ENCLOSURE 1

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

REPORT NO.: 50-184/OL-92-01

FACILITY DOCKET NO.: 50-184

FACILITY LICENSE NO.: TR-5

FACILITY: National Institute of Standards and Technology (NIST)

EXAMINATION DATE: March 18, 1992

EXAMINER: Paul V. Doyle, Chief Examiner

SUBMITTED BY: _____ 5.4.92
Paul V. Doyle, Chief Examiner Date

APPROVED BY: James L. Caldwell 4/4/92
James L. Caldwell, Chief Date
Non-Power Reactor Section
Operator Licensing Branch
Division of Licensee Performance
and Quality Evaluation
Office of Nuclear Reactor Regulation

SUMMARY:

On March 18, 1992, the NRC administered Requalification written examinations to 17 Senior Reactor Operators (SROs) for the NIST reactor facility. All 17 SROs passed the written examinations.

The NRC will conduct operating examinations during dates mutually agreed upon between the NRC and the facility management. Only those operators who satisfactorily complete both the written and operating portions of the NRC administered requalification examination will receive credit for license renewal per 10 CFR 55.57.b.2(iv).

REPORT DETAILS

1. Examiner:

   Paul V. Doyle, Chief Examiner

2. Results:

	RO (Pass/Fail)	SRO (Pass/Fail	Total (Pass/Fail)
NRC Grading:	0/0	17/0	17/0
Facility Grading:	0/0	17/0	17/0

3. Written Examination:

   The NRC administered Requalification written examinations to 17 Senior Reactor Operators (SROs). All 17 SROs passed the written examinations.

4. Operating Examinations:

   The NRC will administer requalification operating examinations on mutually agreeable dates.

5. Exit Meeting:

   Personnel attending:

   Paul V. Doyle, NRC
   Tawfik Raby, NIST

   The NRC thanked the facility for their assistance in the preparation of the written examination. The facility was not prepared to submit dates for the conduct of operating examinations.

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

FACILITY: Nat Bureau of Standards

REACTOR TYPE: NBSR

DATE ADMINISTERED: 92/03/18

REGION: 1

CANDIDATE: _____

LICENSE APPLIED FOR: _____

INSTRUCTIONS TO CANDIDATE:
Answers are to be written on the exam page itself, or the answer sheet provided. Write answers one side ONLY. Attach any answer sheets to the examination. Points for each question are indicated in parentheses for each question. A 70% in each section 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
23.00	32.86			A. REACTOR THEORY, THERMODYNAMICS AND FACILITY OPERATING CHARACTERISTICS
23.00	32.86			B. NORMAL AND EMERGENCY OPERATING PROCEDURES AND RADIOLOGICAL CONTROLS
24.00	34.29			C. PLANT AND RADIATION MONITORING SYSTEMS
70.00		FINAL GRADE	_____%	TOTALS

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

_____
Candidate's Signature

NRC RULES AND GUIDELINES FOR LICENSE EXAMINATIONS

During the administration of this examination the following rules apply:

1. Cheating on the examination means an automatic denial of your application and could result in more severe penalties.

2. After the examination has been completed, you must sign the statement on the cover sheet indicating that the work is your own and you have not received or given assistance in completing the examination. This must be done after you complete the examination.

3. Restroom trips are to be limited and only one candidate at a time may leave. You must avoid all contacts with anyone outside the examination room to avoid even the appearance or possibility of cheating.

4. Use black ink or dark pencil only to facilitate legible reproductions.

5. Print your name in the blank provided in the upper right-hand corner of the examination cover sheet.

6. Fill in the date on the cover sheet of the examination (if necessary).

7. The point value for each question is indicated in parentheses after the question. The amount of blank space on an examination question page is NOT an indication of the depth of answer required.

8. If the intent of a question is unclear, ask questions of the examiner only.

9. When turning in your examination, assemble the completed examination with examination questions, examination aids and answer sheets. In addition, turn in all scrap paper.

10. To pass the examination, you must achieve at least 70% in each category.

11. There is a time limit of (3) hours for completion of the examination.

12. When you are done and have turned in your examination, leave the examination area as defined by the examiner. If you are found in this area while the examination is still in progress, your license may be denied or revoked.

QUESTION: 001 (1.00)

The regulating rod is calibrated at the NBSR by measuring reactor power doubling time. Indicate the time it takes for reactor power to increase by a factor of "e" (2.7) when the measured doubling time is 20.8 sec.

a. 14.4 sec.

b. 20.8 sec.

c. 25 sec.

d. 30 sec.

QUESTION: 002 (1.00)

The reactivity associated with the doubling time of 20.8 sec. above is:

a. 13.3 cents

b. 25 cents

c. 30 cents

d. 35 cents

QUESTION: 003 (1.00)

One minute after scram from full power the indications on the nuclear channels are mainly due to:

a. Prompt neutrons

b. Prompt and delayed neutrons

c. Prompt, delayed and photoneutrons

d. Delayed and photoneutrons

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

QUESTION: 004 (1.00)

Indicate which of the following neutron absorbers will result in a positive reactivity effect.

a. U-235 in the center of G-4

b. Stainless steel in the center of G-4

c. Cadmium in the center of G-4

d. Light water introduced in the heavy water system

QUESTION: 005 (1.00)

The reactor is shutdown with two shutdown pumps running. System parameters are:

Coolant flow rate through the core:	1500 gpm
Delta-t across the core:	3° F
NC-5 indication:	2 kW

The decay heat power level of the core at this point is:

a. 661 kW

b. 729 kW

c. 1.0 MW

d. 1.2 MW

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

QUESTION: 006 (1.00)

The principal source of decay heat in the core after shutdown is:

a. Neutrons causing fissions

b. Cosmic rays causing fissions

c. Decay of fission products

d. Stored energy from reactor and core materials

QUESTION: 007 (1.00)

With the reactor on a constant period, select the LONGEST time for a reactor power change of:

a. 5% -- going from 1% to 6% power

b. 10% -- going from 10% to 20% power

c. 15% -- going from 20% to 35% power

d. 20% -- going from 40% to 60% power

QUESTION: 008 (1.00)

Select the factor that will NOT affect the estimated shim arm critical position.

a. Xenon level

b. N-16 level

c. Moderator temperature

d. Fuel burnup

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

QUESTION: 009 (1.00)

The NBSR is critical with the regulating rod fully withdrawn and the four shim arm position is at 30 deg. At this point the shutdown margin WITH and WITHOUT the regulating rod is:

a. $ 5.8 with $ 5. without

b. $ 28.2 with $ 29.8 without

c. $ 29.8 with $ 29. without

d. $ 29. with $ 34. without

e. $ 34. with $ 5. without

QUESTION: 010 (1.00)

After a routine startup to power all primary temperature indications except outlet temperature fail. The following information was available in the Control Room.

Assume only HEIP. like

Primary flow	= 6300 gpm
Core outlet temperature	= 114° F
NC-6, 7 and 8	= 100%
Secondary Flow through HE-1B	= 5100 gpm
HE-1B secondary inlet temp	= 84° F
HE-1B secondary outlet temp	= 100° F

The reactor power is calculated to be:

a. 12 MW

b. 13.2 MW

c. 14.8 MW

d. 16.3 MW

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

QUESTION: 011 (1.00)

Recently 350g elements were introduced into the core replacing 300g elements. This will result in:

a. Decreased operating cycle time

b. Decreased shutdown margin

c. Higher critical shim position

d. Decreased core excess reactivity

QUESTION: 012 (1.00)

Equilibrium xenon for the NBSR at full power is worth 3.75 dollars and peak xenon is worth about 15 dollars above equilibrium. The worth of xenon ten days after shutdown is:

a. Zero

b. 3.75 dollars

c. 15 dollars

d. 18.75 dollars

QUESTION: 013 (1.00)

If samarium was worth 1.25 dollars at full power, its worth 10 days after shutdown is:

a. Zero

b. 1.25 dollars

c. less than 1.25 dollars but not zero

d. greater than 1.25 dollars

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

QUESTION: 014 (1.00)

Two days after operating continuously at 5 MW, reactor power was increased to 15 MW. At this point the regulating rod position was 15 inches and the reactor in automatic control. The condition of the regulating rod for several minutes after the power increase will be:

a. Inserting

b. Withdrawing

c. Fully inserted

d. Fully withdrawn

QUESTION: 015 (1.00)

The principal reason for the condition of the regulating rod is:

a. Xenon decay

b. Xenon burnup

c. Xenon equilibrium

d. Xenon and samarium buildup

QUESTION: 016 (1.00)

The addition of one dollar of reactivity to a just critical reactor will result in the reactor being: (Assume no other changes)

a. Subcritical

b. Critical but not Prompt Critical

c. Prompt Critical

d. Supercritical but not Prompt Critical

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

QUESTION: 017 (1.00)

Near the end of core life, the shim arms are fully withdrawn and the regulating rod is at 15 inches. The excess reactivity at this point is:

a. 35 cents

b. 42 cents

c. 77 cents

d. 9 dollars

QUESTION: 018 (1.00)

For the NBSR, the neutron lifetime is 7×10^{-4} sec., βeff is 0.008 and τ is 10 seconds. The addition of one dollar of reactivity to a critical NBSR will result in a period of:

a. Zero

b. .0875 sec.

c. 1 sec.

d. 11.4 sec.

QUESTION: 019 (1.00)

NBSR shim arms were withdrawn from their fully inserted position until the count rate increased by a factor of 10. The delta K deviation from criticality after the partial shim withdrawal is:

a. one half as before

b. one tenth as before

c. one one-hundredth as before

d. ten times as before

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

QUESTION: 020 (1.00)

NBSR shim arms are dropped from 12 degrees as a check prior to startup. Assuming that K effective is 0.95 before the drop and 0.9 after the drop.

The count rate after the drop will:

a. Increase by a factor of 2

b. Decrease by a factor of 2

c. Increase by a factor of 5

d. Decrease by a factor of 5

QUESTION: 021 (1.00)

During reactor startup, the shim arms are withdrawn such that the reactivity addition doubles the count rate. The amount of reactivity needed to double again is _____ and the amount of reactivity needed to go go critical is _____.

a. Less than the original reactivity addition, less than the original reactivity addition

b. More than the original reactivity addition, more than the original reactivity addition

c. Less than the original reactivity addition, more than the original reactivity addition

d. The same as the original reactivity addition, more than the original reactivity addition

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

QUESTION: 022 (1.00)

Recently core inlet temperature was reduced to 90° F to extend the operating cycle. This can be accomplished because:

a. Negative moderator temperature coefficient

b. Positive moderator temperature coefficient

c. Greater thermalization of neutron

d. Lower fuel plate temperature

QUESTION: 023 (1.00)

An operator notices that indications on the Log N nuclear channels of a reactor with partially withdrawn rods show a steady vertical line. How can the operator ascertain whether the reactor is critical?

a. The reactor is critical because the Log N shows a steady vertical line which indicates criticality.

b. The shim arm indication must be checked against past critical indication.

c. Slightly withdrawing the rods results in a steady positive period.

d. Slightly inserting the rods results in a reduction in the flux level and a corresponding lower indication on the Log N.

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

QUESTION: 001 (1.00)

The reactor startup checklist is valid for:

a. 24 hours after beginning the checklist

b. 24 hours after completing the checklist

c. 48 hours after beginning the checklist

d. 48 hours after completing the checklist

QUESTION: 002 (1.00)

As a MINIMUM, who may authorize a reactor restart following an unplanned scram? (Assume the cause of the scram has been found and corrected.)

a. Any Senior Reactor Operator

b. The Reactor Supervisor on shift

c. Deputy Chief, Reactor Operations

d. Chief, Reactor Operations

QUESTION: 003 (1.00)

The administrative rules require that a minor change to the safety system be approved by:

a. The Reactor Supervisor

b. The Chief or Deputy Chief, Reactor Operations

c. The Chief, Reactor Instrumentation

d. The Chief, Engineering Services

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

QUESTION: 004 (1.00)

During full power operation, both N-16 monitors alarm and are reading 1500 and 2000 cpm respectively. As the Console Operator, your immediate action is:

a. Notify the Reactor Supervisor

b. Notify Health Physics

c. Have secondary water analyzed for tritium

d. Scram the reactor

QUESTION: 005 (1.00)

The fission products monitor alarms at full power. An immediate action required by the procedures is:

a. Shutdown the reactor

b. Raise the set point by 10,000 cpm, if it alarms again shutdown the reactor

c. Check the tritium monitor to determine the source of argon

d. Draw gas sample and analyze for fission products

QUESTION: 006 (1.00)

Identify the condition REQUIRING an immediate halt to any fuel handling in progress.

a. Calculations determine shutdown margin has decreased to twenty five cents ($.25) above the most reactive shim arm.

b. The Reactor Supervisor approves a request for 2 personnel to enter the Process Room

c. The Control Room operator notes a step change in level on NC-1 from 10 c.p.s. to 150 c.p.s. that steadies out at 90 c.p.s.

d. Nuclear Instrumentation channel NC-3 fails downscale with channels NC-1, 2 and 4 still operable

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

QUESTION: 007 (1.00)

Whose PERMISSION must be obtained prior to the insertion of any sample in the pneumatic or vertical manual irradiation facilities?

a. Any licensed Reactor Operations personnel on shift

b. The on-shift Reactor Console Operator

c. The Reactor Supervisor

d. The Activation Analysis Coordinator

QUESTION: 008 (1.00)

The initial Emergency Director is:

a. The duty Reactor Supervisor

b. The Deputy Chief, Reactor Operations

c. The Chief, Reactor Operations

d. The NIST Facility Emergency Coordinator

QUESTION: 009 (1.00)

The Emergency Planning Zone extends to:

a. Building 235

b. 200 meters from the stack

c. 400 meters from the stack

d. The fenced in perimeter of NIST

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

QUESTION: 010 (2.00)

The NBSR emergency plan requires that an emergency be declared for certain conditions. For each of the conditions listed below, indicate the level of emergency to be declared: (0.5 each)

A. None

B. Notification on Unusual Event

C. Alert

D. Site Area Emergency

a. Prolonged fire threatening the reactor

b. A bomb threat directed against the reator

c. A major security breach threatening the reactor

d. Level 1 indication on RD 4-2

QUESTION: 011 (1.00)

Select the person meeting the criteria allowing their QUARTERLY exposure limit to be raised from 1-1/4 rem to 3 rem.

a. Person "A" -- 24 years old
-- Has an undocumented current lifetime dose of 22.5 rem

b. Person "B" -- 19 years old
-- Has a documented current lifetime dose of 5 mrem

c. Person "C" -- 29 years old
-- Has an undocumented current lifetime dose of 48.2 rem

d. Person "D" -- 17 years old
-- Has documented no prior exposure

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

QUESTION: 012 (1.00)

Use of the Hand and Foot or Portal monitors is required:

a. When leaving any restricted area

b. When leaving the Reactor Building

c. Only if contamination is known to exist

d. Only when required by a Radiation Work Permit

QUESTION: 013 (1.00)

A Radiation Work Permit (RWP) is written to perform a non-repetitive task on equipment that is potentially contaminated.

How long is this RWP allowed to remain in effect?

a. Until the job is completed

b. 8 hours or until the end of the current shift

c. A maximum of 24 hours

d. Indefinitely, if reviewed daily by Health Physics

QUESTION: 014 (1.00)

What is the longest an adult radiation worker, whose exposure history is not known, can remain in an area with a dose rate of 1 R/hr without exceeding the daily and weekly NBSR limits respectively.

a. 2 minutes and 6 minutes

b. 6 minutes and 6 minutes

c. 6 minutes and 18 minutes

d. 18 minutes and 75 minutes

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

QUESTION: 015 (1.00)

Limiting Safety System Settings in the NBSR Technical Specifications specifies only one rundown. This is:

a. Low primary flow

b. High reactor inlet temperature

c. High reactor outlet temperature

d. High primary system conductivity

QUESTION: 016 (1.00)

A shift composed of two senior operators and one unlicensed trainee. One senior operator becomes ill and leaves the NIST site. The following action(s) must be taken with regard to reactor operation:

a. The reactor must be shutdown

b. Operations may continue unrestricted

c. Operations may continue but only if the remaining senior operator remains in the Control Room

d. Operation may continue but only if the remaining senior operator remains within the confinement building

QUESTION: 017 (1.00)

Indicate which of the following combination of experiments may be inserted at the same time without violating NBSR Technical Specifications. Assume no other experiments in reactor:

a. Two experiments each with a reactivity worth of +0.6% ρ

b. Two experiments each with a reactivity worth of -0.6% ρ

c. Two experiments, one is worth +0.6% ρ and the other -0.6% ρ for a net reactivity effect of zero

d. Ten experiments each with a reactivity worth of 0.1% ρ

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

QUESTION: 018 (1.00)

NBSR Technical Specifications require that Reactor Safety System Channels, including trip points, shall be tested for operability using internal test signals. The test must be performed at least:

a. Weekly

b. Monthly

c. Prior to each reactor startup

d. Prior to each reactor startup following a shutdown in excess of 24 hours, or at least quarterly

QUESTION: 019 (1.00)

Upon refilling HE-1A and 1B after they have been drained completely, the procedures require that:

a. The secondary side be filled first, followed by the primary and normal system operation

b. The primary side be filled first, followed by the secondary and normal system operation

c. The primary side is filled first, the primary is operated, normal levels established and a check of the secondary reveals no primary leakage prior to filling the secondary and resuming normal system operation

d. Either side may be filled first provided tritium and N-16 are monitored

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

QUESTION: 020 (1.00)

A primary to secondary leak was detected. The technical specifications require that the reactor be shutdown and corrective action taken if the following limit is exceeded.

a. 5 gallons in one day

b. 5 gallons in one week

c. 50 gallons in one week

d. 180 gallons in one week

QUESTION: 021 (1.00)

The technical specifications require a scram for each of the following except:

a. High flux level

b. High reactor thermal power

c. Low reactor vessel level

d. Low inner and outer plena flow

QUESTION: 022 (1.00)

The emergency procedures require that a major scram be initiated and the confinement building evacuated if:

a. The area monitor on the south wall of the experimental first floor is alarmed and off-scale

b. Two area monitors on the experimental first floor are alarmed and reading 20 mR/hr.

c. All area monitors on the experimental first floor are at their alarm point

d. All area monitors on the first floor are reading 15 mR/hr

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

QUESTION: 001 (1.00)

During power operation, BT-7 shutter is RAISED. The effect on reactor power without immediate operator action will be.

a. Power increases in both auto and manual

b. Power decreases in both auto and manual

c. Power decreases in auto, remains the same in manual

d. Power increases in auto remains the same in manual

QUESTION: 002 (1.00)

With the soft start added to the Thermal Shield pumps, a pump trip will result in the following:

a. There is a likelihood of a rundown

b. There is a likelihood of a scram

c. The standby pump will start immediately and a scram or rundown is unlikely

d. Reduction in flow but no automatic action since thermal shield flow has no trip funct

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

QUESTION: 003 (1.00)

An essential purpose of the alignment marks for the transfer arms on the lower floor plate is to:

a. Ensure engagement of both element ears with the pickup tool

b. Ensure engagement of at least one element ear with the pickup tool

c. Prevent engagement of the element ears with the pickup tool

d. Allow rotation of other transfer arms

e. Allow removal of the indexing plate

QUESTION: 004 (1.00)

The D_2O storage tank pumps are usually started before the helium blowers in order to:

a. Provide cooling to the fission products monitor

b. Supply seal water to the helium blowers

c. Prevent overpressure of the helium sweep system

d. Prevent excessive helium leakage

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

QUESTION: 005 (1.00)

Select the type of material used by the shim arms and the regulating rod respectively for reactor control.

a. Bare cadmium, Solid Aluminum

b. Cadmium clad with aluminum, Solid Aluminum

c. Solid aluminum, Bare Cadmium

d. Solid aluminum, Cadmium clad with aluminum

QUESTION: 006 (1.00)

Identify the METHOD for controlling the flow rate from the inner reserve cooling tank to the emergency cooling distribution pan upon decreasing reactor vessel water level.

a. Throttling the "Emergency Cooling to Reserve Tank valves" (DWV-32 & 33)

b. The rate at which the operator pumps the Hot Waste Sump (#4 sump) to the D_2O Storage Tank

c. Diverting some of the emergency cooling flow to the two reactor inlet plena via DWV-34 & 35

d. Two unisolable flow restrictor nozzles in the inner reserve cooling tank wall

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

QUESTION: 007 (1.00)

Select the condition resulting in regulating rod control swapping from AUTOMATIC to MANUAL.

a. Power reading on NC-6 and NC-7 are indicating a 12% difference

b. A control limit alarm is received

c. NC-5 indication is 7% higher than the power demand potentiometer setting

d. A servo deviation of - 12%

QUESTION: 008 (1.00)

Identify the PURPOSE of the Carbon Dioxide (CO_2) System.

The Carbon Dioxide system:

a. is supplied to various void areas in the plant as a fire suppression media

b. is provided as a backup to the helium sweep system during plant shutdown periods

c. is provided as a backup for the 150# and 90# plant service air systems

d. is used in high neutron flux regions to remove air thus minimizing Argon activation

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

QUESTION: 009 (1.00)

Following a confinement building closure and normal ventillation shutdown on high radiation coupled with a loss of commercial and diesel power, negative building pressure is maintained because:

a. The vacuum in the guide tubes will provide the suction necessary

b. The emergency door will automatically open thereby relieving any pressure

c. The emergency exhaust system will continue to function because it is equipped with AC and DC fan motors

d. There is no way to maintain negative pressure unless AC or diesel power is restored

QUESTION: 010 (1.00)

At power the fission products monitor reads approximately 10,000 cpm. This reading is due mainly to:

a. N-16 produced from neutron oxygen reactions

b. Tritium vapor in the helium sweep system

c. Fission gases escaping through the cladding

d. Argon-41 from the small amount of air in the helium sweep system

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

QUESTION: 011 (1.00)

After a lengthy shutdown, NC-3 and NC-4 are both reading less than $2x10^{-10}$. The first action required prior to startup is:

a. Ensure the source range detectors in NC-1 and NC-2 are inserted

b. Adjust the voltage on NC-3 and NC-4 to bring them above $2x10^{-10}$

c. Recheck that NC-3 and NC-4 period scram is set at 5 sec.

d. Ensure that NC-5 is on scale

QUESTION: 012 (1.00)

The following measurements are made from a beta-gamma source.

2 R/hr at 2 inches and 0.1 mR/hr at 100 inches. The ratio of beta to gamma emission is:

a. $\frac{250}{2000} = 0.125$

b. $\frac{250}{1750} = 0.14$

c. $\frac{2000}{250} = 8$

d. $\frac{1750}{250} = 7$

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

QUESTION: 013 (1.00)

The likely cause of a tritium alarm at the NBSR is:

a. Heavy water leak or spill

b. A primary to secondary leak

c. A leak in the thermal shield cooling system

d. Low storage tank level

QUESTION: 014 (1.00)

Uncompensated ion chambers are used in power channels NC-6, 7 and 8 because:

a. Only uncompensated ion chambers have the sensitivity required for power operation

b. The gamma signal is insignificantly small compared to the neutron signal because of the formation of photoneutrons

c. The gamma signal generated at power reflects power changes and can be included in the neutron signal since residual gamma from past operation is comparitively small

d. All gammas produced from fission are absorbed in fission products. The only gamma generated comes from activation products and is very small

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

QUESTION: 015 (1.00)

NC-3 and 4 are equipped with compensated ion chambers, yet compensating voltage is not applied even at startup. This is mainly because of:

a. The lead windows

b. NC-3 and 4 are free of electronic noise

c. Photoneutrons

d. Heavy Water

QUESTION: 016 (1.00)

A slow reduction in secondary flow with respect to reactor operations will eventually result in:

a. Rundown

b. Scram

c. Higher basin water temperature only

d. Secondary low flow alarm only

QUESTION: 017 (1.00)

Which instrument provides the best backup for both information and function for NC-6?

a. NC-1

b. NC-3

c. NC-5

d. NC-7

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

QUESTION: 018 (1.00)

Which other instrument provides the best backup for both information and function for Primary Outlet Flow?

a. Total secondary flow

b. Inner plenum flow

c. Outer plenum flow

d. Both inner and outer plena flows

QUESTION: 019 (1.00)

The NBSR technical specifications require that the first five degree drop time of the shims be measured. Over the years this time has been in the neighborhood of 150 msec., yet it only takes about half this time for the shims to move five degrees. The main reason for this is:

a. Slow instrument response

b. Clutch release time

c. Actuation of the upper limit switch

d. Spring operation

QUESTION: 020 (1.00)

An operator discovers that the shim arms do not fall on a scram signal at 125% of power nor can they or the reg rod be driven in. Reactor shutdown is best accomplished by:

a. Manually rotating the clutch mechanism to insert the rods

b. Introducing light water into the primary system

c. Shutting down the secondary system to raise primary temperature and form voids

d. Lowering the upper reflector

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

QUESTION: 021 (1.00)

Identify the class or classes of instruments that would directly initiate a reactor SCRAM. (Not Magnetic)

a. Nuclear Instrumentation only

b. Process Instrumentation only

c. Nuclear and Process Instrumentation only

d. Nuclear and Radiation Instrumentation only

QUESTION: 022 (1.00)

Identify the class or classes of instruments that would directly initiate a RUNDOWN.

a. Nuclear Instrumentation only

b. Radiation Instrumentation only

c. Nuclear and Process Instrumentation only

d. Nuclear and Radiation Instrumentation only

QUESTION: 023 (1.00)

A spill of primary heavy water is contained in a 55 gallon sealed stainless steel drum (0.25 inch wall). The drum contains approximately 200 Ci of tritium. The amount of shielding needed to reduce the radiation level to less than 1 mR/hr one foot away is:

a. None

b. 6 inches of lead

c. 5 inches of steel

d. 6 inches of concrete

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

QUESTION: 024 (1.00)

A primary to secondary heat exchanger leak while operating at 20 kW can best be detected in the Control Room by:

a. N-16 monitors

b. Tritium monitor

c. Storage tank level

d. Vessel level

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

ANSWER: 001 (1.00)

D

REFERENCE:

Suppplied Equation Reference Sheets. P = POet/τ

ANSWER: 002 (1.00)

B

REFERENCE:

Supplied Equation Reference sheets. $P = P_0 e^{t/\tau}$

ANSWER: 003 (1.00)

D

REFERENCE:

NRSR Exam Bank

ANSWER: 004 (1.00)

A

REFERENCE:
NBSR Exam Bank

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

ANSWER: 005 (1.00)

B

REFERENCE:

Supplied Equation Reference Sheets ($Q = m_c p \Delta T$

ANSWER: 006 (1.00)

C

REFERENCE:

NBSR Exam Bank

ANSWER: 007 (1.00)

A

REFERENCE:

Supplied Equation Sheet ($P = P_0 e^{t/\tau}$)

ANSWER: 008 (1.00)

B

REFERENCE:

NBSR Exam Bank

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

ANSWER: 009 (1.00)

C

REFERENCE:

NBSR Exam Bank

ANSWER: 010 (1.00)

A

REFERENCE:

Q = mcp ΔT

ANSWER: 011 (1.00)

B

REFERENCE:

NBSR Exam Bank

ANSWER: 012 (1.00)

A

REFERENCE:

$A = A_0 e^{-t(0.693 * t_{\frac{1}{2}})}$

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

ANSWER: 013 (1.00)

D

REFERENCE:

$A = A_0 e^{-t(0.693 \div t_{\frac{1}{2}})}$

ANSWER: 014 (1.00)

A

REFERENCE:

NBSR Exam Bank

ANSWER: 015 (1.00)

B

REFERENCE:

NBSR Exam Bank

ANSWER: 016 (1.00)

C

REFERENCE:

NBSR Exam Bank

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

ANSWER: 017 (1.00)

A

REFERENCE:

ANSWER: 018 (1.00)

B

REFERENCE:

Supplied Equation Reference Sheet.

ANSWER: 019 (1.00)

B

REFERENCE:

Supplied Equation Reference Sheet.

ANSWER: 020 (1.00)

B

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

REFERENCE:

ANSWER: 021 (1.00)

A

REFERENCE:

NBSR Exam Bank

ANSWER: 022 (1.00)

A

REFERENCE:

NBSR Exam Bank

ANSWER: 023 (1.00)

C

REFERENCE:

NBSR Exam Bank

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

ANSWER: 001 (1.00)

A

REFERENCE:

OI 1.1 Checklist A p. 1 of 11

ANSWER: 002 (1.00)

B

REFERENCE:

OI 1.1 Checklist B p. 1 of 2 GENERAL

ANSWER: 003 (1.00)

B

REFERENCE:

NBSR Administrative Rules A.R. 15 p. 1 of 1

ANSWER: 004 (1.00)

D

REFERENCE:

A.P. 2.29 SECONDARY COOLANT HIGH RADIATION p. 1 of 4

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

ANSWER: 005 (1.00)

D

REFERENCE:

A.P. 2.28 HE SWEEP GAS HIGH RADIATION

ANSWER: 006 (1.00)

C

REFERENCE:

OI 6.1 § II LIMITATIONS AND PRECAUTIONS pp. 3 & 4 of 9
AR 6.C § I GENERAL

ANSWER: 007 (1.00)

B

REFERENCE:

OI 4.5 II Limitations and Precautions § A

ANSWER: 008 (1.00)

A

REFERENCE:

E.I. 1.1 ORGANIZATION AND GENERAL INFORMATION p. 1 of 5. § III

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

ANSWER: 009 (1.00)

C

REFERENCE:

E.I. 1.2 LOCATIONS § I EMERGENCY PLANNING ZONE

ANSWER: 010 (2.00)

B -->(0.5 each)

REFERENCE:

E.I. 1.4 EMERGENCY CLASSIFICATIONS

ANSWER: 011 (1.00)

B

REFERENCE:

10 CFR 20.201

ANSWER: 012 (1.00)

A

REFERENCE:

H.P. 2.10 p 1 of 2

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

ANSWER: 013 (1.00)

A

REFERENCE:

A.R. 10 § ii PROCEDURE p 1 of 2
H.P. 2.4 p 2 of 2

ANSWER: 014 (1.00)

C

REFERENCE:

H.P. 2.1 p. 2 of 3 (last paragraph)

ANSWER: 015 (1.00)

C

REFERENCE:

NBSR Technical Specifications T.S,. 2.2 p. 4 of 4

ANSWER: 016 (1.00)

C

REFERENCE:

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

ANSWER: 017 (1.00)

D

REFERENCE:

NBST Technical Specifications Section 4.0 EXPERIMENTS

ANSWER: 018 (1.00)

D

REFERENCE:

NBSR Technical Specifications § 5.3 (4)

ANSWER: 019 (1.00)

C

REFERENCE:

ANSWER: 020 (1.00)

C

REFERENCE:

NBSR Technical Specifications 3.6 p. 11 of 17

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

ANSWER: 021 (1.00)

B

REFERENCE:

NBSR Technical Specifications 3.4 p. 9 of 17

ANSWER: 022 (1.00)

D

REFERENCE:

E.I. 2.11 step 7 (Reading reaches 12.5 on all monitors)

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

ANSWER: 001 (1.00)

D

REFERENCE:

NBSR Training Guide 8.2.1 (OI-5.6) Experimental Beam Port Shutters

ANSWER: 002 (1.00)

A

REFERENCE:

NBSR Exam Bank

ANSWER: 003 (1.00)

A

REFERENCE:

NBSR Training Guide, §4.11 also OI 6.1 "Fueling and Refueling Procedures"

ANSWER: 004 (1.00)

B

REFERENCE:

NBSR Exam Bank

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

ANSWER: 005 (1.00)

B

REFERENCE:

NBSR Training Guide § 1.3.2, p. 8
NBSR Training Guide § 1.4 p. 10

ANSWER: 006 (1.00)

D

REFERENCE:

NBSR Training Guide § 4.1.2, p. 24

ANSWER: 007 (1.00)

D

REFERENCE:

NBSR Exam Bank

ANSWER: 008 (1.00)

D

REFERENCE:

NBSR Training Guide, § 4.8.1

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

ANSWER: 009 (1.00)

C

REFERENCE:

NBSR Training Guide § 4.10.3

ANSWER: 010 (1.00)

D

REFERENCE:

NBSR Exam Bank

ANSWER: 011 (1.00)

A

REFERENCE:

OI 1.1, "Reactor Startup" ▪ Pre-Startup Checklist 'A' § A.1

ANSWER: 012 (1.00)

D

REFERENCE:

Supplied Equation Sheet

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

ANSWER: 013 (1.00)

A

REFERENCE:

A.P. 2.30 HIGH TRITIUM RELEASE

ANSWER: 014 (1.00)

C

REFERENCE:

NBSR Exam Bank

ANSWER: 015 (1.00)

A

REFERENCE:

NBSR Training Guide § 6.2.11, ¶ 2, p.52 in conjunction with § 6.2.4 p.52

ANSWER: 016 (1.00)

A

REFERENCE:

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

ANSWER: 017 (1.00)

D

REFERENCE:

NBSR Training Guide §6.2.8 p. 51

ANSWER: 018 (1.00)

D

REFERENCE:

NBSR Training Guide § 2.3.2 p. 15

ANSWER: 019 (1.00)

B

REFERENCE:

ANSWER: 020 (1.00)

D

REFERENCE:

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

ANSWER: 021 (1.00)

C

REFERENCE:

ANSWER: 022 (1.00)

C

REFERENCE:

ANSWER: [illegible] (1.00)

ANSWER: 024 (1.00)

C

REFERENCE:

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