REPORT DETAILS

FACILITY LICENSEE: University of Virginia
Charlottesville, Virginia

FACILITY DOCKET NO.: 50-062

FACILITY LICENSE NO.: R-66

EXAMINATION DATES: August 28, 1995

EXAMINER: Paul Doyle, Chief Examiner

CHIEF EXAMINER: Paul V. Doyle Jr. 8/31/95
Paul V. Doyle Jr. Date

APPROVED BY: 9/6/95
Anthony J. Mendiola, Deputy Chief Date
Operator Licensing Branch
Division of Reactor Controls
and Human Factors
Office of Nuclear Reactor Regulation

SUMMARY:

On August 28, 1995, the NRC administered a written examination and an operating test to one Senior Reactor Operator, Instant (SRO-I) candidate. The candidate had been granted a waiver of Section A of the written examination. The candidate passed the examination.

1. Examiner:
   Paul Doyle, NRC

2. Exit Meeting:

Participants:
Mr. Paul Doyle, Chief Examiner, NRC
Dr. Thomas Doyle, Acting Reactor Supervisor, University of Virginia

At the conclusion of the site visit, the examiner met with the acting reactor supervisor to discuss the results of the examination. Dr. Doyle submitted a comment to the examination clarifying question B.9. The examiner thanked Dr. Doyle for his support of the examinations.

Per telephone call on August 29, 1995, the facility had no further comments on the examination. Dr. Doyle's comment has been incorporated into the written examination with annotation.

ENCLOSURE 1

9509290118 950906
PDR ADOCK 05000062
V PDR

United States Nuclear Regulatory Commission

Operator Licensing Examination

Enclosure 2

QUESTION (B.1) [1.0]
A 10 curie source is removed from the reactor after irradiation. The source emits a 2 Mev gamma, and acts as a point source. There is a two inch lead shield (a tenth thickness) around the source. Which ONE of the following is the minimum distance from the source a radiation worker may be without being in a HIGH RADIATION area?

a. 6½ feet

b. 7 feet

c. 11 feet

d. 12 feet

QUESTION (B.2) [1.0]
Which ONE of the following statements describes the correct method for performing a frisk using a hand-held meter? The probe should be...

a. in contact with the surface, maximizing sensitivity, and moved slowly to allow time for meter to detect contamination.

b. in contact with the surface, maximizing sensitivity, and moved quickly to detect contamination before it decays.

c. close but not in contact with the surface, minimizing possible contamination of the probe, and moved slowly to allow time for meter to detect contamination.

d. close but not in contact with the surface, minimizing possible contamination of the probe, and moved quickly to detect contamination before it decays.

QUESTION (B.3) [1.0]
During an evacuation, it is determined that the primary assembly area east end of the reactor facility building near the entrance gate should also be evacuated. Where should personnel now assemble?

a. The Van de Graaf building Southeast of the reactor facility.

b. The Special Materials Handling Facility at the bottom of Observatory Hill.

c. The Radio Astronomy Laboratory Northeast of the facilty.

d. The University Police Office.

QUESTION (B.4) [1.0]
Which ONE of the following amounts of radiation would cause the most damage to the body? Assume no shielding in all cases.

a. A beta emitting point source reading 0.5 mrad/hr on contact.

b. An alpha emitting point source reading 0.5 mrad/hr on contact.

c. A gamma emitting point source reading 10 mrad/hr on contact.

d. A fast neutron emitting point source reading 10 mrad/hr on contact.

QUESTION (B.5) [1.0]
Which ONE of the following describes the correct action(s) to be taken if a film badge is lost?

a. Until a new film badge is obtained, no entry into a radiation area is allowed.

b. A direct-reading dosimeter is used until a new film badge is obtained.

c. Individual dose is estimated by processing the film badges of individuals with similar work functions, then a new film badge is issued.

d. A direct reading dosimeter is issued, but entry into high radiation areas is not allowed until the next quarter to ensure quarterly exposure limits are not exceeded.

QUESTION (B.6) [1.0]
If an radioisotope has a biological half life of 138 days and a radiological half life of 8 days, then half of the radioisotope will remain in the body ____ days after ingestion.

a. 130

b. 73

c. 7.6

d. 0.13

QUESTION (B.7) [1.0]
Which ONE of the following is the level at which you would stop decontamination procedures during performance of EPIP-9? A frisker reading less than...

a. 100 cpm (absolute)

b. 500 cpm (absolute)

c. 100 cpm (above background)

d. 500 cpm (above background)

QUESTION (B.8) [1.0]
Which ONE of the following is the lowest level of UVAR management who may approve temporary procedural changes?

a. Reactor Operator

b. Reactor Supervisor

c. Facility Director

d. Reactor Safety Committee

QUESTION (B.9) [1.0]
Which ONE of the following statements is correct concerning the release of pond water to Meadow Creek?

a. Both the Reactor Supervisor and the On-Duty SRO must approve all pond water releases.

b. If the pond water reaches a level less than one foot below the top of the spillway, a sample must be taken.

c. If pond water beta activity, less ^{3}H activity, is greater than 3×10^{-8} μcuries/ml, the water will normally be diluted prior to release.
Changes made per facility comment

d. One week prior to discharge, three samples must be drawn to determine pond water activity.

QUESTION (B.10) [1.0]
Which ONE of the following statements concerning experiments is NOT a UVAR limit?

a. NEW experiments worth greater than 0.1% $\Delta K/K$ must be inserted or removed with the reactor shutdown.

b. PREVIOUSLY TRIED experiments worth greater than 0.1% $\Delta K/K$ must be inserted or removed with the reactor shutdown.

c. MOVABLE experiments must be worth less than 0.1% $\Delta K/K$.

d. Experiments worth more than 0.4% $\Delta K/K$ may not be inserted into the reactor under any condition.

QUESTION (B.11) [1.0]
A fueled experiment will generate greater than 1 watt during irradiation. Which ONE of the following statements is a requirement to be satisfied prior to irradiation of this experiment?

a. The experiment must be in the reactor pool and under at least 20 feet of water.

b. The thermal power generated shall be less than 10 watts.

c. The irradiation must be approved by the Radiation Health Physicist.

d. The irradiation must be approved by the Reactor Safety Committee.

QUESTION (B.12) [1.0]
A visual inspection of the seals and gaskets for the truck door, the personnel door and the ventilation exhaust duct door was last performed on May 30, 1995. Which ONE of the following is the latest date these seals and gaskets could be visually inspected without exceeding a UVAR surveillance requirement?

a. September 30, 1995

b. November 30, 1995

c. January 15, 1996.

d. August 30, 1996

QUESTION (B.13) [1.0]
Which ONE of the listed individuals (by title) is the lowest level of University personnel who may authorize, in accordance with the Virginia Reactor Emergency Plan, reentry into the facility following evacuation due to an emergency?

a. Facility Director (Emergency Director)

b. Reactor Supervisor (Emergency Coordinator)

c. Director of Radiological Safety

d. Senior On-Site Health Physicist

QUESTION (B.14) [1.0]
Which ONE of the following limits for reactor period is correct?

a. The minimum allowed reactor period is 100 seconds for all conditions

b. The minimum allowed reactor period is 30 seconds for all conditions.

c. The minimum allowed reactor period after getting indication on the intermediate and linear power channels is 30 seconds.

d. The minimum allowed reactor period after getting indication on the intermediate and linear power channels is 100 seconds.

QUESTION (B.15) [1.0]
The UVAR technical specifications require that there be two separate emergency core spray systems. Which ONE of the following is the correct minimum flow rates to be maintained for the first ½ hour and the next hour?

a. 10 gpm, 7½ gpm

b. 10 gpm, 5 gpm

c. 15 gpm, 10 gpm

d. 15 gpm, 7½ gpm

QUESTION (B.16) [1.0]
Which ONE of the following failures does NOT require an IMMEDIATE shutdown of the reactor?

a. Failure of the pool water level monitor.

b. One (1) solid state relay failure light comes on.

c. One (1) stuck rod.

d. Pool temperature continues to rise after system has stabilized.

QUESTION (B.17) [1.0]
While operating at power, the MAGNET ENGAGED light for a shim rod goes out and the SEATING light energizes. Which ONE of the following actions should be taken in accordance with SOP 11.D? (Assume no scram signal.) Clarification added during examination.

a. Immediately scram the reactor.

b. Fully insert the remaining shim rods and the regulating rod.

c. Insert the remaining shim rods to 10 inches.

d. Reengage the shim rod and obtain the SRO's permission to return it to its original position.

QUESTION (B.18) [1.0]
You've just finished loading a new core. Which ONE of the following power levels are you limited to until a rod calibration has been performed?

a. 10 watts

b. 100 watts

c. 1 kilowatt

d. 10 kilowatts

QUESTION (B.19) [1.0]
Which ONE of the following is the definition of *CHANNEL TEST*?

a. An adjustment of the channel so that its output responds with acceptable range and accuracy, to known values of the parameter that the channel measures.

b. A qualitative verification of acceptable performance by observation of channel behavior.

c. The combination of sensor, lines, amplifiers, and output devices that are connected for the purpose of measuring the value of a process variable.

d. The introduction of a signal into a channel to verify that it is operable.

QUESTION (B.20) [1.0]
Which ONE of the following reactor instrumentation may be replaced by a locally alarming monitor of similar range for up to 30 days without requiring a reactor shutdown?

a. Core Gamma Monitor

b. Reactor Room Constant Monitor

c. Reactor Face Monitor

d. Linear Power Channel

(***End of Section B ***)

QUESTION (C.1) [1.0]
Which ONE of the following statements correctly describes the operation of the Temperature Monitoring System for the UVAR reactor?

a. The ΔT obtained from the temperature detectors on the inlet and the outlet of the heat exchanger can be related to reactor thermal power.

b. An outlet temperature of 105°F from the heat exchanger will initiate a reactor scram.

c. The ΔT obtained from the pool temperature detector and the temperature on the suction side of the primary pump can be related to reactor power.

d. A ΔT of 25°F across the core as detected by the temperature monitoring system will initiate a reactor scram.

QUESTION (C.2) [1.0]
The "RAD ZONE ENTRY" alarm annunciates during reactor power operation. Which ONE of the following could have caused the alarm?

a. the electric eye system in the heat exchanger room.

b. the entry alarm on the demineralizer room.

c. the entry alarm to the large access facility.

d. the entry alarm the "rabbit" facility.

QUESTION (C.3) [1.0]
Which ONE of the following conditions will cause a reactor scram when operating at 2 Megawatts?

a. High radiation on bridge monitor.

b. High radiation on the criticality monitor.

c. High ΔT across the core.

d. Deenergizing the secondary pump.

QUESTION (C.4) [1.0]
Each of the ventilation ducts leading from the experimental facilities can be fitted with an internal radiation monitor. Which ONE of the following correctly describes the type and the set point of the detector?

a. Scintillation, 800 cpm.

b. Scintillation, 100 cps above background.

c. Geiger Müeller, 800 cps above background.

d. Geiger Müeller, 800 cpm.

QUESTION (C.5) [1.0]
The reactor room ventilation exhaust ducts have doors which are part of the reactor room isolation. Which ONE of the following statements describes the mechanism which causes the exhaust doors to close on a high radiation condition? The doors are held open by

a. a pneumatic cylinder, which is depressurized on any high radiation level.

b. a solenoid operated mechanical latch which deenergizes on high radiation level on two constant air monitors.

c. a magnet which releases on high radiation level at the reactor bridge.

d. air flow, which stops on the trip of the ventilation fans on high radiation level in the ventilation exhaust duct.

QUESTION (C.6) [1.0]
Which ONE of the following correctly describes the method for minimizing the buildup of Ar^{41} in the North Neutron Beamport?

a. A constant air purge is circulated through the beamport during operation and exhausted to the stack.

b. The front tube is filled with demineralized water during operation to minimize neutron activation.

c. A Boron paraffin sleeve surround the experiment to be irradiated to minimize the air activation.

d. When the front of the tube is drained it is filled with Helium gas eliminating air activation in the tube.

QUESTION (C.7) [1.0]
Which ONE of the following is the correct setpoint, and action associated with the alarming of the reactor bridge monitor?

a. 30 mr/hr, no scram

b. 2 mr/hr, no scram

c. 30 mr/hr, scram

d. 2 mr/hr, scram

QUESTION (C.8) [2.0]
Match the Nuclear Instrumentation channel in column A with the neutron detector type listed in column B.

a.	Source Range	1.	BF_3 Proportional Counter
b.	Intermediate Range	2.	Compensated Ion Chamber
c.	Power Range 1/2	3.	Fission Chamber
d.	Linear Power	4.	Uncompensated Ion Chamber

QUESTION (C.9) [1.0]
You are the console operator operating the reactor at 2 Megawatts, when there is a total loss of electrical power to the facility. Which ONE of the following will result from the power failure?

a. The regulating rod will drop into the core.

b. The ventilation exhaust doors will open.

c. The pool makeup valve will open.

d. The personnel access doors will close.

QUESTION (C.10) [1.0]
Which ONE of the following are the correct drive speeds for the control rods?

a. The shim rods drive at 24 inches/minute, while the regulating rod drives at 3.74 inches/minute.

b. The shim rods drive at 3.74 inches/minute, while the regulating rod drives at 24 inches/minute.

c. The shim rods and regulating rod all drive at 3.74 inches/minute.

d. The shim rods and regulating rod all drive at 24 inches/minute.

QUESTION (C.11) [1.0]
Which ONE of the following correctly describes operation of the primary coolant header?

a. The header is raised into and held in place by a 50 psig air pressure cylinder.

b. The header is held in place by differential pressure generated by primary coolant flowing down through the core .

c. A trip of the primary pump deenergizes an electromagnet, causing the header to drop.

d. Stopping the primary pump vents air from the header operating system, causing the header to drop.

QUESTION (C.12) [1.0]
Which ONE of the following parameters is NOT an input to the Mixer Driver relay.

a. Pool Level.

b. Reactor Period.

c. Source Range level.

d. Pool Temperature.

QUESTION (C.13) [1.0]
According to the UVAR Safety Analysis Report, graphite is a significantly better material for a reflector than pool water. Which ONE of the following is the reason for this?

a. A fast neutron colliding with carbon will have a much greater loss of energy per collision.

b. Carbon has a lower cross-section for absorption of neutrons, resulting in a much lower loss of neutrons.

c. Carbon has a much higher cross-section for scattering resulting in a much higher number of thermalized neutrons.

d. Graphite is much denser than water causing more thermalizations per area.

QUESTION (C.14) [2.0]
Using the figure provided, list the normal positions of valves 1 through 6 for filtration of tank number 2.

1. Valve #1

2. Valve #2 Question changed during administration.

3. Valve #3

4. Valve #4

5. Valve #5

6. Valve #6

QUESTION (C.15) [1.0]
Which ONE of the following is the reason sulfuric acid is added to facility water?

a. Added to secondary coolant to lower pH.

b. Added to primary coolant to lower pH.

c. Added to secondary coolant to raise pH.

d. Added to primary coolant to raise pH.

QUESTION (C.16) [1.0]
In addition to traditional reactor power detectors (Nuclear Instrumentation) UVAR has two other radiation detectors with output proportional to reactor power. Which ONE of the following correctly describes the detector which measures radiation due to N^{16}?

a. A scintillation detector located approximately 7 feet above the core.

b. An ionization chamber detector located approximately 7 feet above the core.

c. A scintillation detector located in the heat exchanger room.

d. An ionization chamber detector located in the heat exchanger room.

QUESTION (C.17) [1.0]
Which ONE of the following is where the discharge of the Hot Cells drains to DIRECTLY?

a. 5000 gallon retention tanks

b. 250 gallon waste tanks

c. Sanitary Sewer

d. Waste Pond

QUESTION (C.18) [1.0]
Which ONE of the following is the POSITIVE verification that the core spray header is securely engaged following movement of the reactor bridge?

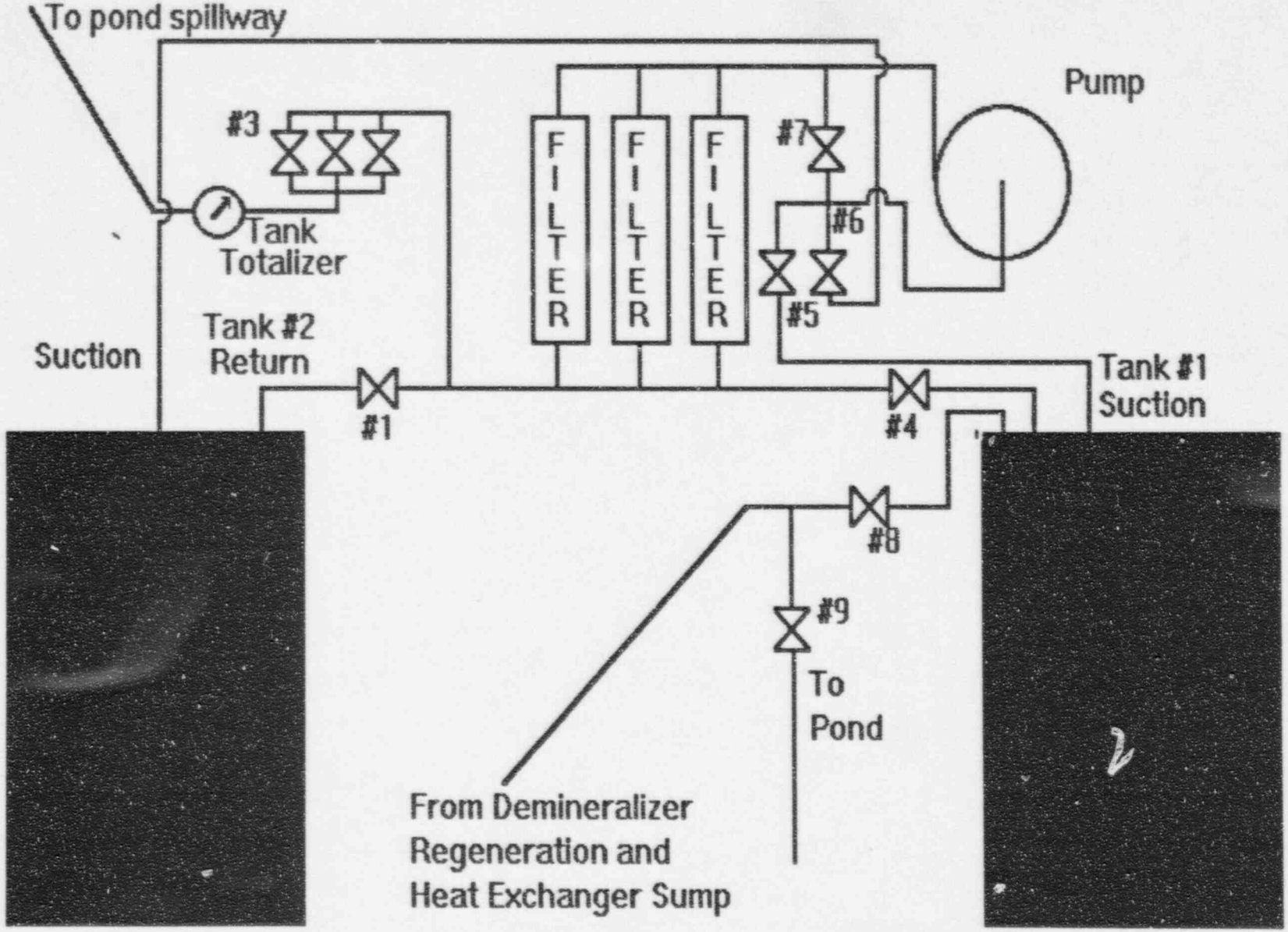
a. A visual check to ensure the bridge is in the full power position.

b. A leak test is performed by supplying air to the coupler.

c. A flow test is performed ensuring a minimum of 12½ gpm.

d. Core spray tank level is monitored for leakage.

(*** End of Section C ***)


To pond spillway
Pump
#3
FILTER
FILTER
FILTER
#7
#6
#5
Tank
Totalizer
Tank #2
Return
Suction
Tank #1
Suction
#1
#4
#8
#9
To
Pond
From Demineralizer
Regeneration and
Heat Exchanger Sump

ANSWER (B.1)
c
Dose Rate (DR) = (6 Ci nE) ÷ Distance $(d)^2$
Given DR = 100 mR/hr = 0.1 R/hr
d^2 = (6 * 10Ci * 2Mev) ÷ 0.1 * 10 = 120/1 = 120
d = 10.95
REFERENCE (B.1)
10 CFR 20

ANSWER (B.2)
c
REFERENCE (B.2)
Radiation/Contamination Protection, G-102

ANSWER (B.3)
b
REFERENCE (B.3)
UVAR EPIP-14 *Evacuation*, § 3.f, p. 3.

ANSWER (B.4)
d
REFERENCE (B.4)
10 CFR 20.5

ANSWER (B.5)
b
REFERENCE (B.5)
UVAR, SOP § 10.3.B, p. 10-4.

ANSWER (B.6)
c
REFERENCE (B.6)
$T_{½eff} = T_{½biol.} * T_{½rad.}/(T_{½biol.} + T_{½rad.})$
(138 * 8)/(138 + 8) = 1104/146 = 7.562

ANSWER (B.7)
c
REFERENCE (B.7)
UVAR EPIP-9 § VI.3.E.6.b, p. 9.

ANSWER (B.8)
c
REFERENCE (B.8)
SOP § 1, p. 1-1

ANSWER (B.9)
c
REFERENCE (B.9)
UVAR SOP § 10.5.B.2.c.1 p. 10-14 & Release of Pond Water Authorization, Release criterial p. 10-18.

ANSWER (B.10)
d
REFERENCE (B.10)
UVAR TS § 3.6

ANSWER (B.11)
d
REFERENCE (B.11)
UVAR SOP § 6.1.b.7, p. 6-3. UVAR TS § 3.7, p. 20

ANSWER (B.12)
c
REFERENCE (B.12)
UVAR SOP § 7.9.B, p. 7-32. UVAR TS 4.6

ANSWER (B.13)
a
REFERENCE (B.13)
Univ of VA. Reactor Facility Emergency Plan, § 3.2.2 p. 9

ANSWER (B.14)
c
REFERENCE (B.14)
UVAR SOP §§ 5.1.A.8, p. 5-2 & 5.1.A.13, p. 5-3.

ANSWER (B.15)
a
REFERENCE (B.15)
UVAR Technical Specifications § 3.10

ANSWER (B.16)
d
REFERENCE (B.16)
UVAR SOP § 11.M, p. 11-14

ANSWER (B.17)
c
REFERENCE (B.17)
UVAR SOP 11.D. p. 11-5.

ANSWER (B.18)
c
REFERENCE (B.18)
UVAR SAR, § 3.6, p. 3-12.

ANSWER (B.19)
d
REFERENCE (B.19)
UVAR T.S. § 1.0 DEFINITIONS

ANSWER (B.20)
c
REFERENCE (B.20)
UVAR T.S. § 3.3 *Reactor Instrumentation*

(***End of Section B ***)

ANSWER (C.1)
c
REFERENCE (C.1)
UVAR SAR, § 4.4, pp. 4-6 & 4-7.

ANSWER (C.2)
b
REFERENCE (C.2)
UVAR SOP 11.C.a.1 p. 11-4

ANSWER (C.3)
a
REFERENCE (C.3)
UVAR SAR, § 3.12.2 p. 3-39 & § 7.4, p. 7-3.

ANSWER (C.4)
d
REFERENCE (C.4)
UVAR, SAR, § 4.9.4, p. 4-21

ANSWER (C.5)
c
REFERENCE (C.5)
UVAR SAR, § 6.1, p. 6-4.

ANSWER (C.6)
d
REFERENCE (C.6)
UVAR SAR, § 5.1 p. 5-1.

ANSWER (C.7)
c
REFERENCE (C.7)
UVAR SOP § 4.5.B, p. 4-23. UVAR SAR § 3.12.3, p. 3-40

ANSWER (C.8)
a, 3; b, 2; c, ~~3~~4; d, 2 Answer key changed during administration of exam.
REFERENCE (C.8)
UVAR SAR § 3.11, pp. 3-21 — 3-38.

ANSWER (C.9)
d
REFERENCE (C.9)
UVAR SAR, § Various

ANSWER (C.10)
b
REFERENCE (C.10)
UVAR SAR, § 3.4, p. 3-11

ANSWER (C.11)
b
REFERENCE (C.11)
UVAR SAR, § 4.3 p. 4-3

ANSWER (C.12)
c
REFERENCE (C.12)
UVAR SAR, § 3.11, Figure 3-11.

ANSWER (C.13)
b
REFERENCE (C.13)
UVAR SAR § 3.5, p. 3-12.

ANSWER (C.14)
1, NO 2, NC 3, NC
4, NC 5, NC 6, NO
REFERENCE (C.14)
Pond & Tank Release Method, Figure *Normal Valve Lineup for Filtration of Tank #2.*

ANSWER (C.15)
a.
REFERENCE (C.15)
UVAR SOP § 8.2 *Secondary Water Chemistry* p. 8-1.

ANSWER (C.16)
d
REFERENCE (C.16)
UVAR SAR, § 3.11.1 p. 3-23.

ANSWER (C.17)
b
REFERENCE (C.17)
UVAR SAR, § 4.8 p. 4-7a.

ANSWER (C.18)
b
REFERENCE (C.18)
UVAR SAR, § 4.10 p. 4-27

(*** End of Section C ***)

B.1 c

B.2 c

B.3 b

B.4 d

B.5 b

B.6 c

B.7 c

B.8 c

B.9 c

B.10 d

B.11 d

B.12 c

B.13 a

B.14 c

B.15 a

B.16 d

B.17 c

B.18 c

B.19 d

B.20 c

C.1 c

C.2 b

C.3 a

C.4 d

C.5 c

C.6 d

C.7 c

C.8 a, 3; b, 2; c, ~~3~~4; d, 2 Answer key changed during exam adminstration.

C.9 d

C.10 b

C.11 b

C.12 c

C.13 b

C.14 1, NO 2, NC 3, NC 4, NC 5, NC 6, NO

C.15 a.

C.16 d

C.17 b

C.18 b

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

FACILITY: Univ. of Virginia

REACTOR TYPE: UVAR

DATE ADMINISTERED: 1995/08/28

REGION: 2

CANDIDATE: _____

INSTRUCTIONS TO CANDIDATE:

Answers are to be written on the answer sheet provided. Points for each question are indicated in brackets for each question. A 70% in each section is required to pass the examination. Examinations will be picked up two (2) hours after the examination starts.

CATEGORY VALUE	% OF TOTAL	CANDIDATE'S SCORE	% OF CATEGORY VALUE		CATEGORY
20.00	50.00	_____	_____	B.	NORMAL AND EMERGENCY OPERATING PROCEDURES AND RADIOLOGICAL CONTROLS
20.00	50.00	_____	_____	C.	PLANT AND RADIATION MONITORING SYSTEMS
40.00		_____ FINAL GRADE	_____%		TOTALS

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

_____
Candidate's Signature

ANSWER SHEET

B.1	a	b	c	d	___	B.11	a	b	c	d	___
B.2	a	b	c	d	___	B.12	a	b	c	d	___
B.3	a	b	c	d	___	B.13	a	b	c	d	___
B.4	a	b	c	d	___	B.14	a	b	c	d	___
B.5	a	b	c	d	___	B.15	a	b	c	d	___
B.6	a	b	c	d	___	B.16	a	b	c	d	___
B.7	a	b	c	d	___	B.17	a	b	c	d	___
B.8	a	b	c	d	___	B.18	a	b	c	d	___
B.9	a	b	c	d	___	B.19	a	b	c	d	___
B.10	a	b	c	d	___	B.20	a	b	c	d	___

ANSWER SHEET

C.1 a b c d ___

C.2 a b c d ___

C.3 a b c d ___

C.4 a b c d ___

C.5 a b c d ___

C.6 a b c d ___

C.7 a b c d ___

C.8a 1 2 3 4 ___

b 1 2 3 3 ___

c 1 2 3 4 ___

d 1 2 3 4 ___

C.9 a b c d ___

C.10 a b c d ___

C.11 a b c d ___

C.12 a b c d ___

C.13 a b c d ___

C.14a NO NC ___

b NO NC ___

c NO NC ___

d NO NC ___

e NO NC ___

f NO NC ___

C.15 a b c d ___

C.16 a b c d ___

C.17 a b c d ___

C.18 a b c d ___