ENCLOSURE 2

PENNSTATE

College of Engineering
Radiation Science and Engineering Center

(814) 865-6351
FAX: (814) 863-4840

Breazeale Nuclear Reactor Building
The Pennsylvania State University
University Park, PA 16802-2301

January 26, 1993

Nuclear Regulatory Commission
Attention: Mr. Warren Eresian
Mail Stop 10D-22
One White Flint North
Washington, D. C. 20555

Dear Sir:

The Penn State Breazeale Reactor would like to make the following comments concerning the Written Operator Requalification Exam given by you on January 25, 1993.

B. Normal/Emerg Procedures and Rad Con - Question # 12

Using $I = I_0 Be^{-ux}$ and solving for x using u as $0.776 cm^{-1}$ from the facility training manual for 1 mev gammas in lead, x is found to be 5.93 cm (or 2.33 in). The 2.33 in of lead is equilvalent to 4.66 sheets of the 1/2 inch lead, so the nearest answer is a. 6 sheets. The answer key is incorrect in that c. 12 sheets is given as the answer.

B. Normal/Emerg Procedures and Rad Con - Question # 19

Both b. and c. are correct answers under our present Tech Specs. Answer c. was based on values in the old PSBR Tech Specs before the new control system installation; under the old Tech Specs, insertion rate was limited to 17 cents/sec (.12% delta k/k) for a standard control rod but under the new Tech Specs the insertion rate limits are 90 cents/sec for each standard control rod in manual mode and 90 cents/sec for all three standard control rod insertion rates added together when in auto mode.

Sincerely,

Terry L. Flinchbaugh
Operations Manager

NRC RESOLUTION OF PENNSYLVANIA STATE UNIVERSITY COMMENTS

QUESTION B012:

Comment accepted. Typographical error on answer sheet.

QUESTION B019:

Comment accepted. Either answer (b or c) will be accepted as correct.

ENCLOSURE 3

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

FACILITY: Penn State University

REACTOR TYPE: TRIGA

DATE ADMINISTERED: 01/25/93

REGION: 1

CANDIDATE: _____

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% overall is required to pass the examination.

Examinations will be picked up three (3) hours after the examination starts.

| CATEGORY VALUE | % OF TOTAL | CANDIDATE'S SCORE | % OF CATEGORY VALUE | CATEGORY |
|---|---|---|---|---|
| 20.00 | 33.33 | _____ | _____ | A. REACTOR THEORY, THERMODYNAMICS, AND FACILITY OPERATING CHARACTERISTICS |
| 20.00 | 33.33 | _____ | _____ | B. NORMAL AND EMERGENCY PROCEDURES AND RADIOLOGICAL CONTROLS |
| 20.00 | 33.33 | _____ | _____ | C. PLANT AND RADIATION MONITORING SYSTEMS |
| 60.00 | 100.00 | _____ | _____ % | TOTALS |
| | | FINAL GRADE | | |

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. You may write your answers on the examination question page or on a separate sheet of paper. USE ONLY THE PAPER PROVIDED AND DO NOT WRITE ON THE BACK SIDE OF THE PAGE.

7. Print your name in the upper right-hand corner of the answer sheets.

8. The point value for each question is indicated in parentheses after the question.

9. Partial credit may be given. Therefore, ANSWER ALL PARTS OF THE QUESTION AND DO NOT LEAVE ANY ANSWER BLANK. NOTE: partial credit will NOT be given on multiple choice questions.

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

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

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)

Which ONE of the following describes the response of the subcritical reactor to equal insertions of positive reactivity as the reactor approaches criticality at low power?

a. Each reactivity insertion causes a SMALLER increase in the neutron flux, resulting in a LONGER time to stabilize

b. Each reactivity insertion causes a LARGER increase in the neutron flux, resulting in a LONGER time to stabilize

c. Each reactivity insertion causes a SMALLER increase in the neutron flux, resulting in a SHORTER time to stabilize

d. Each reactivity insertion causes a LARGER increase in the neutron flux, resulting in a SHORTER time to stabilize

QUESTION: 002 (1.00)

The term "Shutdown Margin" describes:

a. the time required for the rods to fully insert

b. the departure from K-effective = 1.00

c. the amount of subcriticality, considering the worth of all rods

d. the amount of subcriticality with the most reactive rod fully withdrawn

QUESTION: 003 (1.00)

A factor in the six-factor formula which is most affected by control rod position is:

a. Resonance escape probability

b. Fast fission factor

c. Neutron reproduction factor

d. Thermal utilization factor

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

QUESTION: 004 (1.00)

Which ONE of the following is the reason for the -80 second period following a reactor scram?

a. the ability of U-235 to fission with source neutrons, which have an 80 second half-life.

b. The half-life of the longest-lived group of delayed neutron precursors is approximately 55 seconds.

c. The amount of negative reactivity added on a scram is greater than the Shutdown Margin.

d. The fuel temperature effect, which adds negative reactivity due to the temperature decrease following a scram.

QUESTION: 005 (1.00)

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

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

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

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

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

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

QUESTION: 006 (1.00)

In a subcritical reactor, K eff is increased from 0.861 to 0.946. Which ONE of the following is the amount of reactivity that was added to the reactor core?

a. 0.085 delta k/k

b. 0.104 delta k/k

c. 0.161 delta k/k

d. 0.218 delta k/k

QUESTION: 007 (1.00)

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

A reactor power change of:

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

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

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

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

QUESTION: 008 (1.00)

The fuel temperature coefficient of reactivity is -1.25E-4 delta K/K/deg.C. When a control rod with an average rod worth of 0.1 % delta K/K/inch is withdrawn 10 inches, reactor power increases and becomes stable at a higher level. At this point, the fuel temperature has:

a. increased by 80 deg C

b. decreased by 80 deg C

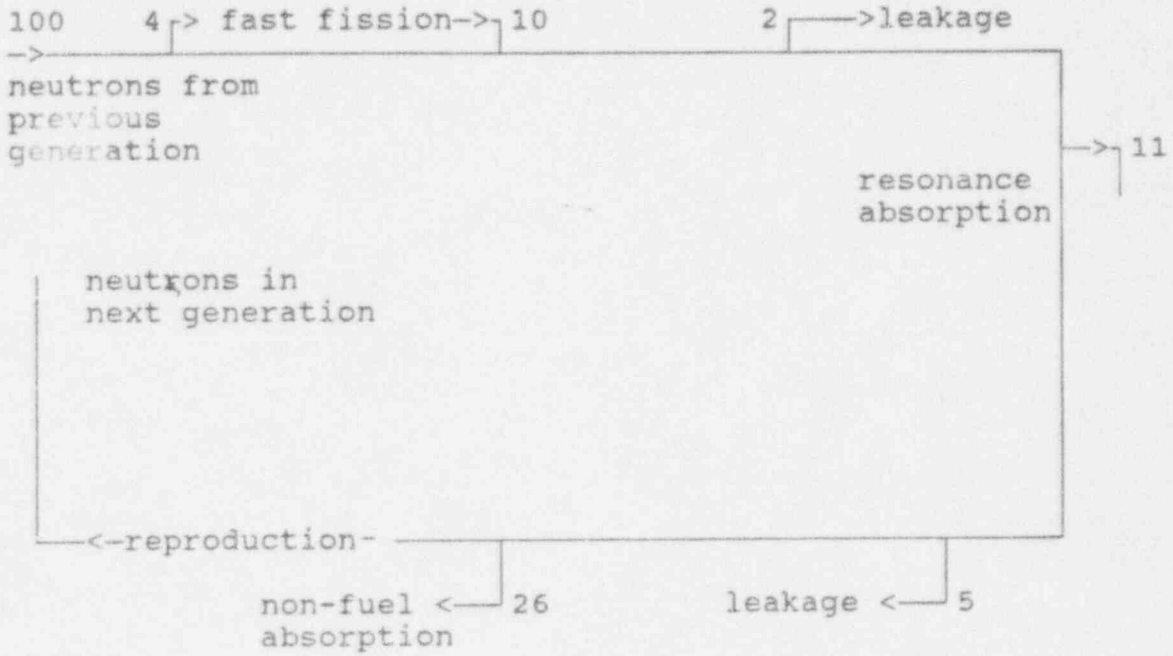
c. increased by 8 deg C

d. decreased by 8 deg C

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

QUESTION: 009 (2.00)

Given the following neutron life cycle for the fission of U-235:




The thermal utilization factor is:

a. 0.419

b. 0.620

c. 0.704

d. 1.613

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

QUESTION: 010 (1.00)

For U-235, the thermal fission cross-section is 582 barns, and the capture cross-section is 99 barns. When a thermal neutron is absorbed by U-235, the probability that a fission will occur is:

a. 0.146

b. 0.170

c. 0.830

d. 0.855

QUESTION: 011 (1.00)

A power calibration is to be done on a pool reactor containing 6000 gallons of water. The pool heats up at a rate of 3 degrees F per hour. The power of the reactor is:

a. 5.3 kW

b. 14.7 kW

c. 44.0 kW

d. 329.1 kW

QUESTION: 012 (1.00)

During a reactor startup, the count rate is increasing linearly with time, with no rod motion. This means:

a. the reactor is subcritical and the count rate increase is due to the buildup of delayed neutron precursors

b. the reactor is critical and the count rate increase is due to Am-Be source neutrons

c. the reactor is subcritical and the count rate increase is due to Am-Be source neutrons

d. the reactor is critical and the count rate increase is due to the buildup of delayed neutron precursors

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

QUESTION: 013 (1.00)

Which ONE of the following describes the difference between reflectors and moderators?

a. Reflectors decrease core leakage while moderators thermalize neutrons

b. Reflectors shield against neutrons while moderators decrease core leakage

c. Reflectors decrease thermal leakage while moderators decrease fast leakage

d. Reflectors thermalize neutrons while moderators decrease core leakage

QUESTION: 014 (1.00)

Which ONE of the following statements describes the difference between Differential and Integral (IRW) rod worth curves?

a. DRW relates the worth of the rod per increment of movement to rod position. IRW relates the total reactivity added by the rod to the rod position.

b. DRW relates the time rate of reactivity change to rod position. IRW relates the total reactivity in the core to the time rate of reactivity change.

c. IRW relates the worth of the rod per increment of movement to rod position. DRW relates the total reactivity added by the rod to the rod position.

d. IRW is the slope of the DRW at a given rod position

QUESTION: 015 (1.00)

Which ONE of the following elements will slow down fast neutrons most quickly, i.e. produces the greatest energy loss per collision?

a. Oxygen-16

b. Uranium-238

c. Hydrogen-1

d. Boron-10

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

QUESTION: 016 (1.00)

The term "Prompt Critical" refers to:

a. the instantaneous jump in power due to a rod withdrawal

b. a reactor which is supercritical using only prompt neutrons

c. a reactor which is critical using both prompt and delayed neutrons

d. a reactivity insertion which is less than Beta-effective

QUESTION: 017 (1.00)

The major contributor to the production of Xenon-135 in a reactor operating at full power is:

a. direct from the fission of Uranium-235

b. from the radioactive decay of Iodine

c. from the radioactive decay of Promethium

d. direct from the fission of Uranium-238

QUESTION: 018 (1.00)

A reactor is operating at a steady-state power level of 1.000 MW. Reactor power is increased to a new steady-state power level of 1.004 MW. At the higher level, K eff is:

a. 1.004

b. 1.000

c. 0.004

d. 0.000

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

QUESTION: 019 (1.00)

A reactor has been operating at full power for one week when a scram occurs. Twelve hours later, the reactor is brought critical and quickly raised to full power. Considering xenon effects only, to maintain a constant power level for the next few hours, control rods must be:

a. inserted

b. maintained at the present position

c. withdrawn

d. withdrawn, then inserted to the original position

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

QUESTION: 001 (1.00)

The Safety Limit for fuel element temperature is:

a. 1150 deg F

b. 1150 deg C

c. 700 deg F

d. 700 deg C

QUESTION: 002 (1.00)

The reactor is shutdown when it is:

a. subcritical by at least $1.00

b. subcritical by at least $1.00 with the highest worth rod withdrawn

c. subcritical by at least $0.25

d. subcritical by at least $0.25 with the highest worth rod withdrawn

QUESTION: 003 (1.00)

Following an evacuation alarm, the persons investigating the alarm encounter a high radiation area. They should immediately:

a. rope off the area

b. attempt to minimize or prevent radiation releases

c. prepare to possibly activate the EPP

d. move to the ESC

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

QUESTION: 004 (1.00)

In accordance with the Technical Specifications, which ONE situation below is NOT permissible when the reactor is operating?

a. scram time of a control rod = 1 second

b. depth of water above the top of the bottom grid plate = 18 feet

c. conductivity of bulk pool water = 5 micromhos/cm

d. reactivity insertion by a control rod = 0.12% delta k/k

QUESTION: 005 (1.00)

How would an accessible area be posted if the radiation level in the area is 40 mR/hr?

a. CAUTION- RADIATION AREA

b. CAUTION- HIGH RADIATION AREA

c. CAUTION- AIRBORNE RADIOACTIVITY AREA

d. CAUTION- RESTRICTED AREA

QUESTION: 006 (1.00)

The Safety System channels required to be operable in all modes of operation are:

a. fuel element temperature scram, reactor high power scram, and manual scram

b. fuel element temperature scram and manual scram

c. manual scram and reactor high power scram

d. reactor high power scram, detector power supply scram, and fuel element temperature scram

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

QUESTION: 007 (1.00)

The measuring channel required to be operable in all modes of reactor operation is:

a. fuel element temperature

b. power level (linear)

c. power level (percent)

d. log power

QUESTION: 008 (1.00)

Which ONE of the following does NOT require the direct supervision of a licensed Senior Reactor Operator?

a. recovery from a scram

b. a student operating the reactor for training as part of a course

c. a reactor operator trainee during a normal startup

d. an unlicensed individual moving fuel

QUESTION: 009 (1.00)

Which ONE of the following would be classified as an OPERATIONAL EVENT?

a. Operation in violation of a safety limit

b. Release of fission products from a fuel element

c. Unanticipated reactivity change greater than $1.00

d. Reactor scram

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

QUESTION: 010 (1.00)

The capsule in a pneumatic transfer system fails to return from the reactor core at the proper time. The reactor operator must:

a. perform a controlled shutdown immediately

b. reduce power and initiate an investigation of the problem

c. perform a controlled reactor shutdown if the capsule cannot be returned within the next four (4) hours

d. immediately scram the reactor

QUESTION: 011 (1.00)

Reactor operations are being conducted around the clock over the weekend, during which time the Reactor Operator (RO) becomes ill and is taken to the hospital. Only the Senior Reactor Operator (SRO) and an experienced student remain in the facility. Reactor operations:

a. must be discontinued because both an RO and an SRO must be in the facility to satisfy PSBR Administrative Policy

b. must be discontinued because both an RO and an SRO must be in the facility to satisfy Technical Specifications

c. may continue until a replacement RO can arrive at the facility, up to a maximum of 30 minutes

d. may continue since the student can monitor the console for brief periods while the SRO makes his periodic tours, provided the student is given written instructions

QUESTION: 012 (1.00)

A radioactive sample (1.0 Mev gamma radiation) from an experiment results in a dose rate of 100 mR/hr at a distance of one foot from the sample. One-half inch thick lead sheets (Buildup Factor = 1.0) are available for shielding. The minimum number of sheets required to lower the dose rate to 1 mR/hr at a distance of one foot is:

a. 6 b. 11

c. 12 d. 24

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

QUESTION: 013 (1.00)

Which ONE statement below describes the basis for the Safety Limit applicable to fuel temperature?

a. Excessive gas pressure may result in loss of fuel element cladding integrity

b. High fuel temperature combined with lack of adequate cooling could result in fuel melt

c. Excessive hydrogen produced as a result of the zirconium-water reaction is potentially explosive

d. High fuel temperature could result in clad melt

QUESTION: 014 (1.00)

The best absorber of high energy (~ 1 Mev) gamma radiation is:

a. lead

b. water

c. concrete

d. polyethylene

QUESTION: 015 (1.00)

Prior to insertion into a pneumatic transfer system, a rabbit sample must be inspected by:

a. the reactor operator

b. the Health Physics office

c. the experimenter

d. a senior reactor operator

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

QUESTION: 016 (1.00)

When performing an emergency shutdown of the pool cooling system, the operator should:

a. verify that valves 80 and 82 automatically close when the primary pump is stopped

b. manually close tagged valves 80A and 82A after stopping the primary pump

c. open valves 80 and 82 and verify that valves 80A and 82A automatically open

d. close valves 80 and 82 and verify that valves 80A and 82A automatically close

QUESTION: 017 (1.00)

A radioactive sample was removed from the reactor core, reading 25 Rem/hour. Four (4) hours later, the sample reads 2.5 Rem/hour. What is the approximate time required for the sample to decay to 100 mRem/hour from the 2.5 Rem/hour point?

a. 1.9 hours

b. 3.8 hours

c. 5.6 hours

d. 7.8 hours

QUESTION: 018 (1.00)

In the event of an emergency involving an emergency evacuation, the Reactor Operator (RO) is responsible to:

a. be a member of the re-entry team, securing the site and reporting to the Emergency Director

b. be the acting Emergency Director until relieved by higher levels of facility management

c. admit appropriate emergency support personnel to the facility to mitigate the consequences of the emergency

d. open and take charge of the Emergency Support Center, distributing emergency equipment to appropriate support personnel

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

QUESTION: 019 (1.00)

In accordance with the Technical Specifications, which ONE situation below is permissible when the reactor is operating?:

a. The Emergency Exhaust System is inoperable for three days for repairs

b. A single secured experiment with a reactivity worth of 2.31 % delta k/k

c. The reactivity insertion rate for standard control rods is 0.17% delta k/k per second

d. The reactor bay truck door is open for ten minutes

QUESTION: 020 (1.00)

"Special Nuclear Material" is defined to be:

a. Uranium-233, Uranium-235, or Uranium-238

b. Plutonium, Uranium-238, or Thorium

c. Uranium-233, Uranium-235, or Thorium

d. Uranium-233, Plutonium, or enriched Uranium

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

QUESTION: 001 (1.00)

The TRIGA fuel elements consist of a mixture of zirconium hydride and:

a. 20% enriched uranium with stainless steel clad

b. 12% enriched uranium with stainless steel clad

c. 8.5% enriched uranium with stainless steel clad

d. 20% enriched uranium with zirconium clad

QUESTION: 002 (1.00)

The Emergency Exhaust System is activated when:

a. the facility exhaust system is secured

b. the reactor bay has a positive pressure with respect to the atmosphere

c. a building evacuation is initiated

d. the pressure drop across the facility exhaust system filters doubles

QUESTION: 003 (1.00)

Carbon dioxide is used in the pneumatic transfer system instead of compressed air because:

a. it is more compressible

b. it does not retain moisture

c. it minimizes Ar-41 production

d. it minimizes N-16 production

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

QUESTION: 004 (1.00)

The top grid plate in the reactor:

a. supports the weight of the fuel assemblies

b. aligns and supports the nuclear detectors

c. maintains lateral fuel alignment

d. serves as a reflector over the top of the core

QUESTION: 005 (1.00)

A signal of notification to Penn State University Police Services is initiated by:

a. reactor bay truck door open

b. UPS battery low

c. emergency exhaust system initiation

d. DCC-Z watchdog trip

QUESTION: 006 (1.00)

For a standard control rod, the drive up arrow is green, the drive down arrow is red, and rod bottom arrow is red. This indicates that:

a. the rod and drive are not in contact, the rod is full up and the drive is full down

b. the rod and drive are both full up

c. the rod and drive are both full down

d. the rod and drive are not in contact, the drive is full up and the rod is full down

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

QUESTION: 007 (1.00)

All operational interlocks and safety trips required by technical specifications are performed by the:

a. Digital Control Computer (DCC-Z)

b. Digital Control Computer (DCC-X)

c. protection, control and monitoring system (PCMS)

d. reactor safety system (RSS)

QUESTION: 008 (1.00)

Which ONE of the following is a control rod interlock?

a. above reactor power of 1 kW, the transient rod cannot be operated in the pulse mode

b. only one standard rod at a time can be moved in the pulse mode

c. control rods cannot be withdrawn unless the count rate is greater than 1 CPS in the manual mode

d. two control rods cannot be moved at the same time above 1 kW in the manual mode

QUESTION: 009 (1.00)

The Wide Range power monitor uses a (an):

a. uncompensated ion chamber

b. compensated ion chamber

c. fission chamber

d. boron-trifluoride detector

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

QUESTION: 010 (1.00)

SCRAM logic is designed to meet the single failure criterion. Which ONE pair of parameters below are in the correct circuits?

| | Scram Circuit #1 | Scram Circuit #2 |
|---|---|---|
| a. | Fuel temperature High | Fission Chamber Power High |
| b. | Manual Scram | Pulse Timer Scram |
| c. | Pulse Timer Scram | GIC Power High |
| d. | Keyswitch Off | Fuel Temperature High |

QUESTION: 011 (1.00)

Reclaimed water from the Liquid Waste Evaporator System is transferred to the reactor makeup by the:

a. makeup pump

b. processed water pump

c. distillate pump

d. hot water pump

QUESTION: 012 (1.00)

When the Automatic Mode Menu is displayed, rod mode "2" is selected. This means that the rods selected for regulation are the:

a. regulating rod and safety rod

b. regulating rod and shim rod

c. safety rod and shim rod

d. regulating rod and transient rod

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

QUESTION: 013 (1.00)

For a standard control rod, the rod drive up arrow is red, the rod drive down arrow is red, and the rod drive magnet block is yellow. This indicates that:

a. the rod and drive are in contact, and are both full down

b. the rod and drive are in contact, and are both full up

c. the rod and drive are not in contact, and the rod and drive are somewhere between full up and full down

d. the rod and drive are in contact, and are somewhere between full up and full down

QUESTION: 014 (1.00)

In the PSBR Water Handling System, pool water conductivity is measured:

a. at the suction of the purification pump

b. downstream of the skimmer

c. between the filter and purification pump

d. at the inlet of the demineralizer

QUESTION: 015 (1.00)

In the Automatic Control mode, the controlling signal is:

a. reactor power as measured by the Power Range Monitor

b. reactor period as measured by the GIC

c. reactor power as measured by the Wide Range Monitor

d. reactor period as measured by the Power Range Monitor

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

QUESTION: 016 (1.00)

Streaming of radiation from the central thimble is prevented by:

a. a graphite shield box over the top of the tube

b. the tube being filled with water

c. a boral plug inserted into the top of the tube

d. large radius bend in the tube

QUESTION: 017 (1.00)

A reactor stepback is initiated by:

a. east or west bay monitor high radiation

b. east and west facility exhaust fans off

c. high fuel temperature

d. pulse timer timed out

QUESTION: 018 (1.00)

The purpose of the boral plate on top of the $D_2O$ tank is to:

a. reduce radiation escaping from the core

b. minimize production of gamma radiation resulting from neutron activation of the pool water

c. reduce gamma interactions with the pool wall

d. absorb reflected neutrons so that the outputs of the gamma and fission chambers are in agreement

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

QUESTION: 019 (1.00)

Which ONE of the following types of detector is used in the Reactor Bay East and West Monitors?

a. Geiger-Mueller tube

b. Scintillation detector

c. Ionization chamber

d. Proportional counter

QUESTION: 020 (1.00)

The thermocouples in the instrumented fuel elements measure temperature at the:

a. interior surface of the cladding

b. center of the zirconium rod

c. outer surface of the fuel

d. interior of the fuel

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

A. RX THEORY, THERMO & FAC OP CHARS

ANSWER: 001 (1.00)
B.
REFERENCE:
PSBR Training Manual, Page 2-22

ANSWER: 002 (1.00)
D.
REFERENCE:
PSBR Technical Specifications, Section 1.1.41

ANSWER: 003 (1.00)
D.
REFERENCE:
PSBR Training Manual, Page 2-23

ANSWER: 004 (1.00)
B.
REFERENCE:
PSBR Training Manual, Page 2-19

ANSWER: 005 (1.00)
C.
REFERENCE:
PSBR Training Manual, Page 2-16

ANSWER: 006 (1.00)
B.
REFERENCE:
PSBR Training Manual, Page 2-14

ANSWER: 007 (1.00)
A.
REFERENCE:
PSBR Training Manual, Page 2-16

ANSWER: 008 (1.00)
A.
REFERENCE:
PSBR Training Manual, Page 2-34

ANSWER: 009 (2.00)
C.
REFERENCE:
PSBR Training Manual, Page 2-9

ANSWER: 010 (1.00)
D.
REFERENCE:
PSBR Training Manual, Page 7-23

ANSWER: 011 (1.00)
C.
REFERENCE:
CCP-2

ANSWER: 012 (1.00)
B.
REFERENCE:
PSBR Training Manual, Page 2-22a

ANSWER: 013 (1.00)
A.
REFERENCE:
PSBR Training Manual, Page 2-4

ANSWER: 014 (1.00)
A.
REFERENCE:
PSBR Training Manual, Page 2-27

ANSWER: 015 (1.00)
C.
REFERENCE:
PSBR Training Manual, Page 7-22

ANSWER: 016 (1.00)
B.
REFERENCE:
PSBR Training Manual, Page 2-19

ANSWER: 017 (1.00)
B.
REFERENCE:
PSBR Training Manual, Page 2-28

ANSWER: 018 (1.00)
B.
REFERENCE:
PSBR Training Manual, Page 2-14

ANSWER: 019 (1.00)
A.
REFERENCE:
PSBR Training Manual, Pages 2-28 through 2-32

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

B. NORMAL/EMERG PROCEDURES & RAD CON

ANSWER: 001 (1.00)
B.
REFERENCE:
PSBR Technical Specifications, Section 2.1

ANSWER: 002 (1.00)
A.
REFERENCE:
PSBR Technical Specifications, Section 1.1.29

ANSWER: 003 (1.00)
C.
REFERENCE:
EP-1

ANSWER: 004 (1.00)
A.
REFERENCE:
PSBR Technical Specifications, Section 3.2.6

ANSWER: 005 (1.00)
A.
REFERENCE:
10 CFR 20.202

ANSWER: 006 (1.00)
B.
REFERENCE:
PSBR Technical Specifications, Section 3.2.4

ANSWER: 007 1.00)
A.
REFERENCE:
PSBR Technical Specifications, Section 3.2.3

ANSWER: 008 (1.00)
A.
REFERENCE:
AP-1

ANSWER: 009 (1.00)
D.
REFERENCE:
AP-4.B.3

ANSWER: 010 (1.00)
D.
REFERENCE:
SOP-9.A.13

ANSWER: 011 (1.00)
A.
REFERENCE:
AP-1.A

ANSWER: 012 (1.00)
A.
REFERENCE:
PSBR Training Manual, Page 7-24

ANSWER: 013 (1.00)
A.
REFERENCE:
PSBR Technical Specifications, Section 2.1

ANSWER: 014 (1.00)
A.
REFERENCE:
PSBR Training Manual, Page 7-33

ANSWER: 015 (1.00)
D.
REFERENCE:
SOP-9

ANSWER: 016 (1.00)
D.
REFERENCE:
SP-3.D

ANSWER: 017 (1.00)
C.
REFERENCE:
PSBR Training Manual, Page 1-14

ANSWER: 018 (1.00)
A.
REFERENCE:
EP-1.D.2.a

ANSWER: 019 (1.00)
B,C
REFERENCE:
PSBR Technical Specifications, Section 3.7

ANSWER: 020 (1.00)
D.
REFERENCE:
EP-9; 10 CFR 50

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

C. PLANT AND RAD MONITORING SYSTEMS

ANSWER: 001 (1.00)
A.
REFERENCE:
PSBR Training Manual, Page 3-5

ANSWER: 002 (1.00)
C.
REFERENCE:
PSBR Training Manual, Page 3-23

ANSWER: 003 (1.00)
C.
REFERENCE:
PSBR Training Manual, Page 3-30

ANSWER: 004 (1.00)
C.
REFERENCE:
PSBR Training Manual, Page 3-1

ANSWER: 005 (1.00)
B.
REFERENCE:
PSBR Training Manual, Page 4-30

ANSWER: 006 (1.00)
B.
REFERENCE:
PSBR Training Manual, Page 6-5

ANSWER: 007 (1.00)
D.
REFERENCE:
PSBR Training Manual, Page 4-15

ANSWER: 008 (1.00)
A.
REFERENCE:
CCP-4

ANSWER: 009 (1.00)
C.
REFERENCE:
PSBR Training Manual, Page 4-9

ANSWER: 010 (1.00)
C.
REFERENCE:
PSBR Training Manual, Page 4-35

ANSWER: 011 (1.00)
B.
REFERENCE:
PSBR Training Manual, Page 3-20

ANSWER: 012 (1.00)
B.
REFERENCE:
PSBR Training Manual, Page 6-7

ANSWER: 013 (1.00)
D.
REFERENCE:
PSBR Training Manual, Page 6-5

ANSWER: 014 (1.00)
D.
REFERENCE:
PSBR Training Manual, Page 3-13

ANSWER: 015 (1.00)
C.
REFERENCE:
PSBR Training Manual, Page 5-2

ANSWER: 016 (1.00)
B.
REFERENCE:
PSBR Training Manual, Page 3-38

ANSWER: 017 (1.00)
C.
REFERENCE:
PSBR Training Manual, Page 4-28

ANSWER: 018 (1.00)
D.
REFERENCE:
PSBR Training Manual, Page 5-2

ANSWER: 019 (1.00)
A.
REFERENCE:
PSBR Training Manual, Page 4-11

ANSWER: 020 (1.00)
D.
REFERENCE:
PSBR Training Manual, Page 3-7

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

ANSWER SHEET

MULTIPLE CHOICE (Circle or X your choice)

If you change your answer, write your selection in the blank.

001 a b c d _____

002 a b c d _____

003 a b c d _____

004 a b c d _____

005 a b c d _____

006 a b c d _____

007 a b c d _____

008 a b c d _____

009 a b c d _____

010 a b c d _____

011 a b c d _____

012 a b c d _____

013 a b c d _____

014 a b c d _____

015 a b c d _____

016 a b c d _____

017 a b c d _____

018 a b c d _____

019 a b c d _____

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

ANSWER SHEET

MULTIPLE CHOICE (Circle or X your choice)

If you change your answer, write your selection in the blank.

001 a b c d _____

002 a b c d _____

003 a b c d _____

004 a b c d _____

005 a b c d _____

006 a b c d _____

007 a b c d _____

008 a b c d _____

009 a b c d _____

010 a b c d _____

011 a b c d _____

012 a b c d _____

013 a b c d _____

014 a b c d _____

015 a b c d _____

016 a b c d _____

017 a b c d _____

018 a b c d _____

019 a b c d _____

020 a b c d _____

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

ANSWER SHEET

MULTIPLE CHOICE (Circle or X your choice)

If you change your answer, write your selection in the blank.

001 a b c d _____

002 a b c d _____

003 a b c d _____

004 a b c d _____

005 a b c d _____

006 a b c d _____

007 a b c d _____

008 a b c d _____

009 a b c d _____

010 a b c d _____

011 a b c d _____

012 a b c d _____

013 a b c d _____

014 a b c d _____

015 a b c d _____

016 a b c d _____

017 a b c d _____

018 a b c d _____

019 a b c d _____

020 a b c d _____

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

# EQUATION SHEET

$Q = m\ c_p\ \Delta T$

$SUR = 26.06/\tau$

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

$\lambda_{eff} = 0.1\ \text{seconds}^{-1}$

$DR = DR_o e^{-\lambda t}$

$\rho = (Keff-1)/Keff$

$CR_1\ (1-Keff)_1 = CR_2\ (1-Keff)_2$

$P = P_0\ 10^{SUR(t)}$

$\tau = (\ell^*/\rho) + [(\beta-\rho)/\lambda_{eff}\rho]$

$DR_1D_1^2 = DR_2D_2^2$

$DR = 6CiE/D^2$

---

1 Curie = $3.7 \times 10^{10}$ dps

1 Btu = 778 ft-lbf

1 Mw = $3.41 \times 10^6$ BTU/hr

1 gallon water = 8.34 pounds

$°F = 9/5°C + 32$

$°C = 5/9\ (°F - 32)$