ENCLOSURE 1

EXAMINATION REPORT - 50-280/OL-85-01

Facility Licensee: Virginia Electric and Power Company
P. O. Box 26666
Richmond, VA 23261

Facility Name: Surry

Facility Docket No. 50-280

Written, oral and simulator examinations were administered at Surry near Gravel Neck, Virginia.

Chief Examiner: William G. Douglas — 29 APR 85
William G. Douglas — Date Signed

Approved by: Bruce A. Wilson — 5/3/85
Bruce A. Wilson, Section Chief — Date Signed

Summary:

Examinations on April 8-11, 1985

Written, oral, and simulator were administered to 7 candidates; all candidates passed. Written re-examinations were administered to 3 candidates; all candidates passed.

REPORT DETAILS

1. Facility Employees Contacted:

*J. Bailey, Superintendent Nuclear Training
*L. Buck, Senior Instructor - Nuclear
C. Curfman, Senior Instructor - Nuclear
*B. Marshall, Senior Instructor - Nuclear
*H. McCallum, Supervisor, Training - Power Station Operations

*Attended Exit Meeting

2. Examiners:

*W. G. Douglas, Region II
T. Rogers, Region II
B. A. Picker, EG&G-Idaho
P. Doyle, OLB-HQ (Observer)
J. Hwang, Taiwan, AEC (Observer)
S. Lie, Taiwan, AEC (Observer)

*Chief Examiner

3. Examination Review Meeting

At the conclusion of the written examinations, the examiners met with J. Bailey, C. Curfman, B. Marshall, and H. McCallum to review the written examination and answer key. The following comments were made by the facility reviewers:

a. SRO Exam

1. Question 6.06

Facility Comment: Another remote monitoring panel was recently installed. All choices of question are monitored on one of the two remote monitoring panels. There is no correct answer to question.

NRC Resolution: Comment verified during plant tour. Question deleted from exam.

2. Question 6.24

Facility Comment: The correct answer to part C is DECREASE.

NRC Resoultion: The reference (Precautions, Limitations, and Setpoints - PLS) used to write the exam says REMAIN THE SAME. According to the Technical Specifications the answer should be DECREASED. The answer key was changed to accept DECREASE as the correct answer.

3. Question 6.25

Facility Comment: The correct answer to part j is NO.

NRC Resolution: Verified correct answer as NO according to reference given in answer key. Answer key was changed to accept NO as the correct answer.

4. Question 7.25

Facility Comment: The requirements for placing the reheat system in service were recently changed. None of the choices for part 5 are correct.

NRC Resolution: Comment verified by Surry Design Change DC-84-17. Deleted part 5 from exam and redistributed points over the remaining four parts.

b. RO Exam

1. Question 3.16

Facility Comment: Loss of station service (2/3) is one of the two auto signals to start TDAFW pump. Other is 2/3 low low S/G level from 2/3 S/G: none of selections given are totally correct. Choice (C) is the closest although not technically correct.

NRC Resolution: Not accepted - answer will not change. As question is worded the candidates must choose one answer, of the distractors "C" is the only correct choice when the term "Blackout" is defined as loss o all AC power.

2. Question 3.23

Facility Comment: Another remote monitoring panel installed recently by design change which adds more parameter indications.

NRC Resolution: Accepted. Added 4 additional parts to answer from material supplied by utility.

3. Question 4.01(5)

Facility Comment: Same as 7.25.

NRC Resolution: Same as 7.25.

4. Question 4.15(f)

Facility Comment: Visitors' limits - If classified as radiation worker; limits sets by the visitors' employer. If classified as a non-radiation worker; limits are:

(a) if he does not enter a restricted area - 125 mrem/QTR

(b) if he enters a restricted area - 300 mrem/QTR

NRC Resolution: There is no 300 mrem choice; therefore, key will remain as indicated.

4. 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 oral examination were identified.

There was no generic weaknesses (greater than 75 percent of candidates giving incorrect answers to one examination topic) noted during the oral examination.

It was noted that the simulator capabilities were improved since the last NRC exam visit and that continuing improvements were being made. The cooperation given to the examiners during the exam visit was also noted and appreciated.

TABLE ES-201-7
POWER PLANT EXAMINATION RESULTS SUMMARY SHEET

OFFICIAL USE ONLY - PRIVACY ACT INFORMATION | ENCLOSURE 2 | OFFICIAL USE ONLY - PRIVACY ACT INFORMATION

...cility Surry
...ate of Written 04/08/85
...ate of Orals 04/09 - 04/10
...ate of Simulator 04/10 - 04/11
...xaminers Douglas, Rogers, Picker
...ype of Exam XXXXXX (Hot)

Overall Results	Total No.	Passed No.	Passed %	Failed No.	Failed %
Senior Operator	5	5	100	0	0
Reactor Operator	4	4	100	0	0
Instructor Cert.	1	1	100	0	0

1. Reactor Operator
2. Sr. Reactor Operator Insta...
3. Sr. Reactor Operator Upgra...
4. Reactor Operator Retake
5. Sr. Reactor Operator Retak...
6. Instructor Certification

...AME	Docket No.	Type Code	1	2	3	4	TOTAL	5	6	7	8	TOTAL	Exam. Results RO W	RO O	RO S	SRO W	SRO O	SRO S
Baker	20562	1	90.0	85.4	83.2	83.8	85.6						P	P	P			
French	20104	4	85.0	80.7	92.3	86.7	86.2						P	P	P			
Huskey	20097	1	96.7	83.9	92.5	81.0	88.5						P	P	P			
Mozo	20565	1	93.3	86.2	92.5	96.7	92.2						P	P	P			
Brown	8033	3						93.3	99.3	82.7	83.3	89.6				P	P	P
Hunnicutt	20563	2						83.3	81.6	85.2	88.3	84.6				P	P	P
McCarthy	8036	3						96.7	90.2	85.2	88.3	84.6				P	P	P
Ringler	5854	5						86.7	84.5	95.2	91.7	89.5				P		
Wheeler	6241	5						93.3	78.1	88.3	91.7	87.9				P		
Gwaltney	20358	6						93.3	82.4	100.0	93.3	92.3				P		

ENCLOSURE 3

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

FACILITY:	SURRY 1&2
REACTOR TYPE:	PWR-WEC3
DATE ADMINISTERED:	85/04/08
EXAMINER:	DOUGLAS, W.
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
30.00	25.00	________	________	5. THEORY OF NUCLEAR POWER PLANT OPERATION, FLUIDS, AND THERMODYNAMICS
30.00	25.00	________	________	6. PLANT SYSTEMS DESIGN, CONTROL, AND INSTRUMENTATION
30.00	25.00	________	________	7. PROCEDURES - NORMAL, ABNORMAL, EMERGENCY AND RADIOLOGICAL CONTROL
30.00	25.00	________	________	8. ADMINISTRATIVE PROCEDURES, CONDITIONS, AND LIMITATIONS
120.00	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 5.01 (1.00)

Which of the following does NOT provide assurance that the enthalpy rise hot channel limits are not violated? (1.0)

a. Axial power distribution is maintained within limits.
b. Control rod banks are sequenced with proper overlap.
c. Control rod insertion limits are maintained.
d. The MTC is within its analyzed temperature range.

QUESTION 5.02 (1.00)

Concerning the values of equilibrium Samarium-149 (Sm) reactivity, which of the following statements is correct? (1.0)

a. 50% equilibrium Sm reactivity is one-quarter of 100% equilibrium Sm reactivity.
b. 50% equilibrium Sm reactivity is one-half of 100% equilibrium Sm reactivity.
c. 50% equilibrium Sm reactivity is three-quarters of 100% equilibrium Sm reactivity.
d. 50% equilibrium Sm reactivity is equal to 100% equilibrium Sm reactivity.

QUESTION 5.03 (1.00)

The -1/3 DPM SUR following a reactor trip is caused by: (1.0)

a. The decay constant of the longest-lived group of delayed neutrons.
b. The ability of U-235 to fission with source neutrons.
c. The amount of negative reactivity added on a trip being greater than the Shutdown Margin.
d. The doppler effect adding positive reactivity due to the temperature decrease following a trip.

QUESTION 5.04 (1.00)

Which of the following tensile stresses is highest on the outer wall of the reactor pressure vessel? (1.0)

a. Pressure stress.
b. Composite (Total) stress during cooldown.
c. Cooldown stress (due to delta T only).
d. Heatup stress (due to delta T only).

QUESTION 5.05 (1.00)

The reactor is producing 100% rated thermal power at a core delta T of 60 degrees and a mass flow rate of 100% when a blackout occurs. Natural circulation is established and core delta T goes to 40 degrees. If decay heat is 2%, what is the core mass flow rate (in %)? (1.0)

a. 1.3
b. 2.0
c. 3.0
d. 4.0

QUESTION 5.06 (1.00)

During a Xenon-free reactor startup, critical data was inadvertently taken two decades below the required Intermediate Range (IR) level (1 E-10 amps). The critical data was then taken at the proper IR level (1 E-08 amps). Assuming RCS temperature and boron concentrations did not change, which of the following statements is correct? (1.0)

a. The critical rod position taken at the proper IR level is LESS THAN the critical rod position taken two decades below the proper IR level.
b. The critical rod position taken at the proper IR level is THE SAME AS the critical rod position taken two decades below the proper IR level.
c. The critical rod position taken at the proper IR level is GREATER THAN the critical rod position taken two decades below the proper IR level.
d. There is not enough information given to determine the relationship between the critical rod position taken at the proper IR level and the critical rod position taken two decades below the proper IR level.

QUESTION 5.07 (1.00)

Which of the following statements is correct if the discharge valve from a centrifugal pump is being partially closed from the full open position? (1.0)

a. Pump head decreases as head loss decreases.
b. Pump head increases as head loss increases.
c. Volume flow rate increases as head loss decreases.
d. Volume flow rate decreasses as head loss decreases.

QUESTION 5.08 (1.00)

Which of the following statements concerning Xenon-135 production and removal is correct? (1.0)

a. At full power, equilibrium conditions about half of the xenon is produced by iodine decay and the other half is produced as a direct fission product.
b. Following a reactor trip from equilibrium conditions, xenon peaks because delayed neutron precursors continue to decay to xenon while neutron absorption (burnout) has ceased.
c. Xenon production and removal increases linearly as power level increases; i.e., the value of 100% equilibrium xenon is twice that of 50% equilibrium xenon.
d. At low power levels, xenon decay is the major removal method. At high power levels, burnout is the major removal method.

QUESTION 5.09 (1.00)

Which of the following is the units of heat flux? (1.0)

a. Watts / cubic centimeter
b. BTU / (hr square ft)
c. Calories / gram
d. kW / ft

QUESTION 5.10 (1.00)

From the following, choose the event that tends to make the Fuel Temperature Coefficient more negative over core life. (1.0)

a. Buildup of Pu-240
b. Clad Creep
c. Pellet Swell
d. Lower Effective Fuel Temperature

QUESTION 5.11 (1.00)

At BOL, the components of the power defect in increasing order of significance (reactivity value) are: (1.0)

a. Void, Doppler, MTC
b. Void, MTC, Doppler
c. MTC, Void, Doppler
d. MTC, Doppler, Xenon

QUESTION 5.12 (1.00)

Which of the following nuclear parameters are ALL contributors to differential rod worth? (1.0)

a. Local gamma flux, peak gamma flux, slowing down length, thermal diffusion length.
b. Local neutron flux, peak neutron flux, slowing down length, thermal diffusion length.
c. Local gamma flux, average gamma flux, slowing down length, thermal diffusion length.
d. Local neutron flux, average neutron flux, slowing down length, thermal diffusion length.

QUESTION 5.13 (1.00)

The main condenser must remove more heat energy to condense ... (1.0)

a. One pound of steam at 0 psia.
b. One pound of steam at 300 psia.
c. Two pounds of steam at 600 psia.
d. Two pounds of steam at 1200 psia.

QUESTION 5.14 (1.00)

Which of the following statements concerning pump characteristics is correct? (1.0)

a. The difference between pump suction pressure and the saturation pressure of the fluid being pumped is called net positive suction head.
b. For a centrifugal pump, the volume flow rate is inversely proportional to the speed of the pump.
c. As VCT temperature decreases, mass flow rate from the positive displacement charging pump remains unchanged.
d. Pump runout is the term used to describe the condition of a cent.ifugal pump running with no volume flow rate.

QUESTION 5.15 (1.00)

Which of the following statements concerning the power defect is correct? (1.0)

a. The power defect is the difference between the measured power coefficient and the predicted power coefficient.
b. The power defect increases the rod worth requirements necessary to maintain the desired shutdown margin following a reactor trip.
c. Because of the higher boron concentration, the power defect is more negative at beginning of core life.
d. The power defect necessitates the use of a ramped Tavg program to maintain an adequate Reactor Coolant System subcooling margin.

QUESTION 5.16 (1.00)

The reactor is critical at 10,000 cps when a S/G PORV fails open. Assuming BOL conditions, no rod motion, and no reactor trip, choose the answer below that best describes the values of Tavg and nuclear power for the resulting new steady state. (POAH = point of adding heat) (1.0)

a. Final Tavg greater than initial Tavg, Final power above POAH.
b. Final Tavg greater than initial Tavg, Final power at POAH.
c. Final Tavg less than initial Tavg, Final power at POAH.
d. Final Tavg less than initial Tavg, Final power above POAH.

QUESTION 5.17 (1.00)

The Moderator Temperature Coefficient (MTC) varies with certain plant conditions. Concerning these variations, which of the following is correct? (1.0)

a. The MTC becomes more negative as boron concentration is increased.
b. The MTC causes axial flux distribution to be tilted towards the top of the core at BOL.
c. The MTC varies as temperature changes because of the non-linear density changes of water as temperature changes.
d. The MTC is not permitted by Technical Specifications to be positive in any plant operating modes.

QUESTION 5.18 (1.00)

During fuel loading, which of the following will have NO effect on the shape of a 1/M plot? (1.0)

a. Location of the neutron source in the core.
b. Strength of the neutron source in the core.
c. Location of the neutron detectors around the core.
d. Order of placement of fuel assemblies in the core.

QUESTION 5.19 (1.00)

Which of the following nuclear related factors or ratios have a normal value of less than one? (1.0)

a. Importance Factor (I)
b. Reproduction Factor (Eta)
c. Fast Fission Factor (Epsilon)
d. Departure from Nucleate Boiling Ratio (DNBR)

QUESTION 5.20 (1.00)

Which of the following statements describe the relationship between integral and differential rod worth? (1.0)

a. Integral rod worth (at any location) is the slope of the differential rod worth curve at that location.
b. Integral rod worth (at any location) is the total area under the differential rod worth curve from the end of the rod to that location.
c. Integral rod worth (at any location) is the square of the differential rod worth at that location.
d. There is no relationship between integral and differential rod worth.

QUESTION 5.21 (1.00)

Which of the following statements about Shutdown Margin (SDM) is correct? (1.0)

a. The maximum SDM requirement occurs at EOL and is based on a rod ejection accident.
b. A SDM calculation includes the effects of the highest worth rod and one other rod remaining fully withdrawn.
c. The SDM requirement is less below 200 degrees because of the possibility of a positive moderator temperature coefficient.
d. The SDM must be greater than 1770 pcm for critical operations.

QUESTION 5.22 (1.00)

Answer TRUE or FALSE to the following.

a. During a RCS heatup, as temperature gets higher, it will take a smaller letdown flow rate to maintain a constant pressurizer level. (0.5)
b. Increasing condensate depression (subcooling) will cause BOTH a decrease in plant efficiency AND an increase in condensate (hotwell) pump available NPSH. (0.5)

QUESTION 5.23 (.50)

A good moderator should have a large scattering cross section, a small absorption cross section, and a large energy decrease per collision. TRUE or FALSE? (0.5)

QUESTION 5.24 (1.50)

During a reactor startup, equal increments of reactivity are added and the count rate is allowed to reach equilibrium each time. Choose the bracketed ([]) words(s) that describe what is observed on the Source Range recorder and/or SUR meter.

a. The change in equilibrium count rate is [larger] [the same] [smaller] each time. (0.5)
b. The time required to reach equilibrium is [longer] [the same] [shorter] each time. (0.5)
c. The point of supercriticality can be identified by a(n) [increasing] [constant] [decreasing] positive SUR several seconds after the reactivity addition is terminated. (0.5)

QUESTION 5.25 (2.00)

If steam goes through a throttling process, indicate whether the following parameters will INCREASE, DECREASE, or REMAIN THE SAME.

a. Enthalpy (0.5)
b. Pressure (0.5)
c. Entropy (0.5)
d. Temperature (0.5)

QUESTION 5.26 (2.00)

The reactor is operating at 30% power when one RCP trips. Assuming no reactor trip or turbine load change occur, indicate whether the following parameters will INCREASE, DECREASE, or REMAIN THE SAME.

a. Flow in operating reactor coolant loops (0.5)
b. Core delta T (0.5)
c. Reactor vessel delta P (0.5)
d. Operating loop steam generator pressure (0.5)

QUESTION 5.27 (2.00)

For the following definitions, give the term that is defined.

a. The amount of reactivity that is needed to go from hot zero power to hot full power. (0.5)
b. The fractional change in neutron population per generation. (0.5)
c. The amount of heat required to change 1 lbm of water into 1 lbm of steam. (0.5)
d. Heat transfer due to relative motion between two bodies. (0.5)

QUESTION 6.01 (1.00)

Which of the following is NOT a reason for the S/G level program? (1.0)

a. Minimize cooldown of RCS following a steam break.
b. Maintain constant mass in S/G at all power levels to facilitate chemistry control.
c. Minimize containment pressure following a steam break.
d. Minimize inadvertent low low S/G level reactor trips following a load reduction.

QUESTION 6.02 (1.00)

Which of the following water sources can NOT supply a direct source of water to the auxiliary feed pumps. (1.0)

a. The 110,000 gallon Condensate Storage Tank (1-CN-TK-1).
b. The 300,000 gallon Condensate Storage Tank (1-CN-TK-2).
c. The 100,000 gallon Condensate Storage Tank (1-CN-TK-3).
d. The Site Fire Main.

QUESTION 6.03 (1.00)

Concerning the operation of the emergency diesel generators (EG), which of the following statements is NOT correct? (1.0)

a. If EG3 is supplying power to Unit 1 due to an under-voltage problem, it will automatically shift to Unit 2 in the event of a Train 'B' SI on Unit 2.
b. EG1 and EG2 will start on Train 'A' Hi-Hi CLS and/or SI signals from their respective units.
c. The starting air pressure for the EG's is maintained automatically by a pressure controlled compressor.
d. The EG overspeed trip is set at 115% of normal operating speed and will be automatically reset at 85% of normal operating speed following an overspeed trip.

QUESTION 6.04 (1.00)

Which of the following signals is NOT directly determined by the value of turbine first stage pressure? (1.0)

a. Programmed S/G Level
b. High Steam Flow SI Setpoint
c. Programmed Pressurizer Level
d. Tref

QUESTION 6.05 (1.00)

Which of the following reactor trip or SI signals is NOT blocked by permissive P-7? (1.0)

a. Low Pzr Pressure trip
b. Low Pzr Pressure SI
c. High Pzr Level trip
d. Low RCS Flow trip

QUESTION 6.06 (1.00)

Which of the following indications is NOT available on the Remote Monitoring Panel? (1.0)

a. % Reactor Power
b. S/G Pressure
c. Cold Leg Temperature
d. S/G Level

QUESTION 6.07 (1.00)

Which of the following is NOT an input to the Core Cooling Monitor System? (1.0)

a. Auctioneered high thermocouple from each core quadrant.
b. Hot leg temperature from Loops A, B, and C.
c. Cold leg temperature from Loops A, B, and C.
d. RCS wide range pressure.

QUESTION 6.08 (1.00)

Which of the following statements about temperature detectors is correct? (1.0)

a. The thermocouple is connected to one leg of a bridge circuit and as the temperature changes the output voltage across the bridge changes.
b. When a thermocouple fails open it will respond in the same manner as an RTD and will indicate a full scale reading on the meter.
c. When a faster responding temperature signal is needed a direct immersion (wet bulb type) RTD is used instead of the thermowell mounted RTD.
d. A RTD is comprised of two wires of dissimilar metals in contact with each other and generates a voltage that is proportional to the temperature difference between the open ends of the wires.

QUESTION 6.09 (1.00)

Which of the following statements describes the signal path from the Source Range detector to the Source Range level meter on the MCB? (1.0)

a. Detector, Pre Amp, Discriminator, Log Integrator, Meter
b. Detector, Log Integrator, Pulse Shaper, Pulse Counter, Meter
c. Detector, Pre Amp, Log Integrator, Discriminator, Meter
d. Detector, Log Amp, Meter

QUESTION 6.10 (1.00)

Which of the following statements concerning the Rod Control System is correct? (1.0)

a. If nuclear power is greater than turbine power, the power mismatch unit will generate a signal to insert rods.
b. Only one of the three (movable, stationary, and lift) coils are energized at any one time.
c. During overlap, two banks move in unison, group one from both banks stepping together, and then group two from both banks.
d. The variable gain unit uses a higher gain as turbine power increases.

QUESTION 6.11 (1.00)

Which of the following statements concerning the Power Range Nuclear Instrumentation detectors is correct? (1.0)

a. Operates in the proportional region of the gas amplication (detector characteristics) curve.
b. Uses inner chamber current to cancel out gamma current in the outer chamber.
c. Uses Boron Trifluoride gas to make it neutron sensitive.
d. Its output is calibrated by doing a secondary heat balance.

QUESTION 6.12 (1.00)

Which of the following flowpaths correctly describe how power is normally supplied to Vital Bus Distribution Panel 1-II? (1.0)

a. 480 VAC from vital bus, rectified to 120 VDC, inverted to 120 VAC, and supplied to Panel 1-II.
b. 480 VAC from vital bus, transformed to 120 VAC, and supplied to Panel 1-II.
c. 120 VDC from battery, inverted to 120 VAC, and supplied to Panel 1-II.
d. 120 VAC from Panel 1-IV is supplied to Panel 1-II.

QUESTION 6.13 (1.00)

Which of the following statements concerning the S/G Blowdown System is correct? (1.0)

a. The blowdown filters and ion exchangers are bypassed unless the blowdown radiation monitors detect a high blowdown activity.
b. The inside and outside containment trip valves are automatically closed by any signal which automatically starts the auxiliary feed pumps.
c. The normal discharge flow path of the cooled and treated blowdown liquid is to the CW outlet piping from water-boxes A or C.
d. The S/G blowdown lines join together to form a commom header upstream of the blowdown coolers.

QUESTION 6.14 (1.00)

Which of the following statements concerning the Spent Fuel Pit System is correct? (1.0)

a. The fuel pit cooling system consists of two pumps, one heat exchanger, suction chest, connecting piping, and associated instrumentation and controls.
b. All penetrations for the fuel pit systems are at least twenty feet above the top of the fuel.
c. The service water system from either Unit 1 or Unit 2 may be lined up to the fuel pit coolers.
d. The charging system blender is used to provide makeup to the fuel pit if fuel pit water loss is due to evaporation and/or leakage.

QUESTION 6.15 (1.00)

Which of the following statements concerning the turbine trip protection and fluid systems is correct? (1.0)

a. If the reactor trip breakers are open, the EH fluid system is depressurized and the autostop oil system is pressurized.
b. The autostop oil system is supplied high pressure oil from the bearing oil pump.
c. A mechanical overspeed will trip the turbine by dumping the EH fluid without affecting the autostop oil.
d. When one of the two generator output breakers are open, the anti-motoring turbine trip protects the turbine from blading overheating.

QUESTION 6.16 (1.00)

During normal full power operation on Unit 1, which of the following describes the power supply path to Component Cooling pump 1A? (1.0)

a. Offsite, reserve station service transformer C, transfer bus F, bus 1H, stub bus 1H.
b. Main generator, station service transformer C, transfer bus F, bus 1H, stub bus 1H.
c. Offsite, reserve station service transformer A, transfer bus D, bus 1J, stub bus 1J.
d. Main generator, station service transformer A, transfer bus D, bus 1J, stub bus 1J.

QUESTION 6.17 (1.00)

Which of the following statements concerning the Steam Dump Control System is correct? (1.0)

a. The steam dump valves fail open on loss of air.
b. In order to cooldown below 543 degrees, the steam dump mode selector switch must be momentarily taken to 'Reset' and returned to 'Steam Pressure'.
c. When in the Tavg mode, the steam dumps are armed by the reactor trip breakers opening.
d. In the load rejection mode, the steam dump valves may receive a signal to modulate open or a signal to trip open depending upon the magnitude of the error signal.

QUESTION 6.18 (1.00)

Which of the following statements concerning the Consequence Limiting Safeguards (CLS) is correct? (1.0)

a. Upon Hi-Hi initiation, containment pressure must decrease below the Hi reset point before Hi-Hi can be reset.
b. Both the Hi and Hi-Hi relays must be energized to initiate CLS actuation.
c. The CLS system uses eight pressure transducers: 4 for the Hi subsystem and 4 for the Hi-Hi subsystem.
d. To manually initiate the Hi subsystem, both trip pushbuttons on the control board must be simultaneously depressed.

QUESTION 6.19 (1.00)

Which of the following fuel handling components is hydraulically operated? (1.0)

a. Conveyer Car
b. Reactor Vessel Stud Tensioner
c. Gripper
d. Reactor Cavity Side Lifting Frame (Upender)

QUESTION 6.20 (1.00)

Which of the following sets of pressurizer pressure setpoints is correct? (1.0)

a. 2335 psig - PORV opens
   2350 psig - High Pressure alarm
   2370 psig - High Pressure trip
b. 2210 psig - B/U heaters on
   2100 psig - Low Pressure alarm
   1875 psig - Low Pressure trip
c. 2370 psig - High Pressure trip
   1875 psig - Low Pressure trip
   1715 psig - Low Pressure SI
d. 2335 psig - PORV opens
   2100 psig - PORV block
   2000 psig - Low Pressure alarm

QUESTION 6.21 (1.00)

Which of the following statements correctly describe the normal lineup of the Containment Spray system for Unit 1 with Unit 1 operating at 100% power? (1.0)

a. Spray pump suction valves open, spray pump discharge valves shut, chemical addition tank valves shut.
b. Spray pump suction valves open, spray pump discharge valves shut, chemical addition tank valves open.
c. Spray pump suction valves open, spray pump discharge valves open, chemical addition tank valves shut.
d. Spray pump suction valves shut, spray pump discharge valves shut, chemical addition tank valves shut.

QUESTION 6.22 (1.00)

Answer TRUE or FALSE to the following.

a. The RHRS is designed to reduce RCS temperature from 350 degrees F to 140 degrees F within 16 hours. (0.5)
b. The design heat load handled by the RHRS only includes core decay heat; it does not include RCP heat. (0.5)

QUESTION 6.23 (1.00)

For the following radiation detector types, indicate whether the output intensity (current or pulse height) is proportional to the incident radiation energy; i.e., if the incident energy increases, will the output intensity increase? (Answer YES or NO to each). (1.0)

a. Ion Chamber
b. GM
c. Proportional Counter
d. Scintillation

QUESTION 6.24 (1.00)

Indicate whether the Over Power Delta Temperature trip setpoint will INCREASE, DECREASE, or REMAIN THE SAME for the following parameter changes. Consider each separately. (1.0)

a. Increasing Tavg
b. Tavg less than rated power Tavg
c. Delta I becoming more negative
d. Pressurizer Presure decreasing

QUESTION 6.25 (2.00)

For the following components, indicate whether they will receive an OPEN, CLOSE, or NO signal upon safety injection initiation. (2.0)

a. Control room supply and exhaust ducts
b. Main feed bypass valves
c. SI accumulator discharge isolation valves
d. Normal cha ging header isolation valves
e. Main steam isolation valves
f. RWST to Lo Hd SI pump suction valves
g. Seal water return isolation valve
h. Component cooling isolation valve from RHRS
i. Component cooling isolation from letdown heat exchanger
j. Steam supply valves to turbine-driven feed pump

QUESTION 6.26 (1.50)

Referring to provided Figure 6-1, indicate whether the following valves receive an OPEN, MODULATED, or CLOSED signal for the given makeup mode selector switch position. (1.5)

a. 114A in AUTO
b. 113B in DILUTE
c. 114B in ALT DILUTE
d. 114B in BORATE
e. 113A in MANUAL

QUESTION 6.27 (1.50)

Match Column A to the RCS pe etration in Column B. (1.5)

Column A	Column B
1. Pzr Surge Line	a. Loop A Hot Leg
2. Normal Letdown	b. Loop B Hot Leg
3. Pzr Spray Line	c. Loop C Hot Leg
4. Normal Charging	d. Loop A Cold Leg
5. RHR Cooldown Suction	e. Loop B Cold Leg
	f. Loop C Cold Leg

QUESTION 6.28 (1.00)

Match the following reactor conditions in Column A with the rod speed in Column B. (1.0)

COLUMN A	COLUMN B
1. Withdrawing Shutdown Bank B in Shutdown Bank B position	a. 0 spm
2. Withdrawing Bank B in Control Bank B position	b. 8 spm
3. Automatic insertion with Tavg > Tref by 2 degrees	c. 16 spm
4. Withdrawing Bank B in Manual position	d. 24 spm
5. Automatic insertion with Tavg > Tref by 5.5 degrees	e. 48 spm
	f. 72 spm

QUESTION 7.01 (1.00)

According to 10CFR20, which of the following is NOT equivalent to a dose of one rem? (1.0)

a. A dose of 1 roentgen due to gamma radiation.
b. A dose of 1 rad due to beta radiation.
c. A dose of 0.3 rad due to neutrons.
d. A dose of 0.05 rad due to alphas.

QUESTION 7.02 (1.00)

Which of the following is NOT a Critical Safety Function? (1.0)

a. Subcooling
b. Heat Sink
c. Subcriticality
d. Inventory

QUESTION 7.03 (1.00)

Following a reactor trip, the turbine did not automatically trip and the manual control room trip was unsuccessful. According to EP-1.00, "Reactor Trip/Safety Injection", which of the following statements is NOT an acceptable method of securing the turbine. (1.0)

a. Close main steam trip valves.
b. Stop EHC pumps.
c. Manually runback turbine.
d. Locally trip turbine.

QUESTION 7.04 (1.00)

Which of the following is NOT a requirement prior to commencing a Fast Trip Recovery? (1.0)

a. If the reactor trip was caused by a turbine trip, the cause of the turbir- trip has been corrected.
b. Less than four hours has elapsed since the reactor trip.
c. An estimated critical position has been calculated.
d. Three RCP's, two condensate pumps, and one main feed pump are operable and in operation.

QUESTION 7.05 (1.00)

Which of the following Precautions and Limitations associated with refueling operations is NOT correct? (1.0)

a. Only green, black, or red tape may be used around or in the refueling cavity.
b. A minimum count rate of 2 cps must be detectable whenever 8 or more fuel assemblies are in the reactor vessel.
c. The refueling crew shall consist of a SRO who is to directly supervise core alterations and at least one licensed RO.
d. If a HIGH FLUX AT SHUTDOWN alarm is actuated during movement of fuel, return the fuel to the position it occupied prior to the alarm before evacuating the containment.

QUESTION 7.06 (1.00)

Which of the following statements concerning radiation protection and control is NOT correct? (1.0)

a. All personnel shall wear the TLD on the forward upper torso with the Beta window facing outward.
b. An individual shall immediately leave the Restricted Controlled Area (RCA) if his/her dosimeter reads 80% of full scale.
c. A Radiation Work Permit is required for all enteries into the RCA.
d. Operations personnel may receive the High Radiation Area key from the Shift Supervisor for routine containment entries.

QUESTION 7.07 (1.00)

Which of the following statements concerning the immediate actions for a complete loss of component cooling water on Unit 1 is NOT correct? (1.0)

a. Stop charging flow by closing FCV-1122 and letdown flow by closing HCV-1200A, B, and C.
b. The RCP's are tripped two minutes after either the upper or lower motor bearing temperature reaches 200 degrees.
c. Shift reactor containment air recirculation coolers to chilled component cooling.
d. Prepare to backup containment instrument air with turbine building instrument air.

QUESTION 7.08 (1.00)

According to EP-1.01, 'Reactor Trip Recovery', which of the following is NOT a proper indication of natural circulation? (1.0)

a. RCS cold leg temperature near saturation temperature for S/G pressure.
b. RCS subcooling greater than 50 degrees.
c. Core exit thermocouples stable or slowly decreasing.
d. Core delta temperature (Thot - Tcold) greater than full power delta temperature.

QUESTION 7.09 (1.00)

Which of the following statements concerning the S/G Tube Rupture procedure EP-4.00 is correct? (1.0)

a. Cooldown may be commenced prior to isolating the ruptured S/G.
b. Cooldown rate is limited to 100 degrees/hour.
c. Using one pzr PORV is the preferred method of depressurization.
d. The RCS should be borated to the cold shutdown requirements prior to commencing cooldown.

QUESTION 7.10 (1.00)

The Unit Startup Procedure states that the shutdown banks must be fully withdrawn whenever reactivity is being changed, except with permission of the Superintendent of Operations and... (1.0)

a. the shutdown margin has been calculated to be greater than 1770 pcm.
b. the RCS is borated to the cold shutdown concentration.
c. the reactor is in the Source Range with the HIGH FLUX AT SHUTDOWN alarm operable.
d. the actual boron concentration is greater than the predicted critical boron concentration.

QUESTION 7.11 (1.00)

Which of the following statements concerning the Immediate Actions for nuclear instrument malfunctions is correct? (1.0)

a. If a source range channel fails while a startup is in progress and reactor power is below P-6, insert all control banks to zero steps.
b. If an intermediate range channel fails while a startup is in progress and reactor power is above P-6 but below P-10, the power increase may continue using the operable intermediate range channel.
c. Failure of one power range channel during shutdown precludes a reactor startup until the failed channel is returned to operable status.
d. Failure of both source range channels while shutdown requires boration to the cold shutdown specification and disabling the primary makeup dilute function.

QUESTION 7.12 (1.00)

Which of the following statements describe the RCP Trip Criteria following a valid safety injection initiation? (1.0)

a. Less than 50 degrees subcooling and pressurizer level less than 10%.
b. Less than 50 degrees subcooling and safety injection is on.
c. RCS pressure less than 1600 psig and safety injection is on.
d. RCS pressure less than 1600 psig and pressurizer level less than 10%.

QUESTION 7.13 (1.00)

Which of the following statements concerning the use of Inverse Count Rate Ratio (ICRR) plots is correct? (1.0)

a. ICRR plots are required for all startups where the reactor has been shutdown for less than 24 hours.
b. The ICRR value is calculated by dividing 1 by the observed count rate.
c. Rod withdrawal increments between successive ICRR data points should not be more than 50 steps.
d. Count rate data must be taken off the NI counter-scalar with a minimum count time of one minute.

QUESTION 7.14 (1.00)

According to the Foldout Page, which of the following is the SI Reinitiation Criteria following a loss of reactor coolant? (1.0)

a. RCS pressure less than 2000 psig, RCS subcooling less than 50 degrees, or pressurizer level less than 20%.
b. RCS pressure less than 1715 psig, RCS subcooling less than 50 degrees, or pressurizer level less than 20%.
c. RCS pressure less than 1715 psig, RCS subcooling less than 20 degrees, or pressurizer level less than 10%.
d. RCS pressure less than 1600 psig, RCS subcooling less than 20 degrees, or pressurizer level less than 10%.

QUESTION 7.15 (1.00)

Which of the following conditions would prevent restarting a RCP following a loss of a RCP bus? (1.0)

a. VCT pressure of 20 psig.
b. Seal injection flow of 8 gpm to each RCP.
c. No. 1 seal return valve shut.
d. Differential pressure across No. 1 seal of 300 psid.

QUESTION 7.16 (1.00)

Which of the following is the correct action if, following a reactor trip, only one AC emergency bus is energized? (1.0)

a. Try to restore power to de-energized AC emergency bus while continuing EP-1.00,'Reactor Trip/Safety Injection'.
b. Go to ECA-2, 'Loss of All AC Power'.
c. Restore power to de-energized AC emergency bus before continuing EP-1.00.
d. Go to FRP-C.1, 'Response to Inadequate Core Cooling'.

QUESTION 7.17 (1.00)

A warning in ECA-2, 'Loss of All A/C Power', states DO NOT REDUCE RCS PRESSURE BELOW 390 PSIG OR RCS TEMPERATURE BELOW 442 DEGREES. Which of the following is a basis for this warning? (1.0)

a.. Prevent pressurized thermal shock.
b. Prevent voiding reactor vessel head.
c. Prevent returning to criticality due to moderator temperature effects.
d. Prevent RCS inventory loss through Residual Heat Removal System relief valves.

QUESTION 7.18 (1.00)

According to FRP-P.1, 'Response to Imminent Pressurized Thermal Shock', a RCS system temperature soak is required if: (1.0)

a. RCS system pressure has increased by more than 1000 psi in any 60 minute period.
b. RCS system cold leg temperature has decreased by greater than 100 degrees in any 60 minute period.
c. RCS system pressure has decreased by more than 500 psi in any 60 minute period.
d. RCS system cold leg temperature has increased by greater than 50 degrees in any 60 minute period.

QUESTION 7.19 (1.00)

Procedure FRP-I.3A, 'Response to Void in Reactor Vessel', attempts to collapse any reactor vessel voids by which of the following methods? (1.0)

a. Holding pressure stable and decreasing temperature in 50 degree increments.
b. Holding temperature stable and increasing pressure in 50 psi increments.
c. Using SI flow to take RCS system solid and increasing pressure in 100 psi increments.
d. Holding pressure and temperature constant while opening head vents.

QUESTION 7.20 (1.00)

If two or more control rods are not fully inserted following a reactor trip, how much boration is required for each rod not fully inserted? (1.0

a. 300 ppm
b. 150 ppm
c. 100 ppm
d. 50 ppm

QUESTION 7.21 (1.00)

During a natural circulation cooldown following a reactor trip, which of the following criteria determine the amount of RCS subcooling required? (1.0)

a. RCS cooldown rate.
b. Reactor power history (decay heat rate).
c. Pressurizer level.
d. Number of CRDM fans running.

QUESTION 7.22 (1.00)

Which of the following statements concerning the procedure for a dropped RCCA is correct? (1.0)

a. Upon starting recovery of the dropped RCCA, an URGENT FAILURE alarm will occur because the lift coils for the other rods in the group have been disconnected.
b. The delta flux target band is not applicable during a dropped RCCA malfunction and recovery.
c. If two or more RCCA's have dropped, manually trip the reactor and proceed in accordance with EP-1.00.
d. Recovery from a dropped RCCA will be facilitated if Tavg is higher than Tref prior to commencing withdrawal of the dropped RCCA.

QUESTION 7.23 (1.00)

Which of the following automatic actions associated with the specified high radiation alarm is correct? (1.0)

a. RI-GW-101 (Process Vent) - closes waste gas release valve.
b. RI-RMS-160 (Containment Gaseous) - sends purge exhaust through HEPA and charcoal filters.
c. RI-RMS-157 (Control Room Area) - shifts control room ventilation system to recirculation mode.
d. RI-LW-108 (Liquid Waste Disposal) - increases dilution flow through waste release valve.

QUESTION 7.24 (1.00)

Which of the following is the MINIMUM RCS leak rate above which the operator is required to manually trip the reactor? (1.0)

a. 100 gpm
b. 75 gpm
c. 50 gpm
d. 25 gpm

QUESTION 7.25 (1.00)

In the event of a rapid decrease in refueling cavity level, an immediate action of AP-22 is to immediately commence make-up to the refueling cavity. Which of the following is the first priority make-up flowpath? (1.0)

a. LHSI or HHSI pumps with suction on containment sump.
b. HHSI pumps with unaffected unit's RWST providing suction vai RWST cross-connect valves.
c. HHSI pumps with affected unit's suction on affected unit's RWST.
d. LHSI pumps with affected unit's suction on affected unit's RWST.

QUESTION 7.26 (1.00)

Which of the following statements concerning a loss of one RCP at less than 35% power is correct? (1.0)

a. After meeting the precautions and limitations associated with starting a RCP, restart the affected RCP.
b. Defeat affected loops delta T and Tavg signals and commence unit shutdown.
c. Immediately trip the reactor and proceed in accordance with EP-1.00, 'Reactor Trip/Safety Injection'.
d. Power operations may continue for up to four hours while attempting repair and restart of the affected RCP.

QUESTION 7.27 (1.00)

Which of the following statements describing the method of unit shutdown from 2% power to hot shutdown is correct? (1.0)

a. Using manual rod control, insert control banks D, C, B, and A to zero steps. Maintain the shutdown banks fully withdrawn.
b. Using manual rod control, insert control banks D, C, B, and A to five steps. Maintain the shutdown banks fully withdrawn.
c. Using manual rod control, insert control banks D, C, B, and A to zero steps. Using group select, insert shutdown banks to zero steps. Open reactor trip breakers. Reset reactor trip breakers. Using group select, fully withdraw shutdown banks.
d. Using group select, insert all rods to five steps. Open reactor trip breakers. Reset reactor trip breakers. Using group select, fully withdraw shutdown banks.

QUESTION 7.28 (1.00)

Which of the following is the maximum quarterly whole body administrative dose that you are allowed to receive at Surry without any special approval or concurrence? (1.0)

a. 0.75 Rem
b. 1.25 Rem
c. 1.75 Rem
d. 2.75 Rem

QUESTION 7.29 (1.00)

Match the evolutions in Column A to the power that they are normally performed at during a power increase in Column B. (1.0)

COLUMN A	COLUMN B
1. Perform heat balance	a. 15%
2. Verify proper S/G chemistry	b. 35%
3. Start second main feed pump	c. 50%
4. Place steam dumps in 'Tavg'	d. 60%
5. Place reheat system in operation	e. 70%
	f. 90%

QUESTION 7.30 (1.00)

Complete the following statements by filling in the appropriate number.

a. If criticality occurs at less than _______ pcm below the ECP (0.2) or has not occurred by _______ pcm above the ECP, the control (0.2) rods must be inserted.

b. When the RCS temperature is greater than _______ degrees, a (0.2) bubble shall exist in the pressurizer.

c. If the source range count rate increases by a factor of _______ (0.2) during boron dilution, stop the dilution.

d. During boron concentration changes of _______ ppm or greater, (0.2) the pressurizer spray should be operated to equalize the concentrations in the reactor coolant loops and pressurizer.

QUESTION 8.01 (1.00)

According to the Technical Specifications, certain conditions must exist for the RWST to be operable. Which of the following is NOT one of these conditions? (1.0)

a. Less than maximum water temperature.
b. Greater than minimum water temperature.
c. Less than maximum water volume.
d. Greater than minimum water volume.

QUESTION 8.02 (1.00)

Which of the following individuals (by title) can NOT relieve the Shift Supervisor as the Station Emergency Manager in the event of an emergency at the station? (1.0)

a. Station Manager
b. Superintendent Operations
c. Superintendent Health Physics
d. Superintendent Technical Services

QUESTION 8.03 (1.00)

Which of the following is NOT a basis for the control rod insertion limits? (1.0)

a. Control 50% load rejection without reactor trip.
b. Maintain required shutdown margin.
c. Minimize consequences of rod ejection accident.
d. Provide for acceptable nuclear peaking factors.

QUESTION 8.04 (1.00)

According to Technical Specifications, which of the following is NOT part of the Accident Monitoring Instrumentation? (1.0)

a. RCS Subcooling Monitor
b. PORV Position Indicator
c. Containment Hydrogen Monitor
d. Auxiliary Feedwater Flow Rate

QUESTION 8.05 (1.00)

Which of the following require activation of the TSC and OSC? (1.0)

a. Either an Unusual Event, Alert, Site Emergency, or General Emergency.
b. Only an Alert, Site Emergency, or General Emergency.
c. Only a Site Emergency or General Emergency.
d. Only a General Emergency.

QUESTION 8.06 (1.00)

The process of determining an instrument's accuracy by visually comparing the indication to other independent instrument channels measuring the same parameter is defined in Technical Specifications as a: (1.0)

a. Channel Calibration
b. Channel Check
c. Channel Functional Test
d. Channel Verification

QUESTION 8.07 (1.00)

Which of the following statements concerning the axial flux difference (AFD) requirements is correct? (1.0)

a. Above 90%, within 30 minutes of going outside the target band: either restore indicated AFD to within the target band or reduce power to less than 90%.
b. If the axial flux difference alarms are out of service, the axial flux difference shall be logged every hour for the first 24 hours and half-hourly thereafter until the alarms are returned to operable.
c. Below 15% power, penalty points are accumulated at one half point for every minute outside the target band.
d. Power level shall not be increased above 50% unless the AFD is within the target band.

QUESTION 8.08 (1.00)

If during a reactor plant cooldown using the RHR system the safety injection system is actuated, the normal EP SI termination criteria do not apply. Which of the following would be the SI termination criteria in this condition? (1.0)

a. No criteria, terminate SI immediately.
b. RCS pressure stable or increasing AND RCS subcooling greater than 10 degrees.
c. RCS pressure stable or increasing AND RCS subcooling greater than 50 degrees AND at least one S/G greater than 65% wide range level.
d. Initiating condition is cleared.

QUESTION 8.09 (1.00)

Following a reactor trip where the reason for the trip is clearly understood and corrected and no significant malfunctions of safety-related or important equipment occurred, which of the following is responsible for making the decision to restart the reactor? (1.0)

a. Assistant Shift Supervisor
b. Shift Supervisor
c. Superintendent of Operations (or SRO on call)
d. Station Manager

QUESTION 8.10 (1.00)

If an operator is returning to shift after a three-week vacation, he/she is required to read and initial the logs for the previous _______. (Choose one answer from below) (1.0)

a. 1 day
b. 7 days
c. 14 days
d. 21 days

QUESTION 8.11 (1.00)

Which of the following can be completed AFTER the Shift Supervisor has assumed the watch? (1.0)

a. Review and initial the Shift Order Book.
b. Read and initial Require Reading.
c. Complete and sign the Minimum Equipment List.
d. Review the Balance of Plant Checklist.

QUESTION 8.12 (1.00)

Which of the following statements concerning the Control Room Operators Log is correct? (1.0)

a. During periods of high work load, log frequency may be reduced to one complete set per shift, provided prior Superintendent Operations' concurrence is obtained.
b. Abnormal or unusual reading shall be noted with a red asterick (*) and reported to the Shift Supervisor.
c. When the plant computer is unavailable at least asterisked (*) items shall be taken every two hours.
d. If log reading are not started within two hours of the specified time, the reason will be recorded in the remarks section of the log and reported to the Shift Supervisor.

QUESTION 8.13 (1.00)

Which of the following is the basis for the high pressurizer water level reactor trip? (1.0)

a. Prevents solid operations while the reactor is critical.
b. Prevents exceeding containment design pressure in event of LOCA with all RCS fluid flashing to steam.
c. Prevents loss of pressure control due to spray nozzle being submerged.
d. Protects the pressurizer safety valves against water relief.

QUESTION 8.14 (1.00)

Except during low power physics tests, the reactor shall not be made critical at any temperature above which the moderator temperaturer coefficient is more positive than: (Choose one) (1.0)

a. +3 pcm/degree from 0 to 50% of rated power and linearly decreasing to 0 pcm/degree at rated power.
b. 0 pcm/degree for all powers up to rated power.
c. +3 pcm/degree for all powers up to rated power.
d. +3 pcm/degree at 0% of rated power and linearly decreasing to 0 pcm/degree at rated power.

QUESTION 8.15 (1.00)

Which of the following signals cause BOTH a safety injection and a steam line isolation? (1.0)

a. High Containment Pressure
b. High-High Containment Pressure
c. High Steam Line Differential Pressure
d. High Steam Flow (with Low Tavg)

QUESTION 8.16 (1.00)

Which of the following statements concerning the action required if the spray and sprinkler system for the cable tunnel is declared inoperable is correct? (1.0)

a. Within one hour establish a fire patrol to inspect the area at least once per hour.
b. Establish a continous fire watch, with backup fire suppression equipment, within one hour.
c. Establish a continous fire watch within one hour.
d. Be in hot shutdown within one hour.

QUESTION 8.17 (1.00)

According to the Technical Specifications, which of the following is the minimum shift crew composition with two units operating? (1.0)

a. 1 SS, 2 SRO, 3 RO, 3 AO, 1 STA
b. 1 SS, 2 SRO, 2 RO, 3 AO, 1 STA
c. 1 SS, 1 SRO, 3 RO, 3 AO, 1 STA
d. 1 SS, 1 SRO, 2 RO, 3 AO, 1 STA

QUESTION 8.18 (1.00)

During a non-emergency situation, a temporary change to an operating procedure which clearly does not change the intent must be authorized by which of the following? (1.0)

a. Shift Supervisor only
b. Shift Supervisor and another licensed SRO
c. Shift Supervisor and STA
d. Licensed SRO and licensed RO

QUESTION 8.19 (1.00)

Which of the following sequences giving the four classes of Emergencies in increasing order of severity is correct? (1.0)

a. Alert, Unusual Event, Site Area Emergency, General Emergency
b. Unusual Event, Alert, General Emergency, Site Area Emergency
c. Alert, Unusual Event, General Emergency, Site Area Emergency
d. Unusual Event, Alert, Site Area Emergency, General Emergency

QUESTION 8.20 (2.00)

Answer TRUE or FALSE to the following statements concerning ADM-29.7, Operations Department - Operation, Maintenace, and Tagging.

a. In cases when equipment cannot practically be tagged, maintenance may be performed with an 'operator standing by'. (0.5)
b. Whenever available, an atmospheric drain and/or vent between the equipment to be worked upon and sources of pressure shall be tagged in the OPEN position. (0.5)
c. When more than one department is to work on the same equipment, one set of tags can be issued to cover all maintenance activities. (0.5)
d. If, after a partial removal of tags, a re-issue of the tags are desired, the new tags must be added to a new Tagging Record. (0.5)

QUESTION 8.21 (1.00)

Answer TRUE or FALSE to the following:

a. Operations personnel may adjust or operate any setpoints, etc., inside the control consoles provided such action is specifically called for in an approved procedure. (0.5)

b. All dusting and cleaning of control consoles, instrument panels, and computer consoles will be performed by shift operating personnel. (0.5)

QUESTION 8.22 (1.50)

Complete the following statements concerning Refueling Operations by filling in the correct number.

a. At least _______ feet of water shall be maintained over the top of the reactor pressure vessel flange during movement of fuel assemblies. (0.5)

b. When the reactor vessel head is unbolted, a minimum boron concentration of _______ ppm shall be maintained in all filled portions of the RCS. (0.5)

c. No movement of irradiated fuel in the reactor core shall be accomplished until the reactor has been subcritical for a period of at least _______ hours. (0.5)

QUESTION 8.23 (1.00)

When a system, subsytem, train, component or device is determined to be inoperable solely because its emergency power source is inoperable, or solely because its normal power source is inoperable, it may be considered operable for the purpose of satisfying the requirements of its applicable Limiting Condition for Operation, provided two conditions are met. List these TWO conditions. (1.0)

QUESTION 8.24 (1.50)

When (times or events) must a core quadrant power balance be determined if the reactor is operating above 75% of rated power with one excore nuclear channel out of service? (THREE answers required) (1.5)

QUESTION 8.25 (1.50)

According to the Technical Specifications, what THREE conditions would require that a control rod be declared inoperable? (1.5)

QUESTION 8.26 (1.00)

ADM-38 indicates that entry into containment during reactor operations exposes personnel to four distinct hazards. List these FOUR hazards. (1.0)

QUESTION 8.27 (1.50)

Standing Order 12 authorizes the use of temporary Control Board Markers. What THREE conditions (requirements) are necessary for their use? (1.5)

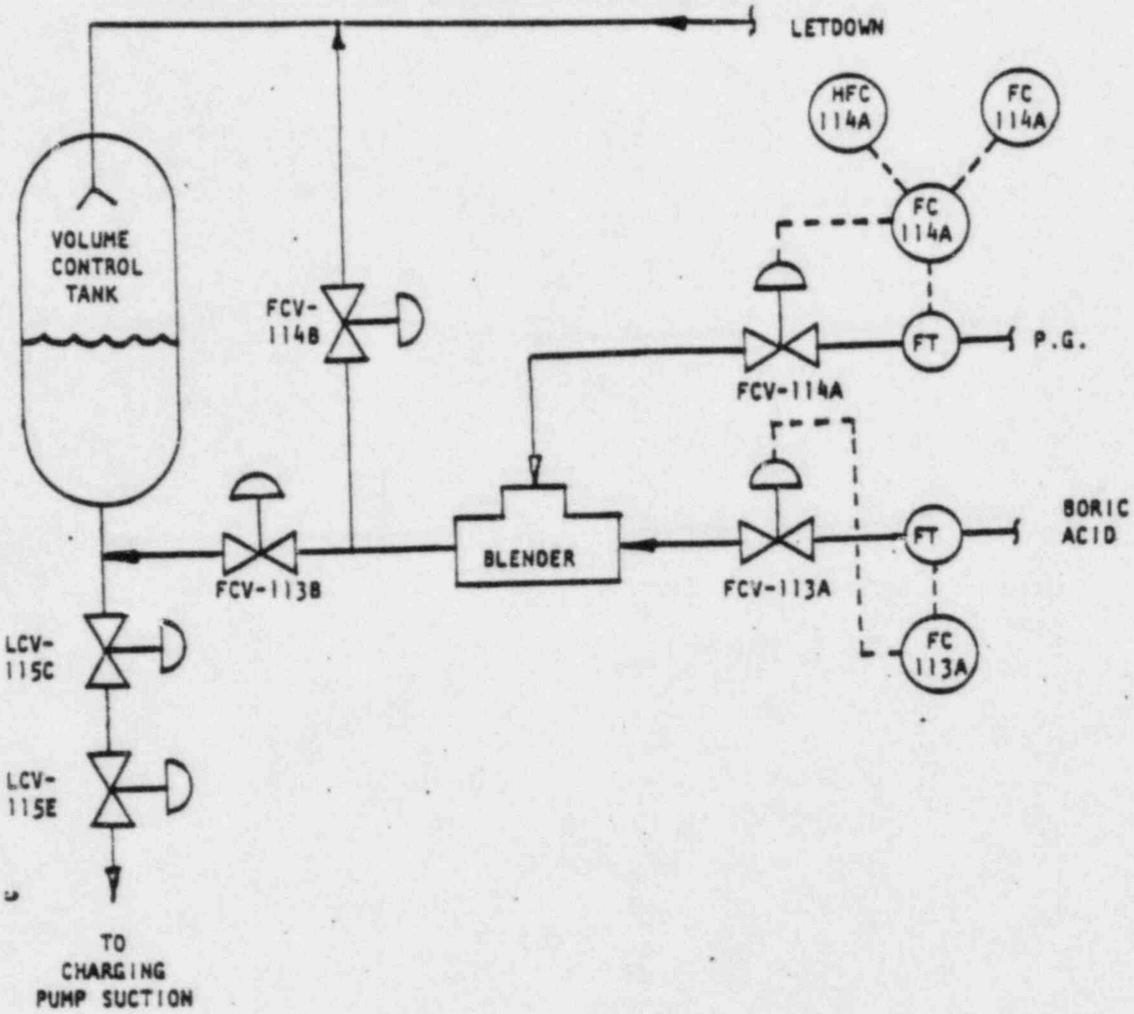

LETDOWN
HFC 114A
FC 114A
FC 114A
VOLUME CONTROL TANK
FCV-114B
FT
P.G.
FCV-114A
BORIC ACID
FT
BLENDER
FCV-113B
FCV-113A
LCV-115C
FC 113A
LCV-115E
TO CHARGING PUMP SUCTION

FIGURE 6.1

$f = ma$

$v = s/t$

Cycle efficiency = (Net work out)/(Energy in)

$w = mg$

$s = V_o t + 1/2\ at^2$

$E = mc^2$

$KE = 1/2\ mv^2$

$a = (V_f - V_o)/t$

$A = \lambda N$

$A = A_o e^{-\lambda t}$

$PE = mgh$

$V_f = V_o + at$

$w = \theta/t$

$\lambda = \ln 2/t_{1/2} = 0.693/t_{1/2}$

$W = v\ \Delta P$

$A = \dfrac{\pi D^2}{4}$

$t_{1/2}eff = \dfrac{[(t_{1/2})(t_b)]}{[(t_{1/2}) + (t_b)]}$

$\Delta E = 931\ \Delta m$

$\dot{m} = V_{av} A \rho$

$\dot{Q} = \dot{m} \Delta h$

$I = I_o e^{-\Sigma x}$

$\dot{Q} = \dot{m} Cp \Delta t$

$\dot{Q} = UA \Delta T$

$I = I_o e^{-\mu x}$

$Pwr = W_f \Delta h$

$I = I_o\ 10^{-x/TVL}$

$TVL = 1.3/\mu$

$P = P_o 10^{sur(t)}$

$HVL = -0.693/\mu$

$P = P_o e^{t/T}$

$SUR = 26.06/T$

$SCR = S/(1 - K_{eff})$

$CR_x = S/(1 - K_{effx})$

$SUR = 26\rho/\ell^* + (\beta - \rho)T$

$CR_1(1 - K_{eff1}) = CR_2(1 - K_{eff2})$

$T = (\ell^*/\rho) + [(\beta - \rho)/\bar{\lambda}\rho]$

$M = 1/(1 - K_{eff}) = CR_1/CR_o$

$T = \ell/(\rho - \beta)$

$M = (1 - K_{effo})/(1 - K_{eff1})$

$T = (\beta - \rho)/(\bar{\lambda}\rho)$

$SDM = (1 - K_{eff})/K_{eff}$

$\rho = (K_{eff} - 1)/K_{eff} = \Delta K_{eff}/K_{eff}$

$\ell^* = 10^{-4}$ seconds

$\bar{\lambda} = 0.1\ \text{seconds}^{-1}$

$\rho = [(\ell^*/(T\ K_{eff})] + [\bar{\beta}_{eff}/(1 + \bar{\lambda}T)]$

$I_1 d_1 = I_2 d_2$

$P = (\Sigma\phi V)/(3 \times 10^{10})$

$I_1 d_1^{\ 2} = I_2 d_2^{\ 2}$

$\Sigma = \sigma N$

$R/hr = (0.5\ CE)/d^2 (\text{meters})$

$R/hr = 6\ CE/d^2\ (\text{feet})$

Water Parameters

1 gal. = 8.345 lbm.
1 gal. = 3.78 liters
1 ft^3 = 7.48 gal.
Density = 62.4 lbm/ft^3
Density = 1 gm/cm^3
Heat of vaporization = 970 Btu/lbm
Heat of fusion = 144 Btu/lbm
1 Atm = 14.7 psi = 29.9 in. Hg.
1 ft. H_2O = 0.4335 lbf/in.

Miscellaneous Conversions

1 curie = 3.7×10^{10} dps
1 kg = 2.21 lbm
1 hp = 2.54×10^3 Btu/hr
1 mw = 3.41×10^6 Btu/hr
1 in = 2.54 cm
°F = 9/5°C + 32
°C = 5/9 (°F-32)
1 BTU = 778 ft-lbf

$e = 2.718$

Temp F	Press. psia	Volume, ft³/lb Water v_f	Evap v_{fg}	Steam v_g	Enthalpy, Btu/lb Water h_f	Evap h_{fg}	Steam h_g	Entropy, Btu/lb x F Water s_f	Evap s_{fg}	Steam s_g	Temp F
32	0.08859	0.01602	3305	3305	−0.02	1075.5	1075.5	0.0000	2.1873	2.1873	32
35	0.09991	0.01602	2948	2948	3.00	1073.8	1076.8	0.0061	2.1706	2.1767	35
40	0.12163	0.01602	2446	2446	8.03	1071.0	1079.0	0.0162	2.1432	2.1594	40
45	0.14744	0.01602	2037.7	2037.8	13.04	1068.1	1081.2	0.0262	2.1164	2.1426	45
50	0.17795	0.01602	1704.8	1704.8	18.05	1065.3	1083.4	0.0361	2.0901	2.1262	50
60	0.2561	0.01603	1207.6	1207.6	28.06	1059.7	1087.7	0.0555	2.0391	2.0946	60
70	0.3629	0.01605	868.3	868.4	38.05	1054.0	1092.1	0.0745	1.9900	2.0645	70
80	0.5068	0.01607	633.3	633.3	48.04	1048.4	1096.4	0.0932	1.9426	2.0359	80
90	0.6981	0.01610	468.1	468.1	58.02	1042.7	1100.8	0.1115	1.8970	2.0086	90
100	0.9492	0.01613	350.4	350.4	68.00	1037.1	1105.1	0.1295	1.8530	1.9825	100
110	1.2750	0.01617	265.4	265.4	77.98	1031.4	1109.3	0.1472	1.8105	1.9577	110
120	1.6927	0.01620	203.25	203.26	87.97	1025.6	1113.6	0.1646	1.7693	1.9339	120
130	2.2230	0.01625	157.32	157.33	97.96	1019.8	1117.8	0.1817	1.7295	1.9112	130
140	2.8892	0.01629	122.98	123.00	107.95	1014.0	1122.0	0.1985	1.6910	1.8895	140
150	3.718	0.01634	97.05	97.07	117.95	1008.2	1126.1	0.2150	1.6536	1.8686	150
160	4.741	0.01640	77.27	77.29	127.96	1002.2	1130.2	0.2313	1.6174	1.8487	160
170	5.993	0.01645	62.04	62.06	137.97	996.2	1134.2	0.2473	1.5822	1.8295	170
180	7.511	0.01651	50.21	50.22	148.00	990.2	1138.2	0.2631	1.5480	1.8111	180
190	9.340	0.01657	40.94	40.96	158.04	984.1	1142.1	0.2787	1.5148	1.7934	190
200	11.526	0.01664	33.62	33.64	168.09	977.9	1146.0	0.2940	1.4824	1.7764	200
210	14.123	0.01671	27.80	27.82	178.15	971.6	1149.7	0.3091	1.4509	1.7600	210
212	14.696	0.01672	26.78	26.80	180.17	970.3	1150.5	0.3121	1.4447	1.7568	212
220	17.186	0.01678	23.13	23.15	188.23	965.2	1153.4	0.3241	1.4201	1.7442	220
230	20.779	0.01685	19.364	19.381	198.33	958.7	1157.1	0.3388	1.3902	1.7290	230
240	24.968	0.01693	16.304	16.321	208.45	952.1	1160.6	0.3533	1.3609	1.7142	240
250	29.825	0.01701	13.802	13.819	218.59	945.4	1164.0	0.3677	1.3323	1.7000	250
260	35.427	0.01709	11.745	11.762	228.76	938.6	1167.4	0.3819	1.3043	1.6862	260
270	41.856	0.01718	10.042	10.060	238.95	931.7	1170.6	0.3960	1.2769	1.6729	270
280	49.200	0.01726	8.627	8.644	249.17	924.6	1173.8	0.4098	1.2501	1.6599	280
290	57.550	0.01736	7.443	7.460	259.4	917.4	1176.8	0.4236	1.2238	1.6473	290
300	67.005	0.01745	6.448	6.466	269.7	910.0	1179.7	0.4372	1.1979	1.6351	300
310	77.67	0.01755	5.609	5.626	280.0	902.5	1182.5	0.4506	1.1726	1.6232	310
320	89.64	0.01766	4.896	4.914	290.4	894.8	1185.2	0.4640	1.1477	1.6116	320
340	117.99	0.01787	3.770	3.788	311.3	878.8	1190.1	0.4902	1.0990	1.5892	340
360	153.01	0.01811	2.939	2.957	332.3	862.1	1194.4	0.5161	1.0517	1.5678	360
380	195.73	0.01836	2.317	2.335	353.6	844.5	1198.0	0.5416	1.0057	1.5473	380
400	247.26	0.01864	1.8444	1.8630	375.1	825.9	1201.0	0.5667	0.9607	1.5274	400
420	308.78	0.01894	1.4808	1.4997	396.9	806.2	1203.1	0.5915	0.9165	1.5080	420
440	381.54	0.01926	1.1976	1.2169	419.0	785.4	1204.4	0.6161	0.8729	1.4890	440
460	466.9	0.0196	0.9746	0.9942	441.5	763.2	1204.8	0.6405	0.8299	1.4704	460
480	566.2	0.0200	0.7972	0.8172	464.5	739.6	1204.1	0.6648	0.7871	1.4518	480
500	680.9	0.0204	0.6545	0.6749	487.9	714.3	1202.2	0.6890	0.7443	1.4333	500
520	812.5	0.0209	0.5386	0.5596	512.0	687.0	1199.0	0.7133	0.7013	1.4146	520
540	962.8	0.0215	0.4437	0.4651	536.8	657.5	1194.3	0.7378	0.6577	1.3954	540
560	1133.4	0.0221	0.3651	0.3871	562.4	625.3	1187.7	0.7625	0.6132	1.3757	560
580	1326.2	0.0228	0.2994	0.3222	589.1	589.9	1179.0	0.7876	0.5673	1.3550	580
600	1543.2	0.0236	0.2438	0.2675	617.1	550.6	1167.7	0.8134	0.5196	1.3330	600
620	1786.9	0.0247	0.1962	0.2208	646.9	506.3	1153.2	0.8403	0.4689	1.3092	620
640	2059.9	0.0260	0.1543	0.1802	679.1	454.6	1133.7	0.8686	0.4134	1.2821	640
660	2365.7	0.0277	0.1166	0.1443	714.9	392.1	1107.0	0.8995	0.3502	1.2498	660
680	2708.6	0.0304	0.0808	0.1112	758.5	310.1	1068.5	0.9365	0.2720	1.2086	680
700	3094.3	0.0366	0.0386	0.0752	822.4	172.7	995.2	0.9901	0.1490	1.1390	700
705.5	3208.2	0.0508	0	0.0508	906.0	0	906.0	1.0612	0	1.0612	705.5

TABLE A.2 PROPERTIES OF SATURATED STEAM AND SATURATED WATER (TEMPERATURE)

Press. psia	Temp F	Volume, ft³/lb Water v_f	Volume, ft³/lb Evap v_{fg}	Volume, ft³/lb Steam v_g	Enthalpy, Btu/lb Water h_f	Enthalpy, Btu/lb Evap h_{fg}	Enthalpy, Btu/lb Steam h_g	Entropy, Btu/lb x F Water s_f	Entropy, Btu/lb x F Evap s_{fg}	Entropy, Btu/lb x F Steam s_g	Energy, Btu/lb Water u_f	Energy, Btu/lb Steam u_g	Press. psia
0.0886	32.018	0.01602	3302.4	3302.4	0.00	1075.5	1075.5	0	2.1872	2.1872	0	1021.3	0.0886
0.10	35.023	0.01602	2945.5	2945.5	3.03	1073.8	1076.8	0.0061	2.1705	2.1766	3.03	1022.3	0.10
0.15	45.453	0.01602	2004.7	2004.7	13.50	1067.9	1081.4	0.0271	2.1140	2.1411	13.50	1025.7	0.15
0.20	53.160	0.01603	1526.3	1526.3	21.22	1063.5	1084.7	0.0422	2.0738	2.1160	21.22	1028.3	0.20
0.30	64.484	0.01604	1039.7	1039.7	32.54	1057.1	1089.7	0.0641	2.0168	2.0809	32.54	1032.0	0.30
0.40	72.869	0.01606	792.0	792.1	40.92	1052.4	1093.3	0.0799	1.9762	2.0562	40.92	1034.7	0.40
0.5	79.586	0.01607	641.5	641.5	47.62	1048.6	1096.3	0.0925	1.9446	2.0370	47.62	1036.9	0.5
0.6	85.218	0.01609	540.0	540.1	53.25	1045.5	1098.7	0.1028	1.9186	2.0215	53.24	1038.7	0.6
0.7	90.09	0.01610	466.93	466.94	58.10	1042.7	1100.8	0.3	1.8966	2.0083	58.10	1040.3	[illegible]
0.8	94.38	0.01611	411.67	411.69	62.39	1040.3	1102.6	0.1117	1.8775	1.9970	62.39	1041.7	0.8
0.9	98.24	0.01612	368.41	368.43	66.24	1038.1	1104.3	0.1264	1.8606	1.9870	66.24	1042.9	0.9
1.0	101.74	0.01614	333.59	333.60	69.73	1036.1	1105.8	0.1326	1.8455	1.9781	69.73	1044.1	1.0
2.0	126.07	0.01623	173.74	173.76	94.03	1022.1	1116.2	0.1750	1.7450	1.9200	94.03	1051.8	2.0
3.0	141.47	0.01630	118.71	118.73	109.42	1013.2	1122.6	0.2009	1.6854	1.8864	109.41	1056.7	3.0
4.0	152.96	0.01636	90.63	90.64	120.92	1006.4	1127.3	0.2199	1.6428	1.8626	120.90	1060.2	4.0
5.0	162.24	0.01641	73.515	73.53	130.20	1000.9	1131.1	0.2349	1.6094	1.8443	130.18	1063.1	5.0
6.0	170.05	0.01645	61.967	61.98	138.03	996.2	1134.2	0.2474	1.5820	1.8294	138.01	1065.4	6.0
7.0	176.84	0.01649	53.634	53.65	144.83	992.1	1136.9	0.2581	1.5587	1.8168	144.81	1067.4	7.0
8.0	182.86	0.01653	47.328	47.35	150.87	988.5	1139.3	0.2676	1.5384	1.8060	150.84	1069.2	8.0
9.0	188.27	0.01656	42.385	42.40	156.30	985.1	1141.4	0.2760	1.5204	1.7964	156.28	1070.8	9.0
10	193.21	0.01659	38.404	38.42	161.26	982.1	1143.3	0.2836	1.5043	1.7879	161.23	1072.3	10
14.696	212.00	0.01672	26.782	26.80	180.17	970.3	1150.5	0.3121	1.4447	1.7568	180.12	1077.6	14.696
15	213.03	0.01673	26.274	26.29	181.21	969.7	1150.9	0.3137	1.4415	1.7552	181.16	1077.9	15
20	227.96	0.01683	20.070	20.087	196.27	960.1	1156.3	0.3358	1.3962	1.7320	196.21	1082.0	20
30	250.34	0.01701	13.7266	13.744	218.9	945.2	1164.1	0.3682	1.3313	1.6995	218.6	1087.9	30
40	267.25	0.01715	10.4794	10.497	236.1	933.6	1169.8	0.3921	1.2844	1.6765	236.0	1092.1	40
50	281.02	0.01727	8.4967	8.514	250.2	923.9	1174.1	0.4112	1.2474	1.6586	250.1	1095.3	50
60	292.71	0.01738	7.1562	7.174	262.2	915.4	1177.6	0.4273	1.2167	1.6440	262.0	1098.0	60
70	302.93	0.01748	6.1875	6.205	272.7	907.8	1180.6	0.4411	1.1905	1.6316	272.5	1100.2	70
80	312.04	0.01757	5.4536	5.471	282.1	900.9	1183.1	0.4534	1.1675	1.6208	281.9	1102.1	80
90	320.28	0.01766	4.8777	4.895	290.7	894.6	1185.3	0.4643	1.1470	1.6113	290.4	1103.7	90
100	327.82	0.01774	4.4133	4.431	298.5	888.6	1187.2	0.4743	1.1284	1.6027	298.2	1105.2	100
120	341.27	0.01789	3.7097	3.728	312.6	877.8	1190.4	0.4919	1.0960	1.5879	312.2	1107.6	120
140	353.04	0.01803	3.2010	3.219	325.0	868.0	1193.0	0.5071	1.0681	1.5752	324.5	1109.6	140
160	363.55	0.01815	2.8155	2.834	336.1	859.0	1195.1	0.5206	1.0435	1.5641	335.5	1111.2	160
180	373.08	0.01827	2.5129	2.531	346.2	850.7	1196.9	0.5328	1.0215	1.5543	345.6	1112.5	180
200	381.80	0.01839	2.2689	2.287	355.5	842.8	1198.3	0.5438	1.0016	1.5454	354.8	1113.7	200
250	400.97	0.01865	1.8245	1.8432	376.1	825.0	1201.1	0.5679	0.9585	1.5264	375.3	1115.8	250
300	417.35	0.01889	1.5238	1.5427	394.0	808.9	1202.9	0.5882	0.9223	1.5105	392.9	1117.2	300
350	431.73	0.01913	1.3064	1.3255	409.8	794.2	1204.0	0.6059	0.8909	1.4968	408.6	1118.1	350
400	444.60	0.0193	1.14162	1.1610	424.2	780.4	1204.6	0.6217	0.8630	1.4847	422.7	1118.7	400
450	456.28	0.0195	1.01224	1.0318	437.3	767.5	1204.8	0.6360	0.8378	1.4738	435.7	1118.9	450
500	467.01	0.0198	0.90787	0.9276	449.5	755.1	1204.7	0.6490	0.8148	1.4639	447.7	1118.8	500
550	476.94	0.0199	0.82183	0.8418	460.9	743.3	1204.3	0.6611	0.7936	1.4547	458.9	1118.6	550
600	486.20	0.0201	0.74962	0.7698	471.7	732.0	1203.7	0.6723	0.7738	1.4461	469.5	1118.2	600
700	503.08	0.0205	0.63505	0.6556	491.6	710.2	1201.8	0.6928	0.7377	1.4304	488.9	1116.9	700
800	518.21	0.0209	0.54809	0.5690	509.8	689.6	1199.4	0.7111	0.7051	1.4163	506.7	1115.2	800
900	531.95	0.0212	0.47968	0.5009	526.7	669.7	1196.4	0.7279	0.6753	1.4032	523.2	1113.0	900
1000	544.58	0.0216	0.42436	0.4460	542.6	650.4	1192.9	0.7434	0.6476	1.3910	538.6	1110.4	1000
1100	556.28	0.0220	0.37863	0.4006	557.5	631.5	1189.1	0.7578	0.6216	1.3794	553.1	1107.5	1100
1200	567.19	0.0223	0.34013	0.3625	571.9	613.0	1184.8	0.7714	0.5969	1.3683	566.9	1104.3	1200
1300	577.42	0.0227	0.30722	0.3299	585.6	594.6	1180.2	0.7843	0.5733	1.3577	580.1	1100.9	1300
1400	587.07	0.0231	0.27871	0.3018	598.8	576.5	1175.3	0.7966	0.5507	1.3474	592.9	1097.1	1400
1500	596.20	0.0235	0.25372	0.2772	611.7	558.4	1170.1	0.8085	0.5288	1.3373	605.2	1093.1	1500
2000	635.80	0.0257	0.16256	0.1883	672.1	466.2	1138.3	0.8625	0.4256	1.2881	662.6	1068.6	2000
2500	668.11	0.0286	0.10209	0.1307	731.7	361.6	1093.3	0.9139	0.3206	1.2345	718.5	1032.9	2500
3000	695.33	0.0343	0.05073	0.0850	801.8	218.4	1020.3	0.9728	0.1891	1.1619	782.8	973.1	3000
3208.2	705.47	0.0508	0	0.0508	906.0	0	906.0	1.0612	0	1.0612	875.9	875.9	3208.2

TABLE A.3 PROPERTIES OF SATURATED STEAM AND SATURATED WATER (PRESSURE)

Abs press. lb/sq in. (sat. temp)		Temperature, F 100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500
1	v	0.0161	392.5	452.3	511.9	571.5	631.1	690.7								
	h	68.00	1150.2	1195.7	1241.8	1288.6	1336.1	1384.5								
(101.74)	s	0.1295	2.0509	2.1152	2.1722	2.2237	2.2708	2.3144								
5	v	0.0161	78.14	90.24	102.74	114.21	126.15	138.08	150.01	161.94	173.86	185.78	197.70	209.62	221.53	233.45
	h	68.01	1148.6	1194.8	1241.3	1288.2	1335.9	1384.3	1433.6	1483.7	1534.7	1585.7	1639.6	1693.3	1748.0	1803.5
(162.24)	s	0.1795	1.8716	1.9369	1.9943	2.0460	2.0932	2.1369	2.1776	2.2159	2.2521	2.2866	2.3194	2.3509	2.3811	2.4101
10	v	0.0161	38.84	44.93	51.03	57.04	63.03	69.00	74.98	80.94	86.91	92.87	98.84	104.80	110.76	116.72
	h	68.02	1146.6	1193.7	1240.6	1287.8	1335.5	1384.0	1433.4	1483.5	1534.6	1586.6	1639.5	1693.3	1747.9	1803.4
(193.21)	s	0.1295	1.7928	1.8593	1.9173	1.9692	2.0166	2.0603	2.1011	2.1394	2.1757	2.2101	2.2430	2.2744	2.3046	2.3337
15	v	0.0161	0.0166	29.899	33.963	37.985	41.986	45.978	49.964	53.946	57.926	61.905	65.882	69.858	73.833	77.807
	h	68.04	168.09	1192.5	1239.9	1287.3	1335.2	1383.8	1433.2	1483.4	1534.5	1586.5	1639.4	1693.2	1747.8	1803.4
(213.03)	s	0.1295	0.2940	1.8134	1.8720	1.9242	1.9717	2.0155	2.0563	2.0946	2.1309	2.1653	2.1982	2.2297	2.2599	2.2890
20	v	0.0161	0.0166	22.356	25.428	28.457	31.466	34.465	37.458	40.447	43.435	46.420	49.405	52.388	55.370	58.352
	h	68.05	168.11	1191.4	1239.2	1286.9	1334.9	1383.5	1432.9	1483.2	1534.3	1586.3	1639.3	1693.1	1747.8	1803.3
(227.96)	s	0.1295	0.2940	1.7805	1.8397	1.8921	1.9397	1.9836	2.0244	2.0628	2.0991	2.1336	2.1665	2.1979	2.2282	2.2572
40	v	0.0161	0.0166	11.036	12.624	14.165	15.685	17.195	18.699	20.199	21.697	23.194	24.689	26.183	27.676	29.168
	h	68.10	168.15	1186.6	1236.4	1285.0	1333.6	1382.5	1432.1	1482.5	1533.7	1585.8	1638.8	1992.7	1747.5	1803.0
(267.25)	s	0.1295	0.2940	1.6992	1.7608	1.8143	1.8624	1.9065	1.9476	1.9860	2.0224	2.0569	2.0899	2.1224	2.1516	2.1807
60	v	0.0161	0.0156	7.257	8.354	9.400	10.425	11.438	12.446	13.450	14.452	15.452	16.450	17.448	18.445	19.441
	h	68.15	168.20	1181.6	1233.5	1283.2	1332.3	1381.5	1431.3	1481.8	1533.2	1585.3	1638.4	1692.4	1747.1	1802.8
(292.71)	s	0.1295	0.2939	1.6492	1.7134	1.7681	1.8168	1.8612	1.9024	1.9410	1.9774	2.0120	2.0450	2.0765	2.1068	2.1359
80	v	0.0161	0.0166	0.0175	6.218	7.018	7.794	8.560	9.319	10.075	10.829	11.581	12.331	13.081	13.829	14.577
	h	68.21	168.24	269.74	1230.5	1281.3	1330.9	1380.5	1430.5	1481.1	1532.6	1584.9	1638.0	1692.0	1746.8	1802.5
(312.04)	s	0.1295	0.2939	0.4371	1.6790	1.7349	1.7842	1.8289	1.8702	1.9089	1.9454	1.9800	2.0131	2.0446	2.0750	2.1041
100	v	0.0161	0.0166	0.0175	4.935	5.588	6.216	6.833	7.443	8.050	8.655	9.258	9.860	10.460	11.060	11.659
	h	68.26	168.29	269.77	1227.4	1279.3	1329.6	1379.5	1429.7	1480.4	1532.0	1584.4	1637.6	1691.6	1746.5	1802.2
(327.82)	s	0.1295	0.2939	0.4371	1.6516	1.7088	1.7586	1.8036	1.8451	1.8839	1.9205	1.9552	1.9883	2.0199	2.0502	2.0794
120	v	0.0161	0.0166	0.0175	4.0786	4.6341	5.1637	5.6831	6.1929	6.7006	7.2060	7.7096	8.2119	8.7130	9.2134	9.7130
	h	68.31	168.33	269.81	1224.1	1277.4	1328.1	1378.4	1428.8	1479.8	1531.4	1583.9	1637.1	1691.3	1746.2	1802.0
(341.27)	s	0.1295	0.2939	0.4371	1.6286	1.6872	1.7376	1.7829	1.8246	1.8635	1.9001	1.9349	1.9680	1.9996	2.0300	2.0592
140	v	0.0161	0.0166	0.0175	3.4661	3.9526	4.4119	4.8585	5.2995	5.7364	6.1709	6.6036	7.0349	7.4652	7.8946	8.3233
	h	68.37	168.38	269.85	1220.8	1275.3	1326.8	1377.4	1428.0	1479.1	1530.8	1583.4	1636.7	1690.9	1745.9	1801.7
(353.04)	s	0.1295	0.2939	0.4370	1.6085	1.6686	1.7196	1.7652	1.8071	1.8461	1.8828	1.9176	1.9508	1.9825	2.0129	2.0421
160	v	0.0161	0.0166	0.0175	3.0060	3.4413	3.8480	4.2420	4.6295	5.0132	5.3945	5.7741	6.1522	6.5293	6.9055	7.2811
	h	68.42	168.42	269.89	1217.4	1273.3	1325.4	1376.4	1427.2	1478.4	1530.3	1582.9	1636.3	1690.5	1745.6	1801.4
(363.55)	s	0.1294	0.2938	0.4370	1.5906	1.6522	1.7039	1.7499	1.7919	1.8310	1.8678	1.9027	1.9359	1.9676	1.9980	2.0273
180	v	0.0161	0.0166	0.0174	2.6474	3.0433	3.4093	3.7621	4.1084	4.4505	4.7907	5.1289	5.4657	5.8014	6.1363	6.4704
	h	68.47	168.47	269.92	1213.8	1271.2	1324.0	1375.3	1426.3	1477.7	1529.7	1582.4	1635.9	1690.2	1745.3	1801.2
(373.08)	s	0.1294	0.2938	0.4370	1.5743	1.6376	1.6900	1.7362	1.7784	1.8176	1.8545	1.8894	1.9227	1.9545	1.9849	2.0142
200	v	0.0161	0.0166	0.0174	2.3598	2.7247	3.0583	3.3783	3.6915	4.0008	4.3077	4.6128	4.9165	5.2191	5.5209	5.8219
	h	68.52	168.51	269.96	1210.1	1269.0	1322.6	1374.3	1425.5	1477.0	1529.1	1581.9	1635.4	1689.8	1745.0	1800.9
(381.80)	s	0.1294	0.2938	0.4359	1.5593	1.6242	1.6776	1.7239	1.7663	1.8057	1.8426	1.8776	1.9109	1.9427	1.9732	2.0025
250	v	0.0161	0.0166	0.0174	0.0186	2.1504	2.4662	2.6872	2.9410	3.1909	3.4382	3.6837	3.9278	4.1709	4.4131	4.6546
	h	68.66	168.63	270.05	375.10	1263.5	1319.0	1371.6	1423.4	1475.3	1527.6	1580.6	1634.4	1688.9	1744.2	1800.2
(400.97)	s	0.1294	0.2937	0.4368	0.5667	1.5951	1.6502	1.6976	1.7405	1.7801	1.8173	1.8524	1.8858	1.9177	1.9482	1.9776
300	v	0.0161	0.0166	0.0174	0.0186	1.7665	2.0044	2.2263	2.4407	2.6509	2.6585	3.0643	3.2688	3.4721	3.6746	3.876
	h	68.79	168.74	270.14	375.15	1257.7	1315.2	1368.9	1421.3	1473.6	1526.2	1579.4	1633.3	1688.0	1743.4	1799.
(417.35)	s	0.1294	0.2937	0.4367	0.5665	1.5703	1.6274	1.6758	1.7192	1.7591	1.7964	1.8317	1.8652	1.8972	1.9278	1.957
350	v	0.0161	0.0166	0.0174	0.0186	1.4913	1.7028	1.8970	2.0332	2.2652	2.4445	2.6219	2.7980	2.9730	3.1471	3.320
	h	68.92	168.85	270.21	375.21	1251.5	1311.4	1366.2	1419.2	1471.8	1524.7	1578.2	1632.3	1687.1	1742.6	1798.
(431.73)	s	0.1293	0.2936	0.4367	0.5664	1.5483	1.6077	1.6571	1.7009	1.7411	1.7787	1.8141	1.8477	1.8799	1.9105	1.940
400	v	0.0161	0.0166	0.0174	0.0162	1.2841	1.4763	1.6499	1.8151	1.9759	2.1339	2.2901	2.4450	2.5987	2.7515	2.903
	h	69.05	168.97	270.33	375.27	1245.1	1307.4	1363.4	1417.0	1470.1	1523.3	1576.9	1631.2	1686.2	1741.9	1798.
(444.60)	s	0.1293	0.2935	0.4365	0.5663	1.5282	1.5901	1.6406	1.6850	1.7255	1.7632	1.7988	1.8325	1.8647	1.8955	1.925
500	v	0.0161	0.0166	0.0174	0.0186	0.9919	1.1584	1.3037	1.4397	1.5708	1.6992	1.8256	1.9507	2.0746	2.1977	2.320
	h	69.32	169.19	270.51	375.38	1231.2	1299.1	1357.7	1412.7	1466.6	1520.3	1574.4	1629.1	1684.4	1740.3	1796.
(467.01)	s	0.1292	0.2934	0.4364	0.5660	1.4921	1.5595	1.6123	1.6578	1.6990	1.7371	1.7730	1.8069	1.8393	1.8702	1.899

TABLE A.4 PROPERTIES OF SUPERHEATED STEAM AND COMPRESSED WATER (TEMPERATURE AND PRESSURE)

Abs press. lb/sq in. (sat. temp)		Temperature, F 100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500
600	v	0.0161	0.0166	0.0174	0.0186	0.7944	0.9456	1.0726	1.1892	1.3008	1.4093	1.5160	1.6211	1.7252	1.8284	1.9309
	h	69.58	169.42	270.70	375.49	1215.9	1290.3	1351.8	1408.3	1463.0	1517.4	1571.9	1627.0	1682.6	1738.8	1795.6
(486.20)	s	0.1292	0.2933	0.4362	0.5657	1.4590	1.5329	1.5844	1.6351	1.6769	1.7155	1.7517	1.7859	1.8184	1.8494	1.8792
700	v	0.0161	0.0166	0.0174	0.0186	0.0204	0.7928	0.9072	1.0102	1.1078	1.2023	1.2948	1.3858	1.4757	1.5647	1.6530
	h	69.04	169.65	270.89	375.61	487.93	1281.0	1345.6	1403.7	1459.4	1514.4	1569.4	1624.8	1680.7	1737.2	1794.3
(503.08)	s	0.1291	0.2932	0.4360	0.5655	0.6889	1.5090	1.5673	1.6154	1.6580	1.6970	1.7335	1.7679	1.8005	1.8318	1.8617
800	v	0.0161	0.0166	0.0174	0.0186	0.0204	0.6774	0.7828	0.8759	0.9631	1.0470	1.1289	1.2093	1.2835	1.3669	1.4446
	h	70.11	169.88	271.07	375.73	487.88	1271.1	1339.2	1399.1	1455.8	1511.4	1566.9	1622.7	1678.9	1735.0	1792.9
(518.2.)	s	0.1290	0.2930	0.4358	0.5652	0.6885	1.4869	1.5484	1.5980	1.6413	1.6807	1.7175	1.7522	1.7851	1.8164	1.8464
900	v	0.0161	0.0166	0.0174	0.0186	0.0204	0.5869	0.6858	0.7713	0.8504	0.9262	0.9998	1.0720	1.1430	1.2131	1.2825
	h	70.37	170.10	271.26	375.84	487.83	1260.6	1332.7	1394.4	1452.2	1508.5	1564.4	1620.6	1677.1	1734.1	1791.6
(531.95)	s	0.1290	0.2929	0.4357	0.5649	0.6881	1.4659	1.5311	1.5822	1.6263	1.6662	1.7033	1.7382	1.7713	1.8028	1.8329
1000	v	0.0161	0.0166	0.0174	0.0186	0.0204	0.5137	0.6080	0.6875	0.7603	0.8295	0.8966	0.9622	1.0266	1.0901	1.1529
	h	70.63	170.33	271.44	375.96	487.79	1249.3	1325.9	1389.6	1448.5	1504.4	1561.9	1618.4	1675.3	1732.5	1790.3
(544.58)	s	0.1289	0.2928	0.4355	0.5647	0.6876	1.4457	1.5149	1.5677	1.6126	1.6530	1.6905	1.7256	1.7589	1.7905	1.8207
1100	v	0.0161	0.0166	0.0174	0.0185	0.0203	0.4531	0.5440	0.6188	0.6865	0.7505	0.8121	0.8723	0.9313	0.9894	1.0468
	h	70.90	170.56	271.63	376.08	487.75	1237.3	1318.8	1384.7	1444.7	1502.4	1559.4	1616.3	1673.5	1731.0	1789.0
(556.28)	s	0.1289	0.2927	0.4353	0.5644	0.6872	1.4259	1.4996	1.5542	1.6000	1.6410	1.6787	1.7141	1.7475	1.7793	1.8097
1200	v	0.0161	0.0166	0.0174	0.0185	0.0203	0.4016	0.4905	0.5615	0.6250	0.6845	0.7418	0.7974	0.8519	0.9055	0.9584
	h	71.16	170.78	271.82	376.20	487.72	1224.2	1311.5	1379.7	1440.9	1449.4	1556.9	1614.2	1671.6	1729.4	1787.6
(567.19)	s	0.1288	0.2926	0.4351	0.5642	0.6868	1.4061	1.4851	1.5415	1.5883	1.6298	1.6679	1.7035	1.7371	1.7691	1.7996
1400	v	0.0161	0.0166	0.0174	0.0185	0.0203	0.3176	0.4059	0.4712	0.5282	0.5809	0.6311	0.6798	0.7272	0.7737	0.8195
	h	71.68	171.24	272.19	376.44	487.65	1194.1	1296.1	1369.3	1433.2	1493.2	1551.8	1609.9	1668.0	1726.3	1785.0
(587.07)	s	0.1287	0.2923	0.4348	0.5636	0.6859	1.3652	1.4575	1.5182	1.5670	1.6096	1.6484	1.6845	1.7185	1.7508	1.7815
1600	v	0.0161	0.0166	0.0173	0.0185	0.0202	0.0236	0.3415	0.4032	0.4555	0.5031	0.5482	0.5915	0.6336	0.6748	0.7153
	h	72.21	171.69	272.57	376.69	487.60	616.77	1279.4	1358.5	1425.2	1486.9	1546.6	1605.6	1664.3	1723.2	1782.3
(604.87)	s	0.1286	0.2921	0.4344	0.5631	0.6851	0.8129	1.4312	1.4968	1.5478	1.5916	1.6312	1.6678	1.7022	1.7344	1.7657
1800	v	0.0160	0.0165	0.0173	0.0185	0.0202	0.0235	0.2906	0.3500	0.3988	0.4426	0.4836	0.5229	0.5609	0.5980	0.6343
	h	72.73	172.15	272.95	376.93	487.56	615.58	1261.1	1347.2	1417.1	1480.6	1541.1	1601.2	1660.7	1720.1	1779.7
(621.02)	s	0.1284	0.2918	0.4341	0.5626	0.6843	0.8109	1.4054	1.4768	1.5302	1.5753	1.6156	1.6528	1.6876	1.7204	1.7516
2000	v	0.0160	0.0165	0.0173	0.0184	0.0201	0.0233	0.2488	0.3072	0.3534	0.3942	0.4320	0.4680	0.5027	0.5365	0.5695
	h	73.26	172.60	273.32	377.19	487.53	614.48	1240.9	1353.4	1408.7	1447.1	1536.2	1596.9	1657.0	1717.0	1777.1
(635.80)	s	0.1283	0.2916	0.4337	0.5621	0.6834	0.8091	1.3794	1.4578	1.5138	1.5603	1.6014	1.6391	1.6743	1.7075	1.7389
2500	v	0.0160	0.0165	0.0173	0.0184	0.0200	0.0230	0.1681	0.2293	0.2712	0.3068	0.3390	0.3692	0.3980	0.4259	0.4529
	h	74.57	173.74	274.27	377.82	487.50	612.08	1176.7	1303.4	1386.7	1457.5	1522.9	1585.9	1647.8	1709.2	1770.4
(668.11)	s	0.1280	0.2910	0.4329	0.5609	0.6815	0.8048	1.3076	1.4129	1.4766	1.5269	1.5703	1.6094	1.6456	1.6796	1.7116
3000	v	0.0160	0.0165	0.0172	0.0183	0.0200	0.0228	0.0982	0.1759	0.2161	0.2484	0.2770	0.3033	0.3282	0.3522	0.3753
	h	75.83	174.88	275.22	378.47	487.52	610.08	1060.5	1267.0	1363.2	1440.2	1500.4	1574.8	1635.5	1701.4	1761.8
(695.33)	s	0.1277	0.2904	0.4320	0.5597	0.6796	0.8009	1.1966	1.3692	1.4429	1.4976	1.5434	1.5841	1.6214	1.6561	1.6888
3200	v	0.0160	0.0165	0.0172	0.0183	0.0199	0.0227	0.0335	0.1588	0.1987	0.2301	0.2576	0.2827	0.3065	0.3291	0.3510
	h	76.4	175.3	275.6	378.7	487.5	609.4	800.8	1250.9	1353.4	1433.1	1503.8	1570.3	1634.8	1698.3	1761.2
(705.08)	s	0.1276	0.2902	0.4317	0.5592	0.6788	0.7994	0.9708	1.3515	1.4300	1.4866	1.5335	1.5749	1.6126	1.6477	1.6806
3500	v	0.0160	0.0164	0.0172	0.0183	0.0199	0.0225	0.0307	0.1364	0.1764	0.2066	0.2326	0.2563	0.2784	0.2995	0.3199
	h	77.2	176.0	276.2	379.1	487.6	608.4	779.4	1224.6	1338.2	1422.2	1495.5	1563.3	1629.2	1693.6	1757.2
	s	0.1274	0.2899	0.4312	0.5585	0.6777	0.7973	0.9508	1.3242	1.4112	1.4709	1.5194	1.5618	1.6002	1.6358	1.6691
4000	v	0.0159	0.0164	0.0172	0.0182	0.0198	0.0223	0.0287	0.1052	0.1463	0.1752	0.1994	0.2210	0.2411	0.2601	0.2783
	h	78.5	177.2	277.1	379.8	487.7	606.5	763.0	1174.3	1311.6	1403.0	1481.3	1552.2	1619.8	1685.7	1750.6
	s	0.1271	0.2893	0.4304	0.5573	0.6760	0.7940	0.9343	1.2754	1.3807	1.4461	1.4976	1.5417	1.5812	1.6177	1.6516
5000	v	0.0159	0.0164	0.0171	0.0181	0.0196	0.0219	0.0268	0.0591	0.1038	0.1312	0.1529	0.1718	0.1690	0.2050	0.220
	h	81.1	179.5	279.1	381.2	488.1	604.6	746.0	1042.9	1252.9	1364.6	1452.1	1529.1	1600.9	1670.0	1737.4
	s	0.1265	0.2861	0.4267	0.5550	0.6726	0.7880	0.9153	1.1593	1.3207	1.4001	1.4582	1.5061	1.5481	1.5863	1.6216
6000	v	0.0159	0.0163	0.0170	[illegible]	0.0195	0.0216	0.0256	0.0397	0.0757	0.1020	0.1221	0.1391	0.1544	0.1684	0.181
	h	83.7	181.7	281.0	382.7	488.6	602.9	736.1	945.1	1168.8	1323.6	1422.3	1505.9	1582.0	1654.2	1724.
	s	0.1258	0.2670	0.4271	0.5528	0.6693	0.7826	0.9026	1.0176	1.2615	1.3574	1.4229	1.4748	1.5194	1.5593	1596.
7000	v	0.0158	0.0163	0.0170	0.0180	0.0193	0.0213	0.0248	0.0334	0.0573	0.0316	0.1004	0.1160	0.1298	0.1424	0.154
	h	86.2	184.4	283.0	384.2	489.3	601.7	729.3	901.8	1124.9	1281.7	1392.2	1482.6	1563.1	1639.6	1711.
	s	0.1252	0.2859	0.4256	0.5507	0.6363	[illegible]	0.8926	1.0350	1.2055	1.3171	1.3904	1.4406	1.4938	[illegible]	1.573

TABLE A.4 PROPERTIES OF SUPERHEATED STEAM AND COMPRESSED WATER (TEMPERATURE AND PRESSURE) (CONTINUED)

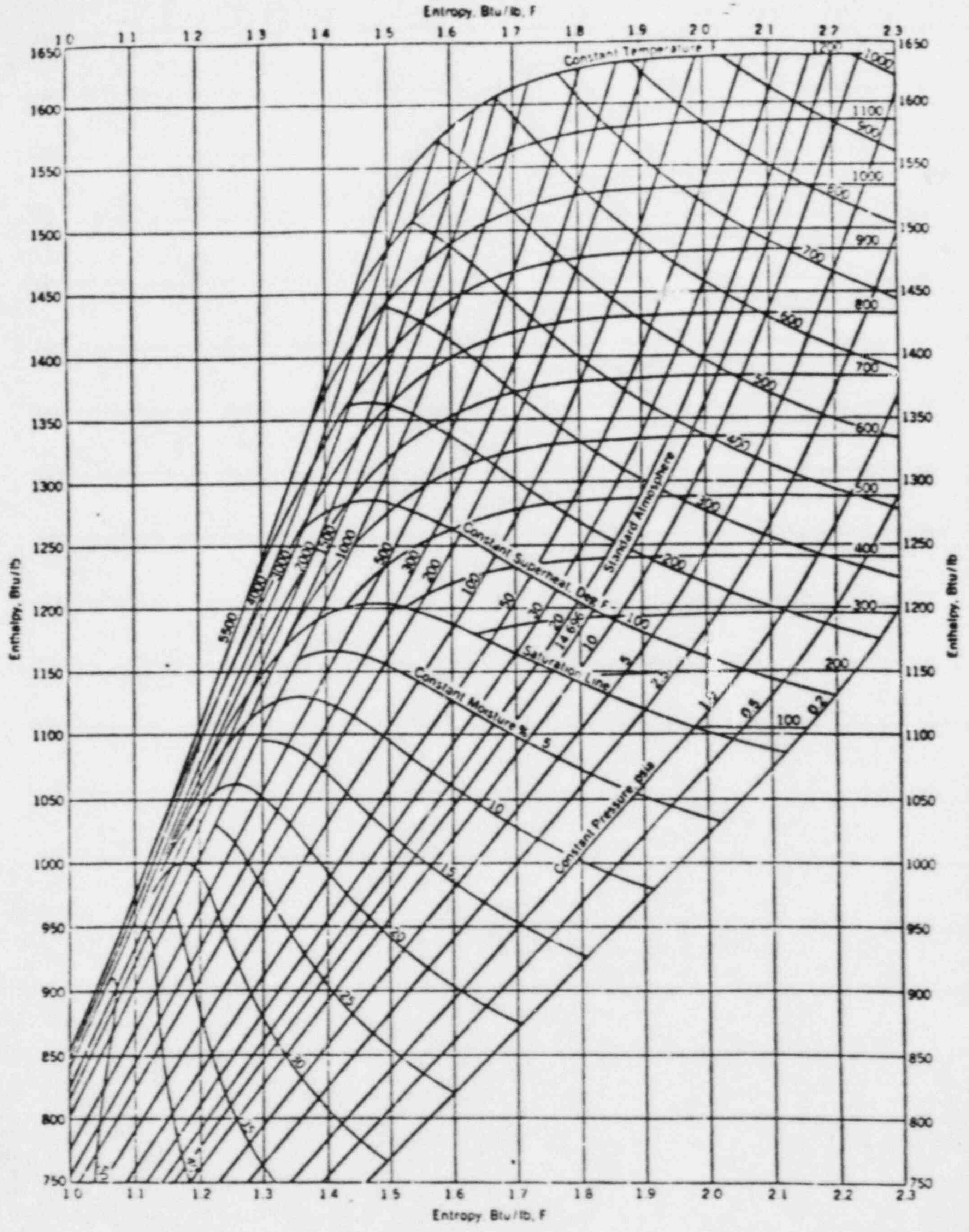


FIGURE A.5 MOLLIER ENTHALPY-ENTROPY DIAGRAM

PROPERTIES OF WATER

Density ρ
(lbs/ft^2)

Temp (°F)	Saturated Liquid	PSIA 1000	2000	2100	2200	2300	2400	2500	3000
32	62.414	62.637	62.846	62.867	62.888	62.909	62.93	62.951	63.056
50	62.38	62.55	62.75	62.774	62.798	62.822	62.846	62.87	62.99
100	61.989	62.185	62.371	62.390	62.409	62.427	62.446	62.465	62.559
200	60.118	60.314	60.511	60.53	60.549	60.568	60.587	60.606	60.702
300	57.310	57.537	57.767	57.79	57.813	57.836	57.859	57.882	57.998
400	53.651	53.903	54.218	54.249	54.28	54.311	54.342	54.373	54.529
410	53.248	53.475	53.79	53.825	53.86	53.89	53.925	53.95	54.11
420	52.798	53.025	53.36	53.40	53.425	53.46	53.50	53.53	53.69
430	52.356	52.575	52.925	52.95	52.99	53.02	53.065	53.09	53.265
440	51.921	52.125	52.42	52.45	52.475	52.51	52.54	52.56	52.275
450	51.546	51.66	52.025	52.065	52.10	52.14	52.175	52.21	52.41
460	51.020	51.175	51.56	51.61	51.64	51.68	51.725	51.76	51.96
470	50.505	50.70	51.1	51.14	51.175	51.22	51.25	51.30	51.50
480	50.00	50.20	50.62	50.66	50.7	50.74	50.78	50.825	51.035
490	49.505	49.685	50.13	50.175	50.22	50.265	50.31	50.35	50 575
500	48.943	49.097	49.618	49.666	49.714	49.762	49.81	49.858	50.098
510	48.31	48.51	49.05	49.101	49.152	49.203	49.254	49.305	49.56
520	47.85	47.91	48.46	48.515	48.57	48.625	48.68	48.735	49.01
530	47.17	47.29	47.86	47.919	47.978	48.037	48.096	48.155	48.45
540	46.51		47.23	47.296	47.362	47.428	47.494	47.56	47.89
550	45.87		46.59	46.658	46.726	46.794	46.862	46.93	47.27
560	45.25		45.92	45.994	46.068	46.142	46.216	46.29	46.66
570	44.64		45.22	45.30	45.38	45.46	45.54	45.62	46.02
580	43.86		44.50	44.586	44.672	44.758	44.844	44.93	45.36
590	43.10		43.73	43.825	43.92	44.015	44.11	44.205	44.68
600	42.321		42.913	43.017	43.122	43.226	43.33	43.434	43.956
610	41.49		41.96	42.08	42.196	42.314	42.432	42.55	43.14
620	40.552		40.950	41.083	41.217	41.35	41.483	41.616	42.283
630	39.53								41.44
640	38.491								40.388
650	37.31								39.26
660	36.01								38.008
670	34.48								36.52
680	32.744								34.638
690	30.516								32.144

TABLE A.6 PROPERTIES OF WATER, DENSITY

ANSWERS -- SURRY 1&2 -85/04/08-DOUGLAS, W.

ANSWER 5.01 (1.00)

d

REFERENCE
Surry, TS 3.12-16 and 17

ANSWER 5.02 (1.00)

d

REFERENCE
NUS, Nuclear Energy Training - Reactor Operation, p. 10.5-1 - 4
Westinghouse Reactor Physics, pp. I-5.77 - 79

ANSWER 5.03 (1.00)

a

REFERENCE
VEGP, Training Text, Vol. 9, p. 21-47
Westinghouse Reactor Physics, pp. I-3.17 & 19

ANSWER 5.04 (1.00)

d

REFERENCE
NUS, Nuclear Energy Training - Plant Performance, pp. 10-1.8 & 9

ANSWER 5.05 (1.00)

c

REFERENCE
General Physics, HT & FF, Section 3.2

ANSWER 5.06 (1.00)

b (1.0)

REFERENCE
NUS, Nuclear Energy Training, Module 3, Unit 6
Westinghouse Reactor Physics, Sect. 3, Neutron Kinetics

ANSWER 5.07 (1.00)

b

REFERENCE
General Physics, HT & FF, p. 328

ANSWER 5.08 (1.00)

d

REFERENCE
Westinghouse Reactor Physics, pp. I-5.63 - 76

ANSWER 5.09 (1.00)

b

REFERENCE
General Physics, HT & FF, p. 229

ANSWER 5.10 (1.00)

a

REFERENCE
Westinghouse Reactor Physics, p. I-5.22

ANSWER 5.11 (1.00)

b

REFERENCE
Westinghouse Reactor Physics, pp. I-5.12, 25, and 27

ANSWER 5.12 (1.00)

d

REFERENCE
Westinghouse Reactor Physics, pp. I-5.36 - 50

ANSWER 5.13 (1.00)

c

REFERENCE
Steam Tables

ANSWER 5.14 (1.00)

a

REFERENCE
General Physics, HT & FF, pp. 319, 320, 322, & 327

ANSWER 5.15 (1.00)

b

REFERENCE
Westinghouse Reactor Physics, pp. I-5.26 & 27

ANSWER 5.16 (1.00)

d

REFERENCE
Westinghouse Reactor Physics, Section I-5, MTC and Power Defect

ANSWER 5.17 (1.00)

c

REFERENCE
Westinghouse Reactor Physics, pp. I-5.2 - 16

ANSWER 5.18 (1.00)

b

REFERENCE
Westinghouse Reactor Physics, pp. I-4.19 - 24

ANSWER 5.19 (1.00)

a

REFERENCE
Westinghouse Reactor Physics, pp. I-2.30 & I-3.10 and General Physics, HT&FF, p. 228

ANSWER 5.20 (1.00)

b

REFERENCE
Westinghouse Reactor Physics, p. I-5.40

ANSWER 5.21 (1.00)

d

REFERENCE
Surry, TS 3.12-2 and 12

ANSWER 5.22 (1.00)

a. FALSE (0.5)
b. TRUE (0.5)

REFERENCE
General Physics, HT&FF, pp. 155 and 320 and Subcooled Liquid Density Tables

ANSWER 5.23 (.50)

TRUE (0.5)

REFERENCE
Westinghouse Reactor Physics, p. I-2.19

ANSWER 5.24 (1.50)

a. LARGER (0.5)
b. LONGER (0.5)
c. CONSTANT (0.5)

REFERENCE
Westinghouse Reactor Physics, Section I-4

ANSWER 5.25 (2.00)

a. REMAIN THE SAME (0.5)
b. DECREASE (0.5)
c. INCREASE (0.5)
d. DECREASE (0.5)

REFERENCE
Steam Tables

ANSWER 5.26 (2.00)

a. INCREASE (0.5)
b. INCREASE (0.5)
c. DECREASE (0.5)
d. DECREASE (0.5)

REFERENCE
General Physics, HTFF - Fluid Flow Applications for Systems and Components

ANSWER 5.27 (2.00)

a. Power Defect (-0.25 for power coefficient)
b. Reactivity
c. Latent Heat of Vaporization (condensation)
d. Convection

REFERENCE
NUS, Nuclear Energy Training - Reactor Operation and Plant Performance
Westinghouse Reactor Physics, pp. I-5.26 and I-3.2 and General Physics, HT&FF, pp. 38 and 99

ANSWER 6.01 (1.00)

b

REFERENCE
Surry, Instrumentation Manual, Sect. 8, p. 8.2

ANSWER 6.02 (1.00)

b

REFERENCE
Surry, S/G Auxiliary Feed System, pp. 1 & 9

ANSWER 6.03 (1.00)

d

REFERENCE
Surry, Emergency Power and Distribution, pp. 4-8, 14, and 24

ANSWER 6.04 (1.00)

c

REFERENCE
Surry, Instrumentation Manual, Process Protection Instrumentation, p. 4

ANSWER 6.05 (1.00)

b

REFERENCE
Surry, Instrumentation Manual, Process Protection Instrumentation, pp. 1 and 2

ANSWER 6.06 (1.00)

X Question Deleted

REFERENCE
Surry, Instrumentation Manual, PNL-REM (Remote Monitoring Panel), p. 5

ANSWER 6.07 (1.00)

a

REFERENCE
Surry, Instrumentation Manual, Core Cooling Monitor System, p. 1

ANSWER 6.08 (1.00)

c

REFERENCE
Nuclear Power Plant Instrumentation Systems Manual, Ch. 4

ANSWER 6.09 (1.00)

a

REFERENCE
FNP, Excore Nuclear Instrumentation System, Fig. 7
Surry, Instrumentation Manual, Excore Instrumentation System, p. IV-1.29

ANSWER 6.10 (1.00)

c

REFERENCE
VEGP, Training Text, Volume 6, pp. 6a-7, 8, & 19
Surry, Instrumention Manual, Rod Control System, pp. 9, 13, and 14

ANSWER 6.11 (1.00)

d

REFERENCE
Nuclear Power Plant Instrumentation Systems Handbook, Ch. 2

ANSWER 6.12 (1.00)

a

REFERENCE
Surry, Vital Bus Distribution, pp. 6-1 - 5

ANSWER 6.13 (1.00)

b

REFERENCE
Surry, S/G Blowdown System, pp. 1 - 4

ANSWER 6.14 (1.00)

b

REFERENCE
Surry, Spent Fuel Pit System, pp. 2 - 5

ANSWER 6.15 (1.00)

d

REFERENCE
Surry, Turbine Protection, pp. 7-1, 4, 6, and 7

ANSWER 6.16 (1.00)

a

REFERENCE
Surry, Emergency Power and Distribution, pp. 4-2, 16, and 17

ANSWER 6.17 (1.00)

d

REFERENCE
Surry, Instrumentation Manual, Steam Dump Control System, pp. 2 - 5

ANSWER 6.18 (1.00)

a

REFERENCE
Surry, Consequence Limiting Safeguards, pp. 1, 10, and 11

ANSWER 6.19 (1.00)

b

REFERENCE
Surry, Fuel Handling System, pp. 4, 5, 10, and 13

ANSWER 6.20 (1.00)

c

REFERENCE
Surry, Instrumentation Manual, Control and Protection, Attachment I and p. 2

ANSWER 6.21 (1.00)

a

REFERENCE
Surry, Containment Spray SD, pp. 2 and 9

ANSWER 6.22 (1.00)

a. TRUE
b. FALSE

REFERENCE
FNP, Residual Heat Removal System, p. 4
Surry, Residual Heat Removal System, pp. 1 & 8

ANSWER 6.23 (1.00)

a. YES (0.25)
b. NO (0.25)
c. YES (0.25)
d. YES (0.25)

REFERENCE
FNP, Health Physics and Radiation Protection Lesson Plans, pp. 41-46
William J. Price, Nuclear Radiation Detection, pp. 43 - 46, 77, 138, and 196

ANSWER 6.24 (1.00)

a. DECREASE (0.25)
b. REMAIN THE SAME (0.25)
c. ~~REMAIN THE SAME~~ DECREASE (0.25)
d. REMAIN THE SAME (0.25)

REFERENCE
FNP, Tavg, Delta T, and Pimp, pp. 16 & 17
Surry, ~~Instrumentation Manual, Sect. 9, p. IV-5.5~~
TS, Section 2

ANSWER 6.25 (2.00)

(0.2 pts each)
a. CLOSE
b. CLOSE
c. OPEN
d. CLOSE
e. NO (CLOSE ON HIGH STEAM FLOW SI)
f. OPEN
g. CLOSE
h. CLOSE
i. NO
j. ~~OPEN~~ NO

REFERENCE
Surry, Safety Injection System, pp. 27 - 29a

ANSWER 6.26 (1.50)

(0.3 pts each)
a. MODULATED
b. CLOSED
c. OPEN
d. CLOSED
e. MODULATED

REFERENCE
Surry, Chemical and Volume Control System, p. 52

ANSWER 6.27 (1.50)

1. c (0.3)
2. d (0.3)
3. d **or F** (0.3)
4. e (0.3)
5. a (0.3)

REFERENCE
Surry, Reactor Coolant System, pp. 1 & 2 and Fig. 2-1

ANSWER 6.28 (1.00)

(0.2 pts each)
1. e
2. e
3. b
4. e
5. f

REFERENCE
Surry, Instrumentation Manual, Rod Control System, pp. 15 and 16

ANSWER 7.01 (1.00)

c

REFERENCE
10CFR20, Sec. 20.4c

ANSWER 7.02 (1.00)

a

REFERENCE
Surry, Status Trees, F-0.1 - F-0.6

ANSWER 7.03 (1.00)

a

REFERENCE
Surry, EP-1.00, p. 3

ANSWER 7.04 (1.00)

a

REFERENCE
Surry, 1-OP-1.5, p. 3

ANSWER 7.05 (1.00)

c

REFERENCE
Surry, OP-4.1, pp. 4, 6, and 10

ANSWER 7.06 (1.00)

d

ANSWERS -- SURRY 1&2 -85/04/08-DOUGLAS, W.

REFERENCE
Surry, HP Manual, pp. 1.3-1, 1.3-2, 2.1-1, and 2.12-2

ANSWER 7.07 (1.00)

b

REFERENCE
Surry, 1-AP-15, pp. 3 and 4

ANSWER 7.08 (1.00)

d

REFERENCE
Surry, EP-1.01, p. 8

ANSWER 7.09 (1.00)

d

REFERENCE
Surry, EP-4.00, pp. 9, 11, and 12

ANSWER 7.10 (1.00)

b

REFERENCE
Surry, 1-OP-1.1, p. 6

ANSWER 7.11 (1.00)

d

REFERENCE
Surry, 1-AP-4, pp. 5, 7, and 8

ANSWER 7.12 (1.00)

c

REFERENCE
Surry, EP-1.00, Foldout Page

ANSWER 7.13 (1.00)

c

REFERENCE
Surry, 1-OP-1.4, p. 7 and Appendix A

ANSWER 7.14 (1.00)

b

REFERENCE
Surry, EP-2.00, Foldout, p. 16

ANSWER 7.15 (1.00)

c

REFERENCE
Surry, 1-OP-5.2

ANSWER 7.16 (1.00)

a

REFERENCE
Surry, EP-1.00, p. 3

ANSWER 7.17 (1.00)

c

REFERENCE
Surry, ECA-2, p. 10

ANSWER 7.18 (1.00)

b

REFERENCE
Surry, FRP-P.1, p. 14

ANSWER 7.19 (1.00)

b

REFERENCE
Surry, FRP-I.3A, p. 3

ANSWER 7.20 (1.00)

a

REFERENCE
Surry, EP-1.01, p. 4

ANSWER 7.21 (1.00)

d

REFERENCE
Surry, EP-1.02A, p. 6

ANSWER 7.22 (1.00)

a

REFERENCE
Surry, 1-AP-1.4, pp. 3 - 5

ANSWERS -- SURRY 1&2 -85/04/08-DOUGLAS, W.

ANSWER 7.23 (1.00)

a

REFERENCE
Surry, AP 5.1, 5.2, 5.7, and 5.8

ANSWER 7.24 (1.00)

c

REFERENCE
Surry, AP-16, pp. 4 - 6

ANSWER 7.25 (1.00)

X ~~Question Deleted~~ d

REFERENCE
Surry, AP-22, p. 5

ANSWER 7.26 (1.00)

b

REFERENCE
Surry, AP-43, p. 2

ANSWER 7.27 (1.00)

d

REFERENCE
Surry, OP-3.1, p. 5

ANSWER 7.28 (1.00)

a

ANSWERS -- SURRY 1&2 -85/04/08-DOUGLAS, W.

REFERENCE
Surry, HP Manual, p. 1.2-3

ANSWER 7.29 (1.00)

(0.25pts each)
1. e
2. b
3. d
4. b
~~5. b~~ DELETED

REFERENCE
Surry, 1-OP-2.1, pp. 7 - 10

ANSWER 7.30 (1.00)

a. 250 (0.2)
   400 (0.2)
b. 350 (200 on heatup) (0.2)
c. 2 (0.2)
d. 20 (0.2)

REFERENCE
Surry, 1-OP-1C, p. 5 and 1-OP-1.4, pp. 6, 8, and 11

ANSWER 8.01 (1.00)

b

REFERENCE
Surry, TS 3.4-1

ANSWER 8.02 (1.00)

c

REFERENCE
Surry, SEP, p. 5.7

ANSWER 8.03 (1.00)

a

REFERENCE
Surry, TS 3.12-11 and 12

ANSWER 8.04 (1.00)

c

REFERENCE
Surry, TS 3.7-21

ANSWER 8.05 (1.00)

b

REFERENCE
VEGP, Emergency Plan, p. 3-3
Surry, EPIP-3.02, p. 1 and EPIP-3.03, p. 1

ANSWER 8.06 (1.00)

b

REFERENCE
McG, TS, p. 1-1
Surry, TS 1.0-3
Cat, TS, p. 1-1

ANSWER 8.07 (1.00)

b

REFERENCE
Surry, TS 3.12-4 - 6

ANSWER 8.08 (1.00)

b

REFERENCE
Surry, Standing Order No. 6

ANSWER 8.09 (1.00)

c

REFERENCE
Surry, ADM-14, pp. 3 and 4

ANSWER 8.10 (1.00)

b

REFERENCE
Surry, ADM-29.1, p. 23

ANSWER 8.11 (1.00)

b

REFERENCE
Surry, ADM-29.1, p. 24

ANSWER 8.12 (1.00)

c

REFERENCE
Surry, ADM-29.2, pp. 16 & 6 and ADM-29.3, pp. 17 & 18

ANSWER 8.13 (1.00)

d

REFERENCE
Surry, TS 2.3-7

ANSWER 8.14 (1.00)

a

REFERENCE
Surry, TS 3.1-18

ANSWER 8.15 (1.00)

d

REFERENCE
Surry, TS 3.7-18

ANSWER 8.16 (1.00)

b

REFERENCE
Surry, TS 3.21-3

ANSWER 8.17 (1.00)

c

REFERENCE
Surry, TS 6.1-4

ANSWER 8.18 (1.00)

b

REFERENCE
Surry, ADM-60, pp. 16 and 18

ANSWER 8.19 (1.00)

d

REFERENCE
Surry, Emergency Plan, p. 4.2

ANSWER 8.20 (2.00)

a. TRUE (0.5)
b. TRUE (0.5)
c. FALSE (0.5)
d. FALSE (0.5)

REFERENCE
Surry, ADM-29.7, pp. 6, 12, and 14

ANSWER 8.21 (1.00)

a. TRUE
b. TRUE

REFERENCE
Surry, ADM-29.2, pp. 16 and 6

ANSWER 8.22 (1.50)

a. 23 (0.5)
b. 2000 (0.5)
c. 100 (0.5)

REFERENCE
Surry, TS 3.10-3

ANSWER 8.23 (1.00)

1. Its corresponding normal or emergency source is operable, and (0.5)
2. All its redundant components are operable. (0.5)

REFERENCE
Surry, TS 3.0-1

ANSWER 8.24 (1.50)

1. Once per day (0.5)
2. Power change > 10% (0.5)
3. More than 30 inches of rod travel (0.5)

REFERENCE
Surry, TS 3.12-9

ANSWER 8.25 (1.50)

1. Cannot be moved by drive assembly (0.5)
2. Misaligned from bank by > 12 steps (0.5)
3. Drop time excessive (> 1.8 seconds) (Untrippable) (0.5)

REFERENCE
Surry, TS 3.12-8

ANSWER 8.26 (1.00)

(0.25 pts each)
1. Radiation
2. Heat
3. Differential Pressure
4. Potential Oxygen Deficiency

REFERENCE
Surry, ADM-38, p. 3

ANSWER 8.27 (1.50)

1. They do not hide any indicators (0.5)
2. They are dated (0.5)
3. They have name of person posting it on it (0.5)

REFERENCE
Surry, Standing Order # 12

ENCLOSURE 3

MASTER COPY

U. S. NUCLEAR REGULATORY COMMISSION
REACTOR OPERATOR LICENSE EXAMINATION

Reviewed by:

C. Curfman
J. Bailey
H. McCallum
B. Marshell

FACILITY: SURRY 1&2

REACTOR TYPE: PWR-WEC3

DATE ADMINISTERED: 85/04/08

EXAMINER: DICKER, B.

APPLICANT: ____________________

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
30.00	~~25.00~~ 25.105 BNP	________	________	1. PRINCIPLES OF NUCLEAR POWER PLANT OPERATION, THERMODYNAMICS, HEAT TRANSFER AND FLUID FLOW
~~30.00~~ 29.5	~~25.00~~ 24.686 BNP	________	________	2. PLANT DESIGN INCLUDING SAFETY AND EMERGENCY SYSTEMS
30.00	~~25.00~~ 25.105 BNP	________	________	3. INSTRUMENTS AND CONTROLS
30.00	~~25.00~~ 25.105 BNP	________	________	4. PROCEDURES - NORMAL, ABNORMAL, EMERGENCY AND RADIOLOGICAL CONTROL
~~120.00~~ 119.50 BNP	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 1.01 (1.00)

As the core ages, the ratio of PU239 atoms to U235 atoms increases. For the same reactivity addition this changing ratio causes:

a. reactor period to decrease.

b. the Void Coefficient becomes less negative.

c. Moderator Temperature Coefficient to become less negative.

d. the delayed neutron fraction to increase.

QUESTION 1.02 (1.00)

The -1/3 DPM SUR following a reactor trip is caused by:

a. The decay constant of the longest-lived group of delayed neutrons.
b. The ability of U-235 to fission with source neutrons.
c. The amount of negative reactivity added on a trip being greater than the Shutdown Margin.
d. The doppler effect adding positive reactivity due to the temperature decrease following a trip.

QUESTION 1.03 (1.00)

Approximately how many hours does it take for Xenon to reach 100% equilibrium concentration after the reactor is brought to full power from a Xenon free condition?

a. 20-40 hours

b. 40-60 hours

c. 60-80 hours

d. 80-100 hours

QUESTION 1.04 (1.00)

If the reactor tripped after a 30 day run at 50% power, BOL, what would be the peak reactivity value of Xenon in PCM?

a. ~ 2060

b. ~ 2470

c. ~ 4110

d. ~ 4520

QUESTION 1.05 (1.00)

As the core ages, delta I at 100% equilibrium Xenon:

a. remains the same.

b. becomes more negative due to more negative MTC.

c. becomes less negative due to samarium.

d. becomes less negative due to redistribution.

QUESTION 1.06 (1.00)

During a steam leak from the main steam header to the atmosphere, a throttling process is created. Which process below will occur?

a. Enthalpy of the steam will decrease.

b. Entropy of the steam will increase.

c. Specific volume of the steam will decrease.

d. Steam temperature will remain the same.

QUESTION 1.07 (1.00)

The reactor is producing 100% rated thermal power at a core delta T of 60 degrees and a mass flow rate of 100% when a blackout occurs. Natural circulation is established and core delta T goes to 40 degrees. If decay heat is 2%, what is the core mass flow rate (in %)?

a. 1.3
b. 2.0
c. 3.0
d. 4.0

QUESTION 1.08 (1.00)

Concerning the behavior of Samarium-149, which one of the following statements is true?

a. Once equilibrium Samarium is established, Samarium reactivity does not change regardless of power level changes.
b. 50% equilibrium Samarium reactivity is equal to 100% equilibrium Samarium reactivity.
c. Samarium is only removed by radioactive decay.
d. Samarium is produced by the decay of Iodine.

QUESTION 1.09 (1.00)

The reactor has been started up on a new core and has achieved 100% power with equilibrium xenon. Boron concentration is at 900 ppm. A reactor trip occurs. Assuming ALL rods trip, what is the approximate shutdown margin immediately after the trip?

a. ~4.5%

b. ~5.5%

c. ~6.5%

d. ~7.5%

QUESTION 1.10 (1.00)

Which of the following is the units of heat flux?

a. watts / cubic centimeter
b. BTU / (hr square ft)
c. Calories / gram
d. kw / ft

QUESTION 1.11 (2.00)

Indicate on your answer sheet whether the following statements are TRUE or FALSE.

a. Pump runout is the term used to describe the condition of a centrifugal pump running with NO volume flow rate. (0.5)

b. If the speed of a centrifugal pump is doubled, the flow rate AND discharge pressure will double. (0.5)

c. If the speed of a positive displacement pump is doubled, the flow rate will double. (0.5)

d. For two centrifugal pumps in SERIES, the combined delivery flow rate is equal to the sum of the individual pump flow rates at the same pump speed. (0.5)

QUESTION 1.12 (1.00)

From the following, choose the event that tends to make the Fuel Temperature Coefficient more negative over core life.

a. Buildup of Pu-240
b. Clad Creep
c. Pellet Swell
d. Lower Effective Fuel Temperature

QUESTION 1.13 (1.00)

With reactor power at $1*10^{-10}$ amps, a SUR of .7 DPM is established. Using $1*10^{-6}$ amps as the POAH, how long will it take the power to reach the POAH?

a. 2.8 minutes

b. 5.7 minutes

c. 28.81 minutes

d. 4.29 minutes

QUESTION 1.14 (1.00)

Which statement below correctly describes what happens to Beta-bar-eff as the core ages?

a. Its value decreases causing the reactor to respond faster to reactivity changes.

b. Its value decreases causing the reactor to respond slower to reactivity changes.

c. Its value increases causing the reactor to respond slower to reactivity changes.

d. Its value increases causing the reactor to respond faster to reactivity changes.

QUESTION 1.15 (1.00)

At EOL, the components of the power defect in increasing order of significance (reactivity value) are:

a. Void, Doppler, MTC
b. Void, MTC, Doppler
c. MTC, Void, Doppler
d. MTC, Doppler, Xenon

QUESTION 1.16 (1.00)

A reactor is presently shutdown with a Keff of .90 and source range counts at 10 cps. The operator inserts reactivity until the source range reads 65 cps. What is the new Keff?

a. 0.90

b. 0.95

c. 0.98

d. Insufficient data to calculate

QUESTION 1.17 (1.00)

Consider the following statements concerning unit efficiency at a steady state power level. Using only the parameter change indicated, choose the MOST CORRECT statement.

a. Unit efficiency increases if one low pressure feedwater heater is bypassed.

b. Unit efficiency increases if ABSOLUTE condenser pressure changes from 1 psia to 1.25 psia.

c. Unit efficiency remains the same if total Steam Generator Blowdown flowrate is changed from 35 to 40 gpm.

d. Unit efficiency increases if hotwell temperature rises from 90-100 F.

QUESTION 1.18 (1.00)

Which of the following nuclear parameters are ALL contributors to differential rod worth?

a. Local gamma flux, peak gamma flux, slowing down length, thermal diffusion length.
b. Local neutron flux, peak neutron flux, slowing down length, thermal diffusion length.
c. Local gamma flux, average gamma flux, slowing down length, thermal diffusion length.
d. Local neutron flux, average neutron flux, slowing down length, thermal diffusion length.

QUESTION 1.19 (1.00)

Which of the following statements concerning the power defect is correct?

a. The power defect is the difference between the measured power coefficient and the predicted power coefficient.
b. The power defect increases the rod worth requirements necessary to maintain the desired shutdown margin following a reactor trip.
c. Because of the higher boron concentration, the power defect is more negative at beginning of core life.
d. The power defect necessitates the use of a ramped Tavg program to maintain an adequate Reactor Coolant System subcooling margin.

QUESTION 1.20 (1.00)

The reactor is operating at 90% of rated thermal power with Tavg on program and equilibrium xenon. The secondary instruments indicate steam pressure at 805 psig. The computer shows feedwater temperature at 440 F. Negate any energy added by the RCP's and assume all liquids at saturation. What is the mass flowrate in the secondary system.

a. $3.21*10^{6}$ lbm/hr
b. $10.96*10^{6}$ lbm/hr
c. $12.17*10^{6}$ lbm/hr
d. $3.57*10^{6}$ lbm/hr

QUESTION 1.21 (1.00)

The Moderator Temperature Coefficient (MTC) varies with certain plant conditions. Concerning these variations, which of the following is correct?

a. The MTC becomes more negative as boron concentration is increased.
b. The MTC causes axial flux distribution to be tilted towards the top of the core at BOL.
c. The MTC varies as temperature changes because of the non-linear density changes of water as temperature changes.
d. The MTC is not permitted by Technical Specifications to be positive in any plant operating modes.

QUESTION 1.22 (1.00)

Which of the following statements describe the relationship between integral and differential rod worth?

a. Integral rod worth (at any location) is the slope of the differential rod worth curve at that location.
b. Integral rod worth (at any location) is the total area under the differential rod worth curve from the end of the rod to that location.
c. Integral rod worth (at any location) is the square of the differential rod worth at that location.
d. There is no relationship between integral and differential rod worth.

QUESTION 1.23 (1.00)

Answer TRUE or FALSE to the following.

a. During a RCS heatup, as temperature gets higher, it will take a smaller letdown flow rate to maintain a constant pressurizer level. (0.5)
b. Increasing condensate depression (subcooling) will cause BOTH a decrease in plant efficiency AND an increase in condensate (hotwell) pump available NPSH. (0.5)

QUESTION 1.24 (2.00)

The reactor is operating at 30% power when one RCP trips. Assuming no reactor trip or turbine load change occur, indicate whether the following parameters will INCREASE, DECREASE, or REMAIN THE SAME.

a. Flow in operating reactor coolant loops (0.5)
b. Core delta T (0.5)
c. Reactor vessel delta P (0.5)
d. Operating loop steam generator pressure (0.5)

QUESTION 1.25 (1.00)

During a reactor startup, critical data was inadvertently taken two decades below the required Intermediate Range (IR) level. The critical data was then taken at the proper IR level. Would the critical rod position at the proper IR level be HIGHER THAN, THE SAME AS, or LOWER THAN the critical rod position taken two decades below the proper IR level?

QUESTION 1.26 (2.00)

For the following definitions, give the term that is defined.

a. The amount of reactivity that is needed to go from hot zero power to hot full power. (0.5)
b. The fractional change in neutron population per generation. (0.5)
c. The amount of heat required to change 1 lbm of water into 1 lbm of steam. (0.5)
d. Heat transfer due to relative motion between two bodies. (0.5)

QUESTION 1.27 (1.00)

Steam exiting the HP turbine is at 785 psig, 90% quality. Steam entering the LP turbine is superheated to 100 F. What is the enthalpy change of the steam?

a. 85 BTU/lbm

b. 140 BTU/lbm

c. 154 BTU/lbm

d. 705 BTU/lbm

End of Category 1

QUESTION 2.01 (1.00)

The orifices in the Reactor Head Vent lines are installed to ...

a. drop the pressure downstream to allow the isolation valves to close rapidly in an emergency.

b. limit the flow to the capacity of a single CVCS charging pump.

c. limit flow to prevent lifting a control rod due to the delta P at the rod penetration.

d. limit the flow errosion to the upstream valve to an acceptable value.

QUESTION 2.02 (1.00)

The Primary Makeup Recirculation pumps will start and run with normal switch alignment when of the following occurs?

a. Low tank temperature and/or high conductivity.

b. Increasing makeup flow and/or lo-lo pressure.

c. High conductivity and/or increasing makeup flow.

d. Lo-lo pressure and/or loss of power.

QUESTION 2.03 (1.00)

Which of the following water sources can NOT supply a direct source of water to the auxiliary feed pumps.

a. The 110,000 gallon Condensate Storage Tank (1-CN-TK-1).
b. The 300,000 gallon Condensate Storage Tank (1-CN-TK-2).
c. The 100,000 gallon Condensate Storage Tank (1-CN-TK-3).
d. The Site Fire Main.

QUESTION 2.04 (1.00)

The operator is alerted to a Low Pressurizer bypass spray flow by:

a. Low temperature alarm.

b. Spray valve position switch.

c. Low flow alarm.

d. Bypass valve position switch.

QUESTION 2.05 (1.00)

The Safety Injection to recirculation mode transfer for the RHR system can be bypassed by means of control board switches only during what condition.

a. Safety Injection with no spray required.

b. Hot standby.

c. Safety Injection termination.

d. Refueling.

QUESTION 2.06 (1.00)

Which of the following flowpaths correctly describes how power is normally supplied to Vital Bus Distribution Panel 1-II?

a. 480 VAC from vital bus, rectified to 120 VDC, inverted to 120 VAC, and supplied to Panel 1-II.
b. 480 VAC from vital bus, transformed to 120 VAC, and supplied to Panel 1-II.
c. 120 VDC from battery, inverted to 120 VAC, and supplied to Panel 1-II.
d. 120 VAC from Panel 1-IV is supplied to Panel 1-II.

QUESTION 2.07 (2.00)

Indicate TRUE or FALSE for each of the following:

a. Both outside recirculation spray subsystems are started by a Consequences Limiting Safeguards initiation after a 2 minute time delay. (0.5)

b. The Service Water from each cooler of the outside recirculation spray subsystem is monitored for radiation and will automaticly shutdown should leakage be indicated. (0.5)

c. The outside recirculation pumps can be stopped by placing their control switch to 'LOCKOUT' with a CLS initiation but the inside recirculation system can not be stopped by placing its control switch to 'LOCKOUT' until the CLS is reset. (0.5)

d. To ensure the NPSH of the outside recirculation spray pumps is met, an orifice was installed to limit flow to 3000 gpm. (0.5)

QUESTION 2.08 (1.00)

Which of the following statements concerning the Consequence Limiting Safeguards (CLS) is correct?

a. Upon Hi-Hi initiation, containment pressure must decrease below the Hi reset point before Hi-Hi can be reset.
b. Both the Hi and Hi-Hi relays must be energized to initiate CLS actuation.
c. The CLS system uses eight pressure transducers: 4 for the Hi subsystem and 4 for the Hi-Hi subsystem.
d. To manually initiate the Hi subsystem, both trip pushbuttons on the control board must be simultaneously depressed.

QUESTION 2.09 (1.00)

Which of the following sets of pressurizer pressure setpoints is correct?

a. 2335 psig - PORV opens
   2350 psig - High Pressure alarm
   2370 psig - High Pressure trip
b. 2210 psig - B/U heaters on
   2100 psig - Low Pressure alarm
   1875 psig - Low Pressure trip
c. 2370 psig - High Pressure trip
   1875 psig - Low Pressure trip
   1715 psig - Low Pressure SI
d. 2335 psig - PORV opens
   2100 psig - PORV block
   2000 psig - Low Pressure alarm

QUESTION 2.10 (1.00)

The Component Cooling Water system in conjunction with the RHR system is designed to reduce the RCS temperature to _____ F within _____ hours after shutdown based on a river water temperature of 95 F.

a. 350, 16

b. 120, 24

c. 250, 18

d. 140, 20

QUESTION 2.11 (1.00)

The backup air supply for the pressurizer PORV's was designed to...

a. allow for 30 min. of normal operation with no operator action.

b. permit 10 min. of continuous cycling with no operator action.

c. provide five cycles of each PORV in a 20 min. period with no operator action.

d. allow for 1 hour of operation with no restoration of normal air or operator action.

QUESTION 2.12 (1.00)

Indicate whether the Over Power Delta Temperature trip setpoint will INCREASE, DECREASE, or REMAIN THE SAME for the following parameter changes. Consider each separately.

a. Increasing Tavg
b. Tavg less than rated power Tavg
c. Delta I becoming more negative
d. Pressurizer Presure decreasing

QUESTION 2.13 (2.00)

For the following components, indicate whether they will receive an OPEN, CLOSE, or NO signal upon safety injection initiation.

a. Control room supply and exhaust ducts
b. Main feed bypass valves
c. SI accumulator discharge isolation valves
d. Normal charging header isolation valves
e. Main steam isolation valves
f. RWST to Lo Hd SI pump suction valves
g. Seal water return isolation valve
h. Component cooling isolation valve from RHRS
i. Component cooling isolation from letdown heat exchanger
j. Steam supply valves to turbine-driven feed pump

QUESTION 2.14 (1.00)

Which of the following is NOT a reason for the S/G level program?

a. Minimize cooldown of RCS following a steam break.
b. Maintain constant mass in S/G at all power levels to facilitate chemistry control.
c. Minimize containment pressure following a steam break.
d. Minimize inadvertent low low S/G level reactor trips following a load reduction.

QUESTION 2.15 (1.00)

The Component Cooling Water Radiation Monitors use a scintillation type detector and causes the overflow vent to _______________ on an alarm.

a. divert to RCDT

b. divert to Waste Holdup Tank

c. close

d. divert to floor drains

QUESTION 2.16 (1.00)

Match the following reactor conditions in Column A with the rod speed in Column B.

COLUMN A	COLUMN B
1. Withdrawing Shutdown Bank B in Shutdown Bank B position	a. 0 spm
2. Withdrawing Bank B in Control Bank B position	b. 8 spm
3. Automatic insertion with Tavg > Tref by 2 degrees	c. 16 spm
4. Withdrawing Bank B in Manual position	d. 24 spm
5. Automatic insertion with Tavg > Tref by 5.5 degrees	e. 48 spm
	f. 72 spm

QUESTION 2.17 (1.00)

The 4KV 'STUB BUSSES' supplied from 1H and 1J are de-energized when which of the following condition occurs?

a. bus voltage is reduced by more than 25%.

b. The Safety Injection start of the diesels.

c. The loads supplied by the stub bus where not previously running.

d. #3 diesel is transfered to the Unit 1 side.

QUESTION 2.18 (2.00)

TRUE or FALSE

a. Emergency Diesel #3 will supply the unit on a priority basis with the FIRST start signal, either Undervoltage or Safety Injection. (0.5)

Computer Typo b. Once started on a SI for Unit 1, #3 diesel will not transfer to Unit #)2 if an Undervoltage occurs. (0.5)

c. If #3 diesel is supplying Unit 1 and a SI or CLS occurs on Unit 2 the #3 diesel will automaticly transfer to Unit 2. (0.5)

d. The #3 diesel will supply either the 1H or 2H bus when automaticly started. (0.5)

?

QUESTION 2.19 (1.00)

Reactor Coolant Pump #3 is started during shutdown after a seal replacement. After operating for approximately 20 minutes the following is observed.

1. #1 seal delta P >400#
2. Standpipe low level
3. #1 seal leakoff has increased.

ASSUME:

1. Plant pressure is at 400#
2. Seal injection at 6 gpm.

Which of the following is a probable cause for the abnormal indications?

a. #3 seal failure.

b. VCT pressure is low.

c. #1 seal bypass is open.

d. PRT pressure has increased.

QUESTION 2.20 (1.00)

RCP flywheel is designed to...

a. extend coastdown for bearing protection.

b. minimize flow surges caused by power line fluctuations.

c. provide starting inertia to prevent sudden flow spikes at S/U.

d. extend coastdown for protection of the core.

QUESTION 2.21 (1.00)

Which of the following core parameters does the OT delta T protective circuit prevent exceeding?

a. Power density

b. Departure from Nucleate Boiling

c. Total core power

d. Redistribution

QUESTION 2.22 (1.00)

Which of the turbine trips below is initiated to ensure sufficient cooling for the CLS systems?

a. Main Feedwater pump trip.

b. 4/4 turbine stop valves shut.

c. <18 ft. in the intake canal.

d. 2/3 Steam Generator levels HIGH.

QUESTION 2.23 (1.00)

Which of the following diesel engine/generator shutdowns are enabled during an emergency start of the diesel? More than one answer may be correct.

a. High lube oil temperature

b. High jacket coolant temperature

c. Diesel overspeed.

d. Generator differential current.

e. Generator overcurrent.

f. Negative phase sequence.

g. Diesel low lube oil pressure.

h. Reverse power.

i. Generator ground.

QUESTION 2.24 (1.00)

The 125VDC distribution battery system is sized to carry the required shutdown loads for ______ hours.

a. 1.

b. 2.

c. 4.

d. 5.

QUESTION 2.25 (2.00)

a. How do the pressurizer power operated relief valves (PORV's) prevent overpressurization at low reactor coolant temperature conditions? (0.5)

b. What alerts the operator to the fact that PORV overpressure protection is required? (0.5)

c. What TWO actions must the operator take to provide automatic overpressure protection from the PORV's? (1.0)

QUESTION 2.26 (.50)

TRUE or FALSE

The automatic switchover of the charging pumps from the VCT to the RWST is designed to maintain proper seal injection flow to the RCP's.

End of Category 2

QUESTION 3.01 (2.00)

Match the statement in Column A to the proper Steam Dump mode in Column B.

COLUMN A	COLUMN B
a. Operates Steam Dump with a 5 F deviation (Tavg-Tref).	1. Turbine trip
b. Has two independent operating modes.	2. Steam pressure
c. Controls only two condenser steam dump valves.	3. Load rejection
d. Operates steam dump with no dead band (Tavg-Tref).	4. Tavg

[0.5 each]

QUESTION 3.02 (1.00)

The THREE input signals to the Steam Generator Water Level Control are:

a. Tavg, compensated feed flow, uncompensated steam flow.

b. Feed flow, compensated steam flow, water level error.

c. Compensated feed flow, water level, compensated steam flow.

d. Uncompensated feed flow, compensated steam flow, water level.

QUESTION 3.03 (1.00)

Which of the following is used to create the level programming signal for the Steam Generator Water Level Control System?

a. Average NI power.

b. Auctioneered low NI power.

c. Turbine 1st stage impulse pressure.

d. Auctioneered hi NI power.

QUESTION 3.04 (1.00)

Which of the following statements about temperature detectors is correct?

a. The thermocouple is connected to one leg of a bridge circuit and as the temperature changes the output voltage across the bridge changes.
b. When a thermocouple fails open it will respond in the same manner as an RTD and will indicate a full scale reading on the meter.
c. When a faster responding temperature signal is needed a direct immersion (wet bulb type) RTD is used instead of the thermowell mounted RTD.
d. A RTD is comprised of two wires of dissimilar metals in contact with each other and generates a voltage that is proportional to the temperature difference between the open ends of the wires.

QUESTION 3.05 (1.00)

Which of the following statements describes the signal path from the Source Range detector to the Source Range level meter on the MCB?

a. Detector, Pre Amp, Discriminator, Log Integrator, Meter
b. Detector, Log Integrator, Pulse Shaper, Pulse Counter, Meter
c. Detector, Pre Amp, Log Integrator, Discriminator, Meter
d. Detector, Log Amp, Meter

QUESTION 3.06 (1.00)

Which of the following statements concerning the Power Range Nuclear Instrumentation detectors is correct?

a. Operates in the proportional region of the gas amplification (detector characteristics) curve.
b. Uses inner chamber current to cancel out gamma current in the outer chamber.
c. Uses Boron Trifluoride gas to make it neutron sensitive.
d. Output is calibrated by use of a secondary heat balance.

QUESTION 3.07 (1.00)

Which of the following statements concerning the S/G Blowdown System is correct?

a. The blowdown filters and ion exchangers are bypassed unless the blowdown radiation monitors detect a high blowdown activity.
b. The inside and outside containment trip valves are automatically closed by any signal which automatically starts the auxiliary feed pumps.
c. The normal discharge flow path of the cooled and treated blowdown liquid is to the CW outlet piping from water-boxes A or C.
d. The S/G blowdown lines join together to form a common header upstream of the blowdown coolers.

QUESTION 3.08 (1.00)

Which of the following statements concerning the Steam Dump Control System is correct?

a. The steam dump valves fail open on loss of air.
b. In order to cooldown below 543 degrees, the steam dump mode selector switch must be momentarily taken to "Reset" and returned to "Steam Pressure".
c. When in the Tavg mode, the steam dumps are armed by the reactor trip breakers opening.
d. In the load rejection mode, the steam dump valves may receive a signal to modulate open or a signal to trip open depending upon the magnitude of the error signal.

QUESTION 3.09 (1.50)

Referring to provided Figure 3-1, indicate whether the following valves receive an OPEN, MODULATED, or CLOSED signal for the given makeup mode selector switch position.

a. 114A in AUTO
b. 113B in DILUTE
c. 114B in ALT DILUTE
d. 114B in BORATE
e. 113A in MANUAL

QUESTION 1.01 (1.00)

As the core ages, the ratio of PU239 atoms to U235 atoms increases. For the same reactivity addition this changing ratio causes:

a. reactor period to decrease.

b. the Void Coefficient becomes less negative.

c. Moderator Temperature Coefficient to become less negative.

d. the delayed neutron fraction to increase.

QUESTION 1.02 (1.00)

The -1/3 DPM SUR following a reactor trip is caused by:

a. The decay constant of the longest-lived group of delayed neutrons.
b. The ability of U-235 to fission with source neutrons.
c. The amount of negative reactivity added on a trip being greater than the Shutdown Margin.
d. The doppler effect adding positive reactivity due to the temperature decrease following a trip.

QUESTION 1.03 (1.00)

Approximately how many hours does it take for Xenon to reach 100% equilibrium concentration after the reactor is brought to full power from a Xenon free condition?

a. 20-40 hours

b. 40-60 hours

c. 60-80 hours

d. 80-100 hours

QUESTION 1.04 (1.00)

If the reactor tripped after a 30 day run at 50% power, BOL, what would be the peak reactivity value of Xenon in PCM?

a. ~ 2060

b. ~ 2470

c. ~ 4110

d. ~ 4520

QUESTION 1.05 (1.00)

As the core ages, delta I at 100% equilibrium Xenon:

a. remains the same.

b. becomes more negative due to more negative MTC.

c. becomes less negative due to samarium.

d. becomes less negative due to redistribution.

QUESTION 1.06 (1.00)

During a steam leak from the main steam header to the atmosphere, a throttling process is created. Which process below will occur?

a. Enthalpy of the steam will decrease.

b. Entropy of the steam will increase.

c. Specific volume of the steam will decrease.

d. Steam temperature will remain the same.

QUESTION 1.07 (1.00)

The reactor is producing 100% rated thermal power at a core delta T of 60 degrees and a mass flow rate of 100% when a blackout occurs. Natural circulation is established and core delta T goes to 40 degrees. If decay heat is 2%, what is the core mass flow rate (in %)?

a. 1.3
b. 2.0
c. 3.0
d. 4.0

QUESTION 1.08 (1.00)

Concerning the behavior of Samarium-149, which one of the following statements is true?

a. Once equilibrium Samarium is established, Samarium reactivity does not change regardless of power level changes.
b. 50% equilibrium Samarium reactivity is equal to 100% equilibrium Samarium reactivity.
c. Samarium is only removed by radioactive decay.
d. Samarium is produced by the decay of Iodine.

QUESTION 1.09 (1.00)

The reactor has been started up on a new core and has achieved 100% power with equilibrium Xenon. Boron concentration is at 900 ppm. A reactor trip occurs. Assuming ALL rods trip, what is the approximate shutdown margin immediately after the trip?

a. ~4.5%

b. ~5.5%

c. ~6.5%

d. ~7.5%

QUESTION 1.10 (1.00)

Which of the following is the units of heat flux?

a. watts / cubic centimeter
b. BTU / (hr square ft)
c. Calories / gram
d. kw / ft

QUESTION 1.11 (2.00)

Indicate on your answer sheet whether the following statements are TRUE or FALSE.

a. Pump runout is the term used to describe the condition of a centrifugal pump running with NO volume flow rate. (0.5)

b. If the speed of a centrifugal pump is doubled, the flow rate AND discharge pressure will double. (0.5)

c. If the speed of a positive displacement pump is doubled, the flow rate will double. (0.5)

d. For two centrifugal pumps in SERIES, the combined delivery flow rate is equal to the sum of the individual pump flow rates at the same pump speed. (0.5)

QUESTION 1.12 (1.00)

From the following, choose the event that tends to make the Fuel Temperature Coefficient more negative over core life.

a. Buildup of Pu-240
b. Clad Creep
c. Pellet Swell
d. Lower Effective Fuel Temperature

QUESTION 1.13 (1.00)

With reactor power at $1*10^{-10}$ amps, a SUR of .7 DPM is established. Using $1*10^{-6}$ amps as the POAH, how long will it take the power to reach the POAH?

a. 2.6 minutes

b. 5.7 minutes

c. 28.81 minutes

d. 4.29 minutes

QUESTION 1.14 (1.00)

Which statement below correctly describes what happens to Beta-bar-eff as the core ages?

a. Its value decreases causing the reactor to respond faster to reactivity changes.

b. Its value decreases causing the reactor to respond slower to reactivity changes.

c. Its value increases causing the reactor to respond slower to reactivity changes.

d. Its value increases causing the reactor to respond faster to reactivity changes.

QUESTION 1.15 (1.00)

At BOL, the components of the power defect in increasing order of significance (reactivity value) are:

a. Void, Doppler, MTC
b. Void, MTC, Doppler
c. MTC, Void, Doppler
d. MTC, Doppler, Xenon

QUESTION 1.16 (1.00)

A reactor is presently shutdown with a Keff of .90 and source range counts at 10 cps. The operator inserts reactivity until the source range reads 65 cps. What is the new Keff?

a. 0.90

b. 0.95

c. 0.98

d. Insufficient data to calculate

QUESTION 1.17 (1.00)

Consider the following statements concerning unit efficiency at a steady state power level. Using only the parameter change indicated, choose the MOST CORRECT statement.

a. Unit efficiency increases if one low pressure feedwater heater is bypassed.

b. Unit efficiency increases if ABSOLUTE condenser pressure changes from 1 psia to 1.25 psia.

c. Unit efficiency remains the same if total Steam Generator Blowdown flowrate is changed from 35 to 40 gpm.

d. Unit efficiency increases if hotwell temperature rises from 90-100 F.

QUESTION 1.18 (1.00)

Which of the following nuclear parameters are ALL contributors to differential rod worth?

a. Local gamma flux, peak gamma flux, slowing down length, thermal diffusion length.
b. Local neutron flux, peak neutron flux, slowing down length, thermal diffusion length.
c. Local gamma flux, average gamma flux, slowing down length, thermal diffusion length.
d. Local neutron flux, average neutron flux, slowing down length, thermal diffusion length.

QUESTION 1.19 (1.00)

Which of the following statements concerning the power defect is correct?

a. The power defect is the difference between the measured power coefficient and the predicted power coefficient.
b. The power defect increases the rod worth requirements necessary to maintain the desired shutdown margin following a reactor trip.
c. Because of the higher boron concentration, the power defect is more negative at beginning of core life.
d. The power defect necessitates the use of a ramped Tavg program to maintain an adequate Reactor Coolant System subcooling margin.

QUESTION 1.20 (1.00)

The reactor is operating at 90% of rated thermal power with Tavg on program and equilibrium Xenon. The secondary instruments indicate steam pressure at 805 psig. The computer shows feedwater temperature at 440 F. Negate any energy added by the RCP's and assume all liquids at saturation. What is the mass flowrate in the secondary system.

a. $3.21*10^{6}$ lbm/hr

b. $10.96*10^{6}$ lbm/hr

c. $12.17*10^{6}$ lbm/hr

d. $3.57*10^{6}$ lbm/hr

QUESTION 1.21 (1.00)

The Moderator Temperature Coefficient (MTC) varies with certain plant conditions. Concerning these variations, which of the following is correct?

a. The MTC becomes more negative as boron concentration is increased.
b. The MTC causes axial flux distribution to be tilted towards the top of the core at BOL.
c. The MTC varies as temperature changes because of the non-linear density changes of water as temperature changes.
d. The MTC is not permitted by Technical Specifications to be positive in any plant operating modes.

QUESTION 1.22 (1.00)

Which of the following statements describe the relationship between integral and differential rod worth?

a. Integral rod worth (at any location) is the slope of the differential rod worth curve at that location.
b. Integral rod worth (at any location) is the total area under the differential rod worth curve from the end of the rod to that location.
c. Integral rod worth (at any location) is the square of the differential rod worth at that location.
d. There is no relationship between integral and differential rod worth.

QUESTION 1.23 (1.00)

Answer TRUE or FALSE to the following.

a. During a RCS heatup, as temperature gets higher, it will take a smaller letdown flow rate to maintain a constant pressurizer level. (0.5)
b. Increasing condensate depression (subcooling) will cause BOTH a decrease in plant efficiency AND an increase in condensate (hotwell) pump available NPSH. (0.5)

QUESTION 1.24 (2.00)

The reactor is operating at 30% power when one RCP trips. Assuming no reactor trip or turbine load change occur, indicate whether the following parameters will INCREASE, DECREASE, or REMAIN THE SAME.

a. Flow in operating reactor coolant loops (0.5)
b. Core delta T (0.5)
c. Reactor vessel delta P (0.5)
d. Operating loop steam generator pressure (0.5)

QUESTION 1.25 (1.00)

During a reactor startup, critical data was inadvertently taken two decades below the required Intermediate Range (IR) level. The critical data was then taken at the proper IR level. Would the critical rod position at the proper IR level be HIGHER THAN, THE SAME AS, or LOWER THAN the critical rod position taken two decades below the proper IR level?

QUESTION 1.26 (2.00)

For the following definitions, give the term that is defined.

a. The amount of reactivity that is needed to go from hot zero power to hot full power. (0.5)
b. The fractional change in neutron population per generation. (0.5)
c. The amount of heat required to change 1 lbm of water into 1 lbm of steam. (0.5)
d. Heat transfer due to relative motion between two bodies. (0.5)

QUESTION 1.27 (1.00)

Steam exiting the HP turbine is at 785 psig, 90% quality. Steam entering the LP turbine is superheated to 100 F. What is the enthalpy change of the steam?

a. 85 BTU/lbm

b. 140 BTU/lbm

c. 154 BTU/lbm

d. 705 BTU/lbm

End of Category 1

QUESTION 2.01 (1.00)

The orifices in the Reactor Head Vent lines are installed to ...

a. drop the pressure downstream to allow the isolation valves to close rapidly in an emergency.

b. limit the flow to the capacity of a single CVCS charging pump.

c. limit flow to prevent lifting a control rod due to the delta P at the rcc penetration.

d. limit the flow errosion to the upstream valve to an acceptable value.

QUESTION 2.02 (1.00)

The Primary Makeup Recirculation pumps will start and run with normal switch alignment when of the following occurs?

a. Low tank temperature and/or high conductivity.

b. Increasing makeup flow and/or lo-lo pressure.

c. High conductivity and/or increasing makeup flow.

d. Lo-lo pressure and/or loss of power.

QUESTION 2.03 (1.00)

Which of the following water sources can NOT supply a direct source of water to the auxiliary feed pumps.

a. The 110,000 gallon Condensate Storage Tank (1-CN-TK-1).
b. The 300,000 gallon Condensate Storage Tank (1-CN-TK-2).
c. The 100,000 gallon Condensate Storage Tank (1-CN-TK-3).
d. The Site Fire Main.

QUESTION 2.04 (1.00)

The operator is alerted to a Low Pressurizer bypass spray flow by:

a. Low temperature alarm.

b. Spray valve position switch.

c. Low flow alarm.

d. Bypass valve position switch.

QUESTION 2.05 (1.00)

The Safety Injection to recirculation mode transfer for the RHR system can be bypassed by means of control board switches only during what condition.

a. Safety Injection with no spray required.

b. Hot standby.

c. Safety Injection termination.

d. Refueling.

QUESTION 2.06 (1.00)

Which of the following flowpaths correctly describes how power is normally supplied to Vital Bus Distribution Panel 1-II?

a. 480 VAC from vital bus, rectified to 120 VDC, inverted to 120 VAC, and supplied to Panel 1-II.
b. 480 VAC from vital bus, transformed to 120 VAC, and supplied to Panel 1-II.
c. 120 VDC from battery, inverted to 120 VAC, and supplied to Panel 1-II.
d. 120 VAC from Panel 1-IV is supplied to Panel 1-II.

QUESTION 2.07 (2.00)

Indicate TRUE or FALSE for each of the following:

a. Both outside recirculation spray subsystems are started by a Consequences Limiting Safeguards initiation after a 2 minute time delay. (0.5)

b. The Service Water from each cooler of the outside recirculation spray subsystem is monitored for radiation and will automaticly shutdown should leakage be indicated. (0.5)

c. The outside recirculation pumps can be stopped by placing their control switch to 'LOCKOUT' with a CLS initiation but the inside recirculation system can not be stopped by placing its control switch to 'LOCKOUT' until the CLS is reset. (0.5)

d. To ensure the NPSH of the outside recirculation spray pumps is met, an orifice was installed to limit flow to 3000 gpm. (0.5)

QUESTION 2.08 (1.00)

Which of the following statements concerning the Consequence Limiting Safeguards (CLS) is correct?

a. Upon Hi-Hi initiation, containment pressure must decrease below the Hi reset point before Hi-Hi can be reset.
b. Both the Hi and Hi-Hi relays must be energized to initiate CLS actuation.
c. The CLS system uses eight pressure transducers: 4 for the Hi subsystem and 4 for the Hi-Hi subsystem.
d. To manually initiate the Hi subsystem, both trip pushbuttons on the control board must be simultaneously depressed.

QUESTION 2.09 (1.00)

Which of the following sets of pressurizer pressure setpoints is correct?

a. 2335 psig - PORV opens
   2350 psig - High Pressure alarm
   2370 psig - High Pressure trip
b. 2210 psig - B/U heaters on
   2100 psig - Low Pressure alarm
   1875 psig - Low Pressure trip
c. 2370 psig - High Pressure trip
   1875 psig - Low Pressure trip
   1715 psig - Low Pressure SI
d. 2335 psig - PORV opens
   2100 psig - PORV block
   2000 psig - Low Pressure alarm

QUESTION 2.10 (1.00)

The Component Cooling Water system in conjunction with the RHR system is designed to reduce the RCS temperature to _____ F within _____ hours after shutdown based on a river water temperature of 95 F.

a. 350, 16

b. 120, 24

c. 250, 18

d. 140, 20

QUESTION 2.11 (1.00)

The backup air supply for the pressurizer PORV's was designed to...

a. allow for 30 min. of normal operation with no operator action.

b. permit 10 min. of continuous cycling with no operator action.

c. provide five cycles of each PORV in a 20 min. period with no operator action.

d. allow for 1 hour of operation with no restoration of normal air or operator action.

QUESTION 2.12 (1.00)

Indicate whether the Over Power Delta Temperature trip setpoint will INCREASE, DECREASE, or REMAIN THE SAME for the following parameter changes. Consider each separately.

a. Increasing Tavg
b. Tavg less than rated power Tavg
c. Delta I becoming more negative
d. Pressurizer Presure decreasing

QUESTION 2.13 (2.00)

For the following components, indicate whether they will receive an OPEN, CLOSE, or NO signal upon safety injection initiation.

a. Control room supply and exhaust ducts
b. Main feed bypass valves
c. SI accumulator discharge isolation valves
d. Normal charging header isolation valves
e. Main steam isolation valves
f. RWST to Lo Hd SI pump suction valves
g. Seal water return isolation valve
h. Component cooling isolation valve from RHRS
i. Component cooling isolation from letdown heat exchanger
j. Steam supply valves to turbine-driven feed pump

QUESTION 2.14 (1.00)

Which of the following is NOT a reason for the S/G level program?

a. Minimize cooldown of RCS following a steam break.
b. Maintain constant mass in S/G at all power levels to facilitate chemistry control.
c. Minimize containment pressure following a steam break.
d. Minimize inadvertent low low S/G level reactor trips following a load reduction.

QUESTION 2.15 (1.00)

The Component Cooling Water Radiation Monitors use a scintillation type detector and causes the overflow vent to _______________ on an alarm.

a. divert to RCDT

b. divert to Waste Holdup Tank

c. close

d. divert to floor drains

QUESTION 2.16 (1.00)

Match the following reactor conditions in Column A with the rod speed in Column B.

COLUMN A	COLUMN B
1. Withdrawing Shutdown Bank B in Shutdown Bank B position	a. 0 spm
2. Withdrawing Bank B in Control Bank B position	b. 8 spm
3. Automatic insertion with Tavg > Tref by 2 degrees	c. 16 spm
4. Withdrawing Bank B in Manual position	d. 24 spm
5. Automatic insertion with Tavg > Tref by 5.5 degrees	e. 48 spm
	f. 72 spm

QUESTION 2.17 (1.00)

The 4KV 'STUB BUSSES' supplied from 1H and 1J are de-energized when which of the following condition occurs?

a. Bus voltage is reduced by more than 25%.

b. The Safety Injection start of the diesels.

c. The loads supplied by the stub bus where not previously running.

d. #3 diesel is transfered to the Unit 1 side.

QUESTION 2.18 (2.00)

TRUE or FALSE

a. Emergency Diesel #3 will supply the unit on a priority basis with the FIRST start signal, either Undervoltage or Safety Injection. (0.5)

Computer Typo b. Once started on a SI for Unit 1, #3 diesel will not transfer to Unit #2 if an Undervoltage occurs. (0.5)

c. If #3 diesel is supplying Unit 1 and a SI or CLS occurs on Unit 2 the #3 diesel will automaticly transfer to Unit 2. (0.5)

d. The #3 diesel will supply either the 1H or 2H bus when automaticly started. (0.5)

?

QUESTION 2.19 (1.00)

Reactor Coolant Pump #3 is started during shutdown after a seal replacement. After operating for approximately 20 minutes the following is observed.

1. #1 seal delta P >400#
2. Standpipe low level
3. #1 seal leakoff has increased.

ASSUME:

1. Plant pressure is at 400#
2. Seal injection at 6 gpm.

Which of the following is a probable cause for the abnormal indications?

a. #3 seal failure.

b. VCT pressure is low.

c. #1 seal bypass is open.

d. RCDT pressure has increased.

QUESTION 2.20 (1.00)

RCP flywheel is designed to...

a. extend coastdown for bearing protection.

b. minimize flow surges caused by power line fluctuations.

c. provide starting inertia to prevent sudden flow spikes at S/U.

d. extend coastdown for protection of the core.

QUESTION 2.21 (1.00)

Which of the following core parameters does the OT delta T protective circuit prevent exceeding?

a. Power density

b. Departure from Nucleate Boiling

c. Total core power

d. Redistribution

QUESTION 2.22 (1.00)

Which of the turbine trips below is initiated to ensure sufficient cooling for the CLS systems?

a. Main Feedwater pump trip.

b. 4/4 turbine stop valves shut.

c. <18 ft. in the intake canal.

d. 2/3 Steam Generator levels HIGH.

QUESTION 2.23 (1.00)

Which of the following diesel engine/generator shutdowns are enabled during an emergency start of the diesel? More than one answer may be correct.

a. High lube oil temperature

b. High jacket coolant temperature

c. Diesel overspeed.

d. Generator differential current.

e. Generator overcurrent.

f. Negative phase sequence.

g. Diesel low lube oil pressure.

h. Reverse power.

i. Generator ground.

QUESTION 2.24 (1.00)

The 125VDC distribution battery system is sized to carry the required shutdown loads for ______ hours.

a. 1.

b. 2.

c. 4.

d. 5.

QUESTION 2.25 (2.00)

a. How do the pressurizer power operated relief valves (PORV's) prevent overpressurization at low reactor coolant temperature conditions? (0.5)

b. What alerts the operator to the fact that PORV overpressure protection is required? (0.5)

c. What TWO actions must the operator take to provide automatic overpressure protection from the PORV's? (1.0)

QUESTION 2.26 (.50)

TRUE or FALSE

The automatic switchover of the charging pumps from the VCT to the RWST is designed to maintain proper seal injection flow to the RCP's.

End of Category 2

QUESTION 3.01 (2.00)

Match the statement in Column A to the proper Steam Dump mode in Column B.

COLUMN A	COLUMN B
a. Operates Steam Dump with a 5 F deviation (Tavg-Tref).	1. Turbine trip
b. Has two independent operating modes.	2. Steam pressure
c. Controls only two condenser steam dump valves.	3. Load rejection
d. Operates steam dump with no dead band (Tavg-Tref).	4. Tavg

[0.5 each]

QUESTION 3.02 (1.00)

The THREE input signals to the Steam Generator Water Level Control are:

a. Tavg, compensated feed flow, uncompensated steam flow.

b. Feed flow, compensated steam flow, water level error.

c. Compensated feed flow, water level, compensated steam flow.

d. Uncompensated feed flow, compensated steam flow, water level.

QUESTION 3.03 (1.00)

Which of the following is used to create the level programming signal for the Steam Generator Water Level Control System?

a. Average NI power.

b. Auctioneered low NI power.

c. Turbine 1st stage impulse pressure.

d. Auctioneered hi NI power.

QUESTION 3.04 (1.00)

Which of the following statements about temperature detectors is correct?

a. The thermocouple is connected to one leg of a bridge circuit and as the temperature changes the output voltage across the bridge changes.
b. When a thermocouple fails open it will respond in the same manner as an RTD and will indicate a full scale reading on the meter.
c. When a faster responding temperature signal is needed a direct immersion (wet bulb type) RTD is used instead of the thermowell mounted RTD.
d. A RTD is comprised of two wires of dissimilar metals in contact with each other and generates a voltage that is proportional to the temperature difference between the open ends of the wires.

QUESTION 3.05 (1.00)

Which of the following statements describes the signal path from the Source Range detector to the Source Range level meter on the MCB?

a. Detector, Pre Amp, Discriminator, Log Integrator, Meter
b. Detector, Log Integrator, Pulse Shaper, Pulse Counter, Meter
c. Detector, Pre Amp, Log Integrator, Discriminator, Meter
d. Detector, Log Amp, Meter

QUESTION 3.06 (1.00)

Which of the following statements concerning the Power Range Nuclear Instrumentation detectors is correct?

a. Operates in the proportional region of the gas amplification (detector characteristics) curve.
b. Uses inner chamber current to cancel out gamma current in the outer chamber.
c. Uses Boron Trifluoride gas to make it neutron sensitive.
d. Output is calibrated by use of a secondary heat balance.

QUESTION 3.07 (1.00)

Which of the following statements concerning the S/G Blowdown System is correct?

a. The blowdown filters and ion exchangers are bypassed unless the blowdown radiation monitors detect a high blowdown activity.
b. The inside and outside containment trip valves are automatically closed by any signal which automatically starts the auxiliary feed pumps.
c. The normal discharge flow path of the cooled and treated blowdown liquid is to the CW outlet piping from waterboxes A or C.
d. The S/G blowdown lines join together to form a common header upstream of the blowdown coolers.

QUESTION 3.08 (1.00)

Which of the following statements concerning the Steam Dump Control System is correct?

a. The steam dump valves fail open on loss of air.
b. In order to cooldown below 543 degrees, the steam dump mode selector switch must be momentarily taken to "Reset" and returned to "Steam Pressure".
c. When in the Tavg mode, the steam dumps are armed by the reactor trip breakers opening.
d. In the load rejection mode, the steam dump valves may receive a signal to modulate open or a signal to trip open depending upon the magnitude of the error signal.

QUESTION 3.09 (1.50)

Referring to provided Figure 3-1, indicate whether the following valves receive an OPEN, MODULATED, or CLOSED signal for the given makeup mode selector switch position.

a. 114A in AUTO
b. 113B in DILUTE
c. 114B in ALT DILUTE
d. 114B in BORATE
e. 113A in MANUAL

QUESTION 3.10 (1.00)

Which statement below is correct concerning the Rod Control System?

a. The power cabinet provides AC power pulses to drive the control rod drive mechanism.

b. The reactor control unit generates a rod speed and direction signal in response to two error signals.

c. P impulse provides signals to the rate comparator, lead/lag unit and the variable gain unit in the rod control circuits.

d. Rod power is supplied by two motor generator sets with a 260VDC output through an isolation transformer.

QUESTION 3.11 (1.00)

The controlling pressurizer level channel (459) fails high during 100% power operation. Assuming NO operator action is taken, which of the following best describes the response of the plant?

a. Charging flow goes to minimum, pzr level decreases, letdown isolates and the plant continues to operate at the same power.

b. Charging flow goes to minimum, pzr level decreases, letdown isolates and the plant trips on high pzr level.

c. Charging flow goes the maximum, pzr level increases and the plant trips on high pzr level.

d. Charging flow remains the same, pzr level increases due to letdown isolating and the plant trips on high pzr level.

QUESTION 3.12 (2.00)

Indicate whether the following statements concerning the Nuclear Instrument System are TRUE or FALSE.

a. The source range instrument uses a fission chamber for detecting neutrons. (0.5)

b. When an intermediate range detector is over compensated the meter reading will be lower than the actual neutron flux level. (0.5)

c. The power range CHANNEL CURRENT COMPARATOR (located in the comparator and rate drawer) outputs an alarm if any channel deviates by more than 5% full power from any other channel. (0.5)

d. Power range channel N44 is used by the reactor protection and logic system for input to the steam generator low level and low-low level setpoints. (0.5)

QUESTION 3.13 (2.00)

During operation at 50% power the CONTROL RTD in the cold leg of loop one malfunctions and its signal output INCREASES by 6F. Explain the effects on the following indications, parameters or control systems independently. Assume no operator actions and all control systems are in automatic.

a. Rod Control (0.5)

b. Loop #1, OT deltaT setpoint (0.5)

c. Rod insertion limits (0.5)

d. Pressurizer level (0.5)

QUESTION 3.14 (3.00)

Match the conditions of column A to the power level in Column B.

COLUMN A	COLUMN B
a. Blocks rod motion if 1/4 channels of power range reaches ...	1. 2%
	2. 75%
b. Automaticly blocks 6 reactor trips when reactor power and turbine power are ...	3. 103%
c. Block rod withdrawal if intermediate range power is ____ equivalent and itself is not blocked.	4. 10%
	5. 20%
d. P-8 on when 3/4 NI's are below ____ power.	6. 48%
e. Trips all feed pumps, isolates feedwater and trips turbine if 2/3 Hi-Hi S/G levels >____.	7. 15%
	8. 35%
f. Allow automatic rod control above ____ power.	

[0.5 each]

QUESTION 3.15 (1.00)

On an automatic reactor trip, the trip breakers interrupt __________ power to the rod control power cabinets.

a. 260 VDC

b. 120 VDC

c. 260 VAC

d. 120 VAC

QUESTION 3.16 (1.00)

Listed below are all of the conditions which will start the Emergency Feedwater Pumps.

1. 2/3 low-low S/G level from any S/G
2. 2/3 low-low S/G level from 2/3 S/G
3. All main feed pumps trip
4. Blackout
5. Safety Injection

Which conditions below will cause only the TURBINE-DRIVEN pump to start?

a. 1 and 5

b. 3 and 4

c. 2 and 4

d. 2 and 5

QUESTION 3.17 (1.00)

The Reactor Vessel Level Indication System uses what type of instrument to determine the water inventory of the vessel?

a. RTD's

b. Thermocouples

c. Fission chambers

d. Delta P cells

QUESTION 3.18 (1.00)

The resultant indication of the Reactor Vessel Level Indication System is corrected for adverse containment conditions by:

a. Sensing line temperatures, wide range Thot, and RCS pressures.

b. Containment air temperatures, containment pressure and transmitter location.

c. Reactor vessel wall temperature, RCS Tavg, and loop pressure.

d. Containment temperature, containment pressure and operator use of a graph.

QUESTION 3.19 (1.00)

Steam Generator overfill could lead to ...

a. water acceleration damage to the Aux Feed turbine.

b. a positive moderator temperature coefficient.

c. failure of the three element Steam Generator Water Level controller.

d. seismic stability of the piping due to the mass of the water.

QUESTION 3.20 (1.00)

Which indication below is the DIRECT output of an RTD?

a. Tref

b. Tavg

c. Thot

d. delta T

QUESTION 3.21 (1.00)

How would the failure low of the density compensation signal on any Steam Generator a 100% power affect the High Steam flow signal to the Reactor Protection system?

a. Increase, density compensation reduces the high flow signal.

b. Very minor effect which could increase or decrease depending on the square root extrator operation.

c. Decrease, density compensation increases the high flow signal.

d. No effect, high steam flow signal is not density compensated.

QUESTION 3.22 (1.00)

Which indication below is the correct method of determining the status of a Pressurizer Safety Valve?

a. Observe position indication and tailpipe temperature.

b. Observe tailpipe temperature, acoustic monitors and position indication.

c. Observe acoustic monitors and position indication.

d. Observe tailpipe temperature, and acoustic monitors.

QUESTION 3.23 (1.00)

List the FOUR different parameter indications provided on the Remote Monitoring Panel. (1.0)

QUESTION 3.24 (.50)

TRUE OR FALSE

The FIRST TWO barriers to the release of fission products are the primary coolant piping and the reactor containment.

QUESTION 3.25 (1.00)

Which of the following signals is NOT directly determined by the value of turbine first stage pressure?

a. Programmed S/G Level
b. High Steam Flow SI Setpoint
c. Programmed Pressurizer Level
d. Tref

End of Category 3

QUESTION 4.01 (1.00)

Match the evolutions in Column A to the power that they are normally performed at during a power increase in Column B.

COLUMN A	COLUMN B
1. Perform heat balance	a. 15%
2. Verify proper S/G chemistry	b. 35%
3. Start second main feed pump	c. 50%
4. Place steam dumps in "Tavg"	d. 60%
~~5. Place reheat system in operation~~	e. 70%
	~~f. 90%~~

S/ex

QUESTION 4.02 (1.00)

Which of the following statements describing the method of unit shutdown from 2% power to hot shutdown is correct?

a. Using manual rod control, insert control banks D, C, B, and A to zero steps. Maintain the shutdown banks fully withdrawn.
b. Using manual rod control, insert control banks D, C, B, and A to five steps. Maintain the shutdown banks fully withdrawn.
c. Using manual rod control, insert control banks D, C, B, and A to zero steps. Using group select, insert shutdown banks to zero steps. Open reactor trip breakers. Reset reactor trip breakers. Using group select, fully withdraw shutdown banks.
d. Using group select, insert all rods to five steps. Open reactor trip breakers. Reset reactor trip breakers. Using group select, fully withdraw shutdown banks.

QUESTION 4.03 (1.00)

If two or more control rods are not fully inserted following a reactor trip, how much boration is required for each rod not fully inserted?

a. 300 ppm
b. 150 ppm
c. 100 ppm
d. 50 ppm

QUESTION 4.04 (1.00)

Which of the following statements concerning the procedure for a dropped RCCA is correct?

a. Upon starting recovery of the dropped RCCA, an URGENT FAILURE alarm will occur because the lift coils for the other rods in the group have been disconnected.
b. The delta flux target band is not applicable during a dropped RCCA malfunction and recovery.
c. If two or more RCCA's have dropped, manually trip the reactor and proceed in accordance with EP-1.00.
d. Recovery from a dropped RCCA will be facilitated if Tavg is higher than Tref prior to commencing withdrawal of the dropped RCCA.

QUESTION 4.05 (1.00)

During a natural circulation cooldown following a reactor trip, which of the following criteria determine the amount of RCS subcooling required?

a. RCS cooldown rate.
b. Reactor power history (decay heat rate).
c. Pressurizer level.
d. Number of CRDM fans running.

QUESTION 4.06 (1.00)

Which of the following is the correct action if, following a reactor trip, only one AC emergency bus is energized?

a. Try to restore power to de-energized AC emergency bus while continuing EP-1.00,"Reactor Trip/Safety Injection".
b. Go to ECA-2, "Loss of All AC Power".
c. Restore power to de-energized AC emergency bus before continuing EP-1.00.
d. Go to FRP-C.1, "Response to Inadequate Core Cooling".

QUESTION 4.07 (1.00)

Which of the following conditions would prevent restarting a RCP following a loss of a RCP bus?

a. VCT pressure of 20 psig.
b. Seal injection flow of 8 gpm to each RCP.
c. No. 1 seal return valve shut.
d. Differential pressure across No. 1 seal of 300 psid.

QUESTION 4.08 (2.00)

List ALL 19 immediate action steps for a "Reactor Trip/Safety Injection" per EP-1.00.

QUESTION 4.09 (1.00)

Which of the following statements concerning the S/G Tube Rupture procedure EP-4.00 is correct?

a. Cooldown may be commenced prior to isolating the ruptured S/G.
b. Cooldown rate is limited to 100 degrees/hour.
c. Using one PZR PORV is the preferred method of depressurization.
d. The RCS should be borated to the cold shutdown requirements prior to commencing cooldown.

QUESTION 4.10 (1.00)

The Unit Startup Procedure states that the shutdown banks must be fully withdrawn whenever reactivity is being changed, except with permission of the Superintendent of Operations and...

a. the shutdown margin has been calculated to be greater than 1770 pcm.
b. the RCS is borated to the cold shutdown concentration.
c. the reactor is in the Source Range with the HIGH FLUX AT SHUTDOWN alarm operable.
d. the actual boron concentration is greater than the predicted critical boron concentration.

QUESTION 4.11 (1.00)

Which of the following statements concerning the Immediate Actions for nuclear instrument malfunctions is correct?

a. If a source range channel fails while a startup is in progress and reactor power is below P-6, insert all control banks to zero steps.
b. If an intermediate range channel fails while a startup is in progress and reactor power is above P-6 but below P-10, the power increase may continue using the operable intermediate range channel.
c. Failure of one power range channel during shutdown precludes a reactor startup until the failed channel is returned to operable status.
d. Failure of both source range channels while shutdown requires boration to the cold shutdown specification and disabling the primary makeup dilute function.

QUESTION 4.12 (1.00)

Which of the following statements concerning the immediate actions for a complete loss of component cooling water on Unit 1 is NOT correct?

a. Stop charging flow by closing FCV-1122 and letdown flow by closing HCV-1200A, B, and C.
b. The RCP's are tripped two minutes after either the upper or lower motor bearing temperature reaches 200 degrees.
c. Shift reactor containment air recirculation coolers to chilled component cooling.
d. Prepare to backup containment instrument air with turbine building instrument air.

QUESTION 4.13 (1.00)

During boron concentration changes to the RCS AT POWER the operator must observe one of two effects caused by the boron change. What are the TWO effects?

a. Control bank motion and changes in RCS Tavg.

b. Spray valve actuation and NI power change.

c. Control bank motion and NI power changes.

d. Changes in RCS Tavg and Spray valve actuation.

QUESTION 4.14 (1.00)

If actual critical rod position is >250 pcm below the Estimated Critical Position, OP-1C states that you shall:

a. Shutdown the reactor, recalculate ECC.

b. Continue with startup, recalculate ECC.

c. Emergency Borate, shutdown the reactor, recalculate ECC.

d. Trip the reactor, Emergency Borate, recalculate ECC.

QUESTION 4.15 (3.00)

Match the terms in column A to the values in column B for the radiation exposure guidelines. Assume whole body dose unless otherwise stated. CAUTION: Some answers could be used more than once.

COLUMN A	COLUMN B
a. NRC limits/qtr	1. 0.5 REM
b. Surry limits/qtr	2. 1.25 REM
c. Pregnant women limit/gestation	3. 1.0 REM
d. NRC general public limit/year	4. 0.75 REM
e. NRC Quarterly limit with a Form 4	5. 5 REM
f. Surry visitor limit	6. 3 REM
	7. .125 REM [0.5 each]

QUESTION 4.16 (3.00)

Match the condition in column A to the action required in column B.

COLUMN A	COLUMN B
a. Emergency Diesel #2 trip on SI. (AP-17)	1. Reduce plant load.
b. RCS leak > 150 gpm. (AP-16)	2. Reset-auto start disable.
c. Component Cooling Pumps tripped. (AP-15)	3. Stop Charging flow.
d. Condensate pump trip. (AP-21)	4. Place Rods in manual.
e. PZR pressure control channel fails High. (AP-32)	5. Safety inject.
f. First stage turbine pressure fails High. (AP-1.2)	6. Close spray valve 455A.

[0.5 each]

QUESTION 4.17 (1.00)

Which of the following is NOT a Critical Safety Function?

a. Subcooling
b. Heat Sink
c. Subcriticality
d. Inventory

QUESTION 4.18 (1.00)

Which of the following is the minimum RCS leak rate that requires the operator to manually trip the reactor?

a. 150 gpm
b. 100 gpm
c. 50 gpm
d. 10 gpm

QUESTION 4.19 (1.00)

Following a reactor trip, the turbine did not automatically trip and the manual control room trip was unsuccessful. According to EP-1.00, "Reactor Trip/Safety Injection", which of the following statements is NOT an acceptable method of securing the turbine.

a. Close main steam trip valves.
b. Stop EHC pumps.
c. Manually runback turbine.
d. Locally trip turbine.

QUESTION 4.20 (1.00)

Which of the following is NOT a requirement prior to commencing a Fast Trip Recovery?

a. If the reactor trip was caused by a turbine trip, the cause of the turbine trip has been identified and corrected.
b. Less than four hours has elapsed since the reactor trip.
c. An estimated critical position has been calculated.
d. Three RCP's, two condensate pumps, and one main feed pump are operable and in operation.

QUESTION 4.21 (1.00)

Which of the following statements concerning a loss of one RCP at less than 35% power is correct?

a. After meeting the precautions and limitations associated with starting a RCP, restart the affected RCP.
b. Defeat affected loops delta T and Tavg signals and commence unit shutdown.
c. Immediately trip the reactor and proceed in accordance with EP-1.00, "Reactor Trip/Safety Injection".
d. Power operations may continue for up to four hours while attempting repair and restart of the affected RCP.

QUESTION 4.22 (1.00)

According to AP-20, "Main Control Room Inaccessibility", if the reactor nor any equipment can be tripped from the control room, which immediate action below is the operators FIRST PRIORITY?

a. Trip local reactor trip breakers.

b. Trip the turbine if operating.

c. Trip the feed pumps locally.

d. Initiate EPIP-1.01 "Station Emergency Manager Controlling Procedure.

QUESTION 4.23 (1.00)

What are THREE indications used to monitor plant cooldown during Natural Circulation according to EOP-1.02A?

a. RCS Thot, Tavg and Core exit TC's.

b. Reactor Vessel Level, Core exit TC's, Subcooling.

c. RCS Tcold, Reactor Vessel Level, Subcooling.

d. Subcooling, Core exit TC's, RCS Thot.

QUESTION 4.24 (1.00)

After initiating the "Loss of Reactor Coolant" procedure EP-2.00, at what decreasing pressure must the Reactor Coolant Pumps be stopped?

a. 1300 psig

b. 1400 psig

c. 1550 psig

d. 1600 psig

QUESTION 4.25 (1.00)

Which of the following conditions would NOT require re-initiation of safety injection according to EP-2.01 "SI Termination following loss of Reactor Coolant"?

	RCS PRESSURE	SUBCOOLING	PZR LEVEL%
a.	1700	60	15
b.	1600	40	10
c.	1750	50	25
d.	1800	35	30

End of Category 4

EQUATION SHEET

$f = ma$

$v = s/t$

Cycle efficiency = (Net work out)/(Energy in)

$w = mg$

$s = V_o t + 1/2\ at^2$

$E = mc^2$

$KE = 1/2\ mv^2$

$a = (V_f - V_o)/t$

$A = \lambda N$

$A = A_o e^{-\lambda t}$

$PE = mgh$

$V_f = V_o + at$

$w = \theta/t$

$\lambda = \ln 2/t_{1/2} = 0.693/t_{1/2}$

$W = v\ \Delta P$

$A = \frac{\pi D^2}{4}$

$t_{1/2}eff = \frac{[(t_{1/2})(t_b)]}{[(t_{1/2}) + (t_b)]}$

$\Delta E = 931\ \Delta m$

$\dot{m} = V_{av} A \rho$

$I = I_o e^{-\Sigma x}$

$\dot{Q} = \dot{m} Cp \Delta t$

$\dot{Q} = UA\Delta T$

$Pwr = W_f \Delta h$

$I = I_o e^{-ux}$

$I = I_o\ 10^{-x/TVL}$

$TVL = 1.3/u$

$HVL = -0.693/u$

$P = P_o 10^{sur(t)}$

$P = P_o e^{t/T}$

$SUR = 26.06/T$

$SCR = S/(1 - K_{eff})$

$CR_x = S/(1 - K_{effx})$

$CR_1(1 - K_{eff1}) = CR_2(1 - K_{eff2})$

$SUR = 26\rho/\ell^* + (\beta - \rho)T$

$T = (\ell^*/\rho) + [(\beta - \rho)/\bar{\lambda}\rho]$

$T = \ell/(\rho - \beta)$

$T = (\beta - \rho)/(\bar{\lambda}\rho)$

$\rho = (K_{eff} - 1)/K_{eff} = \Delta K_{eff}/K_{eff}$

$M = 1/(1 - K_{eff}) = CR_1/CR_o$

$M = (1 - K_{effo})/(1 - K_{eff1})$

$SDM = (1 - K_{eff})/K_{eff}$

$\ell^* = 10^{-4}$ seconds

$\bar{\lambda} = 0.1$ seconds^{-1}

$\rho = [(\ell^*/(T K_{eff})] + [\bar{\beta}_{eff}/(1 + \bar{\lambda}T)]$

$I_1 d_1 = I_2 d_2$

$I_1 d_1{}^2 = I_2 d_2{}^2$

$P = (\Sigma\phi V)/(3 \times 10^{10})$

$\Sigma = \sigma N$

$R/hr = (0.5\ CE)/d^2$(meters)

$R/hr = 6\ CE/d^2$ (feet)

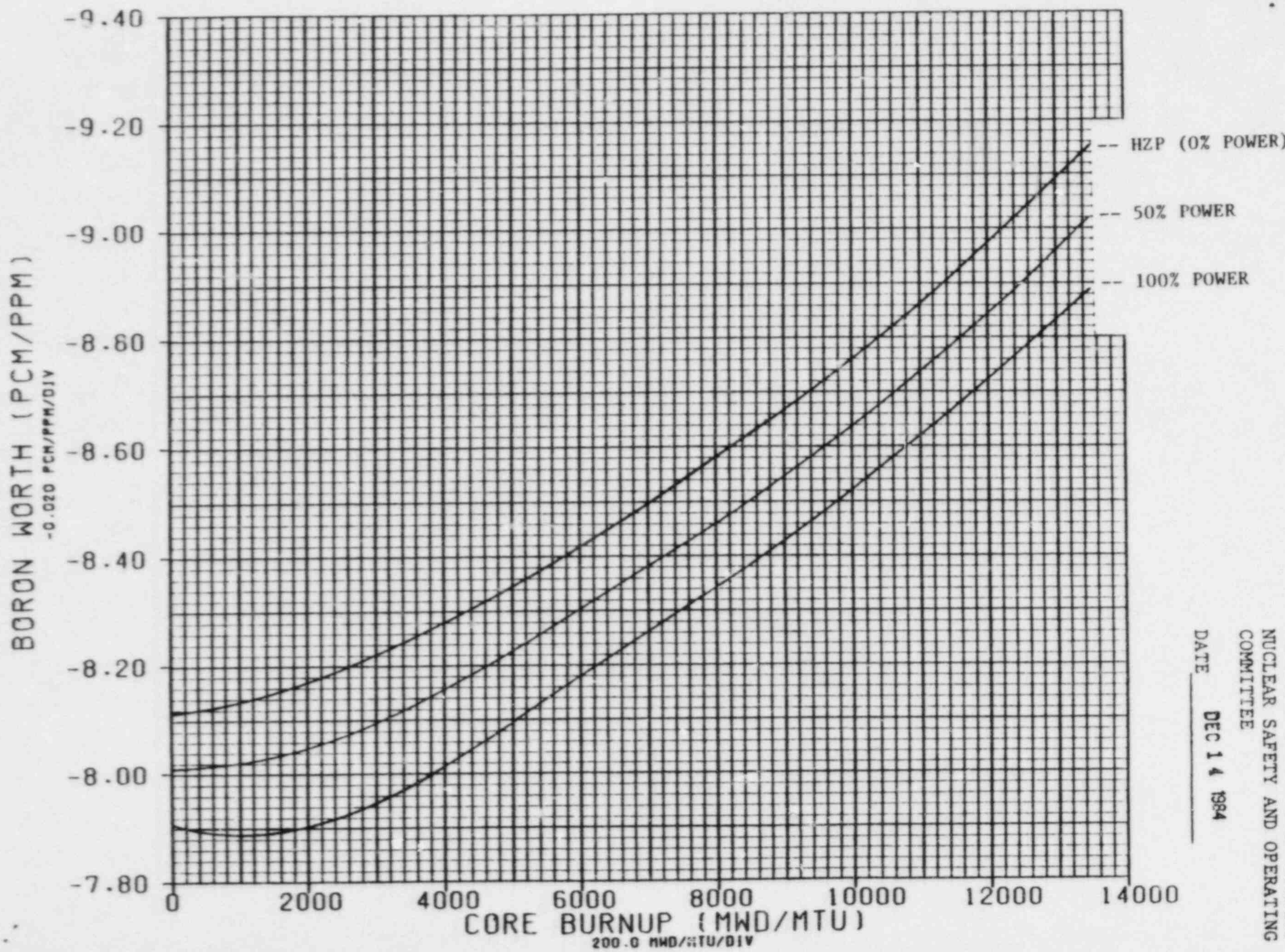
Water Parameters

1 gal. = 8.345 lbm.
1 gal. = 3.78 liters
1 ft^3 = 7.48 gal.
Density = 62.4 lbm/ft^3
Density = 1 gm/cm^3
Heat of vaporization = 970 Btu/lbm
Heat of fusion = 144 Btu/lbm
1 Atm = 14.7 psi = 29.9 in. Hg.
1 ft. H_2O = 0.4335 lbf/in.

Miscellaneous Conversions

1 curie = 3.7×10^{10} dps
1 kg = 2.21 lbm
1 hp = 2.54×10^3 Btu/hr
1 mw = 3.41×10^6 Btu/hr
1 in = 2.54 cm
°F = 9/5°C + 32
°C = 5/9 (°F-32)
1 BTU = 778 ft-lbf

SURRY UNIT 1 - CYCLE 8
BORON COEFFICIENT VS. BURNUP



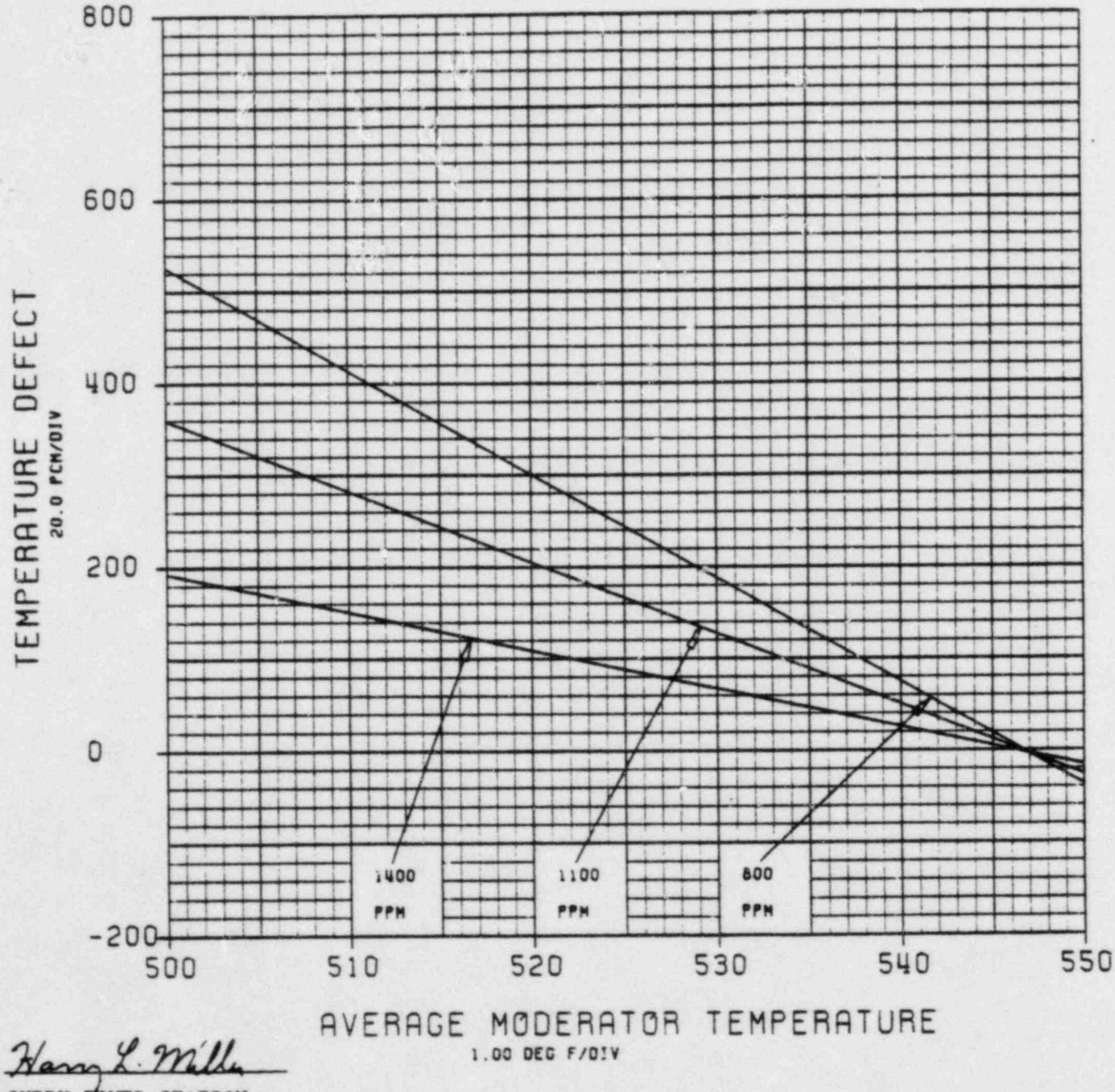
REV. 50

APPROVED
CHAIRMAN SURRY POWER STATION
NUCLEAR SAFETY AND OPERATING
COMMITTEE

DATE DEC 14 1984

SURRY UNIT 1 - CYCLE 8
ISOTHERMAL TEMPERATURE DEFECT VS. AVERAGE MODERATOR TEMPERATURE - BOL

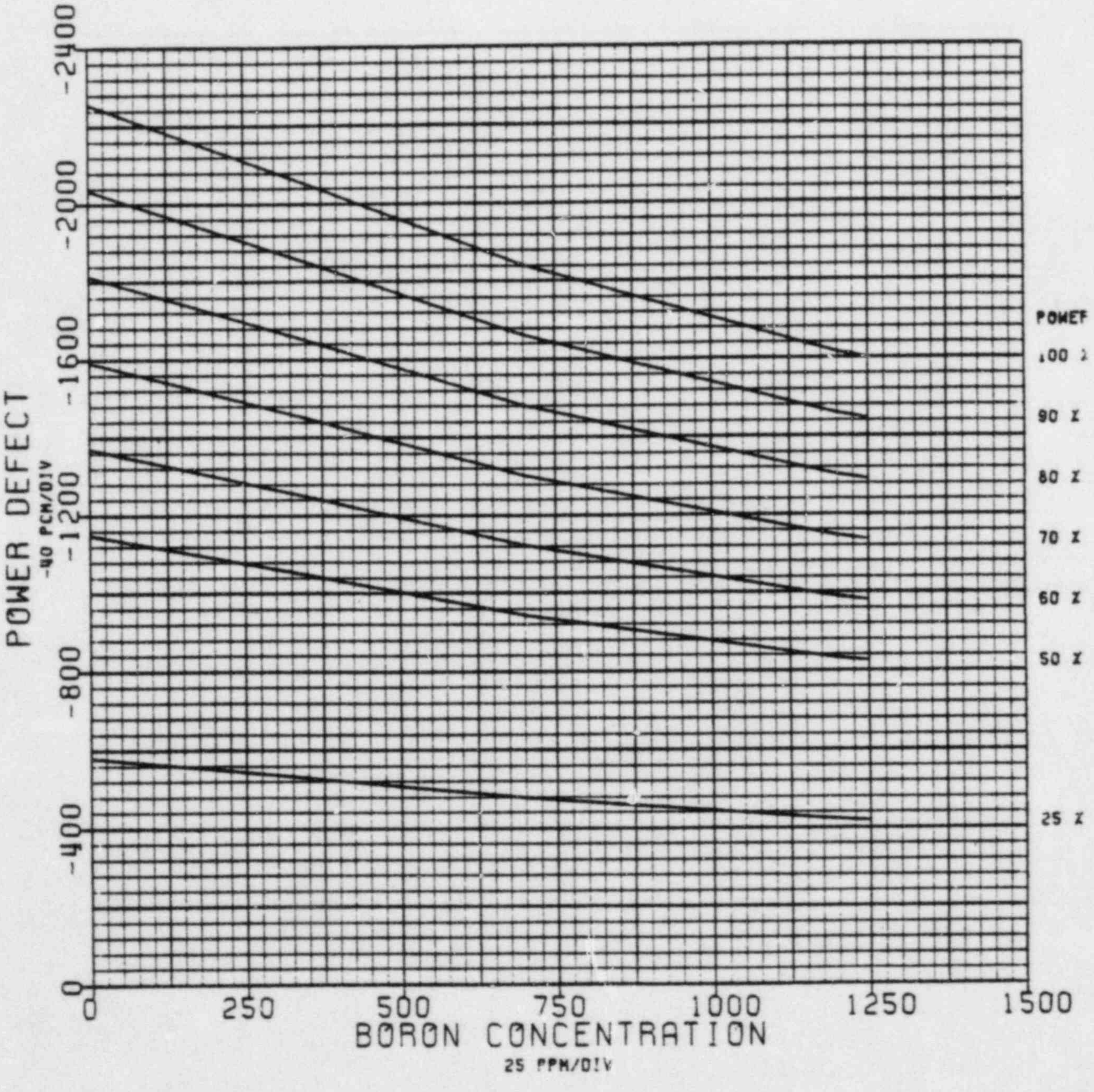
NOTE: BOL EQUALS 0-4500 MWD/MTU
ALL RODS OUT, HZP



APPROVED Harry L. Miller
CHAIRMAN SURRY POWER STATION
NUCLEAR SAFETY AND OPERATING
COMMITTEE
DATE DEC 1 4 1984

REV. 50

SURRY UNIT 1 - CYCLE 8
POWER DEFECT



REV. 50

APPROVED *Harry L. Miller*

CHAIRMAN SURRY POWER STATION
NUCLEAR SAFETY AND OPERATING
COMMITTEE

DATE DEC 1 4 1981

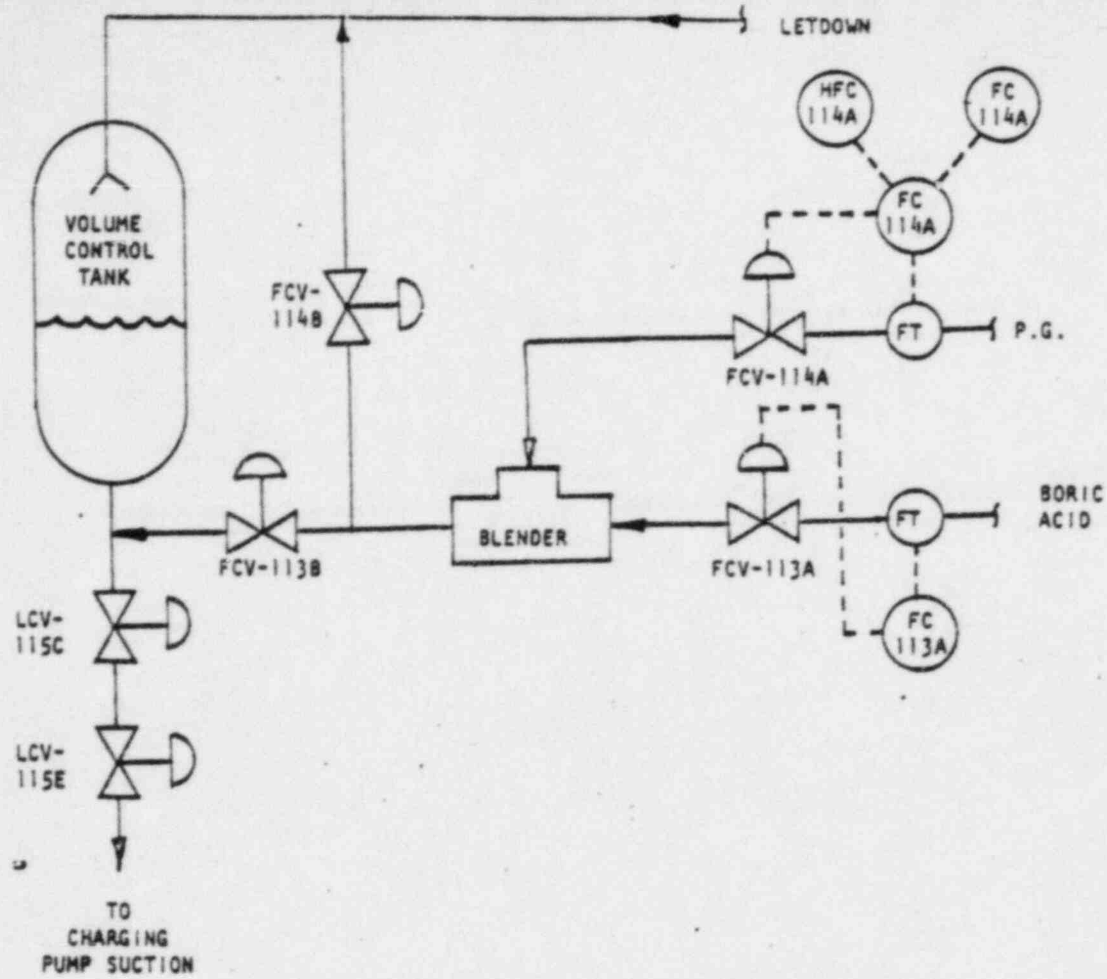

LETDOWN
HFC 114A
FC 114A
FC 114A
VOLUME CONTROL TANK
FCV-114B
FT
P.G.
FCV-114A
BLENDER
FCV-113B
FCV-113A
FT
BORIC ACID
FC 113A
LCV-115C
LCV-115E
TO CHARGING PUMP SUCTION

Figure 3-1

ANSWER 1.01 (1.00)

answer: a. (1.0)

REFERENCE
Surry Reactor Theory, I-5.80

ANSWER 1.02 (1.00)

a

REFERENCE
VEGP, Training Text, Vol. 9, p. 21-47
Westinghouse Reactor Physics, pp. I-3.17 & 19

ANSWER 1.03 (1.00)

answer: b. (1.0)

REFERENCE
Surry Curve Book, p. 31, Xenon reactivity worth following startup.

ANSWER 1.04 (1.00)

answer: b. (1.0)

REFERENCE
Surry Curve Book, p. 33, Xenon reactivity worth buildup following Rx trip

ANSWER 1.05 (1.00)

answer: c. (1.0)

REFERENCE
Surry Reactor Theory, Section 5, pp 52-54

ANSWER 1.06 (1.00)

b

REFERENCE
Surry HTFF pp 94-96

ANSWER 1.07 (1.00)

c

REFERENCE
General Physics, HT & FF, Section 3.2

ANSWER 1.08 (1.00)

b

REFERENCE
NUS, Nuclear Energy Training - Reactor Operation, p. 10.5-1 - 4
Westinghouse Reactor Physics, pp. I-5.77 - 79

ANSWER 1.09 (1.00)

b

REFERENCE
Surry Curve Book, pp 21, 27, 29, 30, 32, 51

ANSWER 1.10 (1.00)

b

REFERENCE
General Physics, HT & FF, p. 229

ANSWER 1.11 (2.00)

a. False.
b. False.
c. True.
d. False. [0.5 ea.]

REFERENCE
Surry Heat Transfer and Fluid Flow, pp. 322-334.

ANSWER 1.12 (1.00)

a

REFERENCE
Westinghouse Reactor Physics, p. I-5.22

ANSWER 1.13 (1.00)

b

REFERENCE
Surry Reactor Theory, p. I-3.15

ANSWER 1.14 (1.00)

a

REFERENCE
Surry Reactor Theory, p. I-3.9

ANSWER 1.15 (1.00)

b

REFERENCE
Westinghouse Reactor Physics, pp. I-5.12, 25, and 27

ANSWER 1.16 (1.00)

c

REFERENCE
Surry Reactor Theory, p. I-4.28

ANSWER 1.17 (1.00)

c

REFERENCE
Westinghouse Thermo-hydraulic Principles and Appliciation to PWR, II, ch. 12 pp 21-26
Surry HTFF, pp 153-160

ANSWER 1.18 (1.00)

c

REFERENCE
Westinghouse Reactor Physics, pp. I-5.36 - 50

ANSWER 1.19 (1.00)

b

REFERENCE
Westinghouse Reactor Physics, pp. I-5.26 & 27

ANSWER 1.20 (1.00)

b

REFERENCE
Surry HTFF, p. 179

ANSWER 1.21 (1.00)

c

REFERENCE
Westinghouse Reactor Physics, pp. I-5.2 - 16

ANSWER 1.22 (1.00)

b

REFERENCE
Westinghouse Reactor Physics, p. I-5.40

ANSWER 1.23 (1.00)

a. FALSE (0.5)
b. TRUE (0.5)

REFERENCE
General Physics, HT&FF, pp. 155 and 320 and Subcooled Liquid Density Tables

ANSWER 1.24 (2.00)

a. INCREASE (0.5)
b. INCREASE (0.5)
c. DECREASE (0.5)
d. DECREASE (0.5)

REFERENCE
General Physics, HTFF - Fluid Flow Applications for Systems and Components

ANSWER 1.25 (1.00)

THE SAME AS

REFERENCE
NUS, Nuclear Energy Training, Module 3, Unit 6
Westinghouse Reactor Physics, Sect. 3, Neutron Kinetics

ANSWERS -- SURRY 1&2 -85/04/08-PICKER, P.

ANSWER 1.26 (2.00)

a. Power Defect (-0.25 for power coefficient)
b. Reactivity
c. Latent Heat of Vaporization (condensation)
d. Convection

REFERENCE
NUS, Nuclear Energy Training - Reactor Operation and Plant Performance
Westinghouse Reactor Physics, pp. I-5.26 and I-3.2 and General Physics,
HT&FF, pp. 38 and 99

ANSWER 1.27 (1.00)

c

REFERENCE
Surry HTFF pp 82-96; pp 143-144

ANSWER 2.01 (1.00)

b.

REFERENCE
Surry Instrumentation Manual; Ch 15, p. 1

ANSWER 2.02 (1.00)

c.

REFERENCE
Surry System Descriptions; Vol. II, Sec. I, Ch. 6, pp 1-3

ANSWER 2.03 (1.00)

b

REFERENCE
Surry, S/G Auxiliary Feed System, pp. 1 & 9

ANSWER 2.04 (1.00)

a.

REFERENCE
Surry System Descriptions; Vol I, ch 1, p. 21

ANSWER 2.05 (1.00)

c.

REFERENCE
Surry System Descriptions; Vol I, Sec. 4, ch 1, pp 4a & 4b

ANSWER 2.06 (1.00)

a

REFERENCE
Surry, Vital Bus Distribution, pp. 6-1 - 5

ANSWER 2.07 (2.00)

a. False
b. False
c. True
d. True [0.5 each]

REFERENCE
Surry System Descriptions; Vol I, Sec. III, ch 4, pp 1-6

ANSWER 2.08 (1.00)

a

REFERENCE
Surry, Consequence Limiting Safeguards, pp. 1, 10, and 11

ANSWER 2.09 (1.00)

c

REFERENCE
Surry, Instrumentation Manual, Control and Protection, Attachment I and p. 2

ANSWER 2.10 (1.00)

d.

REFERENCE
Surry System Descriptions; Vol II, Sec. 1, ch 5, p. 5

ANSWER 2.11 (1.00)

b.

REFERENCE
Surry System Descriptions, Vol. I, Sec. 1, Ch. 1, p. 22

ANSWERS -- SURRY 1&2 -85/04/08-PICKER, B.

ANSWER 2.12 (1.00)

a. DECREASE (0.25)
b. REMAIN THE SAME (0.25)
c. REMAIN THE SAME or decrease (0.25)
d. REMAIN THE SAME (0.25)

REFERENCE
FNP, Tavg, Delta T, and Fimp, pp. 16 & 17
Surry, Instrumentation Manual, Sect. 9, p. IV-5.5

ANSWER 2.13 (2.00)

(0.2 pts each)
a. CLOSE
b. CLOSE
c. OPEN
d. CLOSE
e. ~~NC~~ (TV 405 close on high stm flow)
f. OPEN
g. CLOSE
h. CLOSE
i. NC
j. ~~OPEN~~ No

REFERENCE
Surry, Safety Injection System, pp. 27 - 29a

ANSWER 2.14 (1.00)

b

REFERENCE
Surry, Instrumentation Manual, Sect. 8, p. 8.2

ANSWER 2.15 (1.00)

c.

REFERENCE
Surry System Descriptions; Vol. II, Sec. 1, Ch. 13, pp 5, 6, 13

ANSWER 2.16 (1.00)

(0.2 pts each)
1. e
2. e
3. b
4. e
5. f

REFERENCE
Surry, Instrumentation Manual, Rod Control System, pp. 15 and 16

ANSWER 2.17 (1.00)

a.

REFERENCE
Surry System Descriptions; Vol. II, Sec. IV, Ch. 5, p. 17

ANSWER 2.18 (2.00)

a. False
b. True
c. True
d. False [0.5 each]

REFERENCE
Surry System Descriptions; Vol II, Sec. 4, Ch. 5, p. 8

ANSWER 2.19 (1.00)

b

REFERENCE
Surry System Descriptions; Vol. I, Ch. 3, pp 10, 11
Operating Procedure 5.2, p.4

ANSWER 2.20 (1.00)

c.

REFERENCE
Surry System Descriptions, Vol. I, Sec. 1, Ch. 3, p. 7

ANSWER 2.21 (1.00)

b

REFERENCE
Surry Instrumentation Manual; Ch. 9, p. 5.4

ANSWER 2.22 (1.00)

c.

REFERENCE
Surry System Descriptions; Vol II, Sec. III, Ch 3, p. 5

ANSWER 2.23 (1.~~50~~ 00)

c, c, b ~~[0.5 each]~~
only one

REFERENCE
Surry System Descriptions; Vol. II, Sec. 4, Ch. 5, pp 37-44
~~**************(at for additional details)*******************~~

ANSWER 2.24 (1.00)

b

REFERENCE
Surry System Descriptions; Vol. II, Sec. IV, Ch. 7, p. 3

ANSWER 2.25 (2.00)

a. The overpressure setpoints are reduced from normal at power setpoints to low temperature setpoints. (0.5)

b. The "PRZR NOT OVERPRESSURE SYSTEM REQ'D" alarm annunciates. (0.5)

c. 1. Two key operated switches (one for each valve) are switched from disable to enable.
2. PORV block valves are opened or verified open. (1.0)

REFERENCE
Surry System Descriptions; Vol. I, Sec. I, Ch. 1, p. 22A

ANSWER 2.26 (.50)

FALSE

REFERENCE
Surry System Descriptions, Vol. I, Sec. I, Ch. 5, p. 16
Surry PLS Book, p. 46

ANSWER 3.01 (2.00)

a. 3
b. 4
c. 2
d. 1 [0.5 each] (2.0)

REFERENCE
Surry Instrumentation Manual; Ch. 6, pp 4, 6, 7 and Fig. 5

ANSWER 3.02 (1.00)

b

REFERENCE
Surry Instrumentation Manual; Ch. 8, Fig. 1

ANSWER 3.03 (1.00)

c

REFERENCE
Surry Instrumentation Manual; Ch. 8, Fig. 1

ANSWER 3.04 (1.00)

c

REFERENCE
Nuclear Power Plant Instrumentation Systems Manual, Ch. 4

ANSWER 3.05 (1.00)

a

REFERENCE
FNP, Excore Nuclear Instrumentation System, Fig. 7
Surry, Instrumentation Manual, Excore Instrumentation System, p. IV-1.29

ANSWER 3.06 (1.00)

c

REFERENCE
Nuclear Power Plant Instrumentation Systems Handbook, Ch. 2

ANSWER 3.07 (1.00)

b

REFERENCE
Surry, S/G Blowdown System, pp. 1 - 4

ANSWER 3.08 (1.00)

c

REFERENCE
Surry, Instrumentation Manual, Steam Dump Control System, pp. 2 - 5

ANSWER 3.09 (1.50)

(0.3 pts each)
a. MODULATED
b. CLOSED
c. OPEN
d. CLOSED
e. MODULATED

REFERENCE
Surry, Chemical and Volume Control System, p. 52

ANSWER 3.10 (1.00)

b.

REFERENCE
Surry Instrumentation Manual; Ch. 4, pp 2 & 6, Fig. 1

ANSWER 3.11 (1.00)

b

REFERENCE
Surry Instrumentation Manual; Ch. 10, Pzr level lecture

ANSWER 3.12 (2.00)

a. FALSE
b. TRUE
c. TRUE
d. FALSE [0.5 each]

REFERENCE
Surry Instrumentation Manual; Ch. 7, pp 5-11

ANSWER 3.13 (2.00)

a. The rod control system will see an increased Tave-Tref deviation and rods will insert. (0.5)

b. NONE-- The OT deltaT setpoint is generated using protection RTD's. (0.5)

c. NO EFFECT-- Rod insertion limits are power dependent. Decreased delta T implies lower power. RIL computer uses auct. Hi delta T, so there would be no change in RIL's. (0.5)

d. The increased auct. Tave will cause pressurizer program level setpoint to increase. (0.5)

REFERENCE
Surry Instrumentation Manual; Ch. 9, pp 1-15

ANSWER 3.14 (3.00)

a. 3
b. 4
c. 5
d. 6
e. 2
f. 7 [0.5 each]

REFERENCE
Surry Instrumentation Manual; Ch. 11 and PLS book RCS section

ANSWER 3.15 (1.00)

c.

REFERENCE
Surry Instrumentation Manual; Ch. 3, p. 6

ANSWER 3.16 (1.00)

c.

REFERENCE
Surry System Descriptions; Vol. I, Sec. III, Ch. 3, pp 7, 8

ANSWER 3.17 (1.00)

c.

REFERENCE
Surry Instrumentation Manual; Ch. 14, p. 1

ANSWER 3.18 (1.00)

a.

REFERENCE
Surry Instrumentation Manual; Ch. 14, pp 2, 3

ANSWER 3.19 (1.00)

a.

REFERENCE
Surry Instrument Manual; Ch. 9, pp 1-3

ANSWER 3.20 (1.00)

c.

ANSWERS -- SURRY 1&2   -85/04/08-PICKETT, B.

REFERENCE
Surry Instrument Manual; Ch. 9, pp 5.2, 5.3

ANSWER 3.21 (1.00)

c.

REFERENCE
Surry Instrumentation Manual; Ch. 11, p. 3

ANSWER 3.22 (1.00)

d.

REFERENCE
Surry Instrumentation Manual; Ch. 13,
Operation of Safety and PORVs Memorandum 1/7/80 and 3/21/80

ANSWER 3.23 (1.00)

S/G Pressure   Pzr level
Tcold   RCS wide range   (any 4 required)
Source Range NI   Steam Gen. Level (WR)
Intermediate Range NI   RCS hot leg [0.25 each]   (1.0)

REFERENCE
Surry Instrumentation Manual, Ch. 12, Design change training

ANSWER 3.24 (.50)

FALSE

REFERENCE
Surry Instrumentation Manual Ch. 3 p. 1

ANSWER 3.25 (1.00)

c

REFERENCE
Surry, Instrumentation Manual, Process Protection Instrumentation, p. 4

ANSWER 4.01 (1.00)

(0.25pts each)
1. a
2. b
3. c
4. b
~~5. b~~ e

REFERENCE
Surry, 1-OP-2.1, pp. 7 - 10

ANSWER 4.02 (1.00)

c

REFERENCE
Surry, OP-3.1, p. 6

ANSWER 4.03 (1.00)

a

REFERENCE
Surry, EP-1.01, p. 4

ANSWER 4.04 (1.00)

a

REFERENCE
Surry, 1-AP-1.4, pp. 3 - 5

ANSWER 4.05 (1.00)

d

REFERENCE
Surry, EP-1.02A, p. 6

ANSWERS -- SURRY 1&2 -85/04/09-PICKER, B.

ANSWER 4.06 (1.00)

a

REFERENCE
Surry, EP-1.00, p. 3

ANSWER 4.07 (1.00)

c

REFERENCE
Surry, 1-OP-5.2

ANSWER 4.08 (2.00)

1. Verify Reactor Trip
2. Verify Turbine Trip
3. Verify AC buses energized
4. Check if SI Activated
5. Verify Main Feedwater Isolation
6. Verify Phase I isolation
7. Verify AFW Pumps (M-run, T-stp. if needed)
8. Verify AFW Valve Alignment
9. Verify AFW Flow
10. Verify RCS Heat Removal
11. Check RCS Pressure
12. Verify SI Pumps (Ch/SI-run, Lo Head-Run)
13. Verify SI Valve Emerg. Alignment
14. Verify SI Flow
15. Verify Cont. Pressure Subatmos.
16. Check for High Cont. Press.
17. Check for High-High Cont. Press.
18. Check Cont. Spray Systems
19. Check Cont. Recirc. Spray Systems. [0.105 each]

REFERENCE
Surry Emergency Procedures, EP-1.00

ANSWER 4.09 (1.00)

d

ANSWERS -- SURRY 1&2 -85/04/08-PICKER, B.

REFERENCE
Surry, EP-4.00, pp. 9, 11, and 12

ANSWER 4.10 (1.00)

b

REFERENCE
Surry, 1-OP-1.1, p. 6

ANSWER 4.11 (1.00)

c

REFERENCE
Surry, 1-AP-4, pp. 5, 7, and 8

ANSWER 4.12 (1.00)

b

REFERENCE
Surry, 1-AP-15, pp. 3 and 4

ANSWER 4.13 (1.00)

a.

REFERENCE
Surry PLS, CVCS, p. 47

ANSWER 4.14 (1.00)

a.

REFERENCE
Surry OP-10, p. 5, note

ANSWER 4.15 (3.00)

a. 2 or 6
b. 9
c. 1
d. 1
e. 6 or 2
f. 7. [0.5 each]

depends on definition application of 10CFR20

REFERENCE
Surry Radiation Protection, Section 2.3, pp 1, 2

ANSWER 4.16 (3.00)

a. 2
b. 5
c. 3
d. 1
e. 6
f. 4 [0.5 each]

REFERENCE
Surry AP-1.2, 15, 16, 17, 21, 32

ANSWER 4.17 (1.00)

a

REFERENCE
Surry, Status Trees, F-0.1 - F-0.6

ANSWER 4.18 (1.00)

c

REFERENCE
Surry, AP-16, pp. 4 - 6

ANSWER 4.19 (1.00)

a

ANSWERS -- SURRY 1&2 -85/04/08-PICKER, B.

REFERENCE
Surry, EP-1.00, p. 3

ANSWER 4.20 (1.00)

a

REFERENCE
Surry, 1-CP-1.5, p. 3

ANSWER 4.21 (1.00)

b

REFERENCE
Surry, AP-43, p. 2

ANSWER 4.22 (1.00)

b.

REFERENCE
Surry Abnormal Procedures; AP-20

ANSWER 4.23 (1.00)

~~b.~~ d.

REFERENCE
Surry EP-1.02a, p. 5

ANSWER 4.24 (1.00)

c.

REFERENCE
Surry EP-2.00, foldout page

ANSWER 4.25 (1.00)

c.

REFERENCE
Surry EP-2.01, foldout page