. 1 door on each personnel airlock is closed and sealed.
2. The truck door is closed and sealed.
3. Containment capable of being isolated automatically or inoperable paths are isolated.

REFERENCE
GTRR, TS, 1.26.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER L.05 (2.00)

@ 0.5 points per item

Forced convection:
1. Power within Fig II-1.
2. Reactor coolant inlet temperature < or = to 123F.
3. Moderator level within 12 inches of overflow.

Natural convection:
1. Power < or = to 2kw.

REFERENCE
GTRR TS, 2.2.2, 2.2.2.

ANSWER L.06 (1.50)

@ 0.5 points each.

(a) 0.01.
(b) 0.0275.
(c) 11.9 %.

REFERENCE
GTRR TS, 3.1.

ANSWER L.07 (2.00)

@ 0.5 points each.

1. Reactor operating.
2. Whenever an operation is being performed that could change core reactivity.
3. During movement of irradiated fuel.
4. Reactor shutdown from power level operation above 1 MW, for less than 8 hours.

REFERENCE
GTRR TS, 3.3.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER L.08 (1.50)

1. 2 independent samples[0.5].
2. 1 prior and 1 during release [0.5].
3. 1 must be done from the discharge line during the release [0.5].

REFERENCE
GTRR TS , 3.5.

ANSWER L.09 (1.00)

Gross radioactivity monitor [0.5] charcoal filter cartridge and particulate monitor [0.5].

REFERENCE
GTRR TS, 3.5.b.

ANSWER L.10 (1.00)

To be within the 10 CFR 20 limit.

REFERENCE
GTRR TS 3.5.

ANSWER L.11 (1.00)

c

REFERENCE
GTRR TS 3.6.

ANSWER L.12 (1.00)

c

REFERENCE
GTRR TS, 3.7.

ANSWERS -- GEORGIA INSTITUTE OF TECH.-85/07/10-TOM ROGERS

ANSWER L.13 (1.00)

2 persons [0.5], at least 1 SRO licensed [0.5].

ANSWER L.14 (1.00)

Nuclear Safeguards Committee [0.5].
Licensed SRO in charge of reactor operations [0.5].

REFERENCE
GTRR TS, 6.3.a.

ANSWER L.15 (1.00)

Any 4 @ 0.25 points each.
1. Rabbit.
2. Guppy.
3. External.
4. Internal.
5. General.

REFERENCE
GTRR, OP 3102.

ANSWER L.16 (1.00)

(a) U-235 [0.5].
(b) By serial number [0.5].

REFERENCE
GTRR, OP 3600, p.1.

ANSWER L.17 (.50)

Verify all jumpers are on the jumper board.

REFERENCE
GTRR, OP 2004, p.1.