FEB 26 1992

Docket No. 50-285
License No. DPR-40

Omaha Public Power District
ATTN: W. G. Gates, Division Manager
Nuclear Operations
444 South 16th Street Mall
Mail Stop FE/EP4
Omaha, NE 68102-2247

Gentlemen:

SUBJECT: GENERIC FUNDAMENTALS EXAMINATION RESULTS

This letter forwards the results of the Generic Fundamentals Examination Section (GFES) of the written operator licensing examination that was administered on February 5, 1992, to nominated employees of your facility. We are forwarding the following items:

- the examination, including answer keys,
- the results for your nominated employees, and
- copies of the individual answer sheets completed by your nominated employees

We request that your training department forward the individual answer sheets and results to the appropriate individuals. It should be noted that the examination was administered in two forms, which were identical except for the sequence of questions.

In accordance with the Commission's regulations, 10 CFR 2.790, a copy of this letter and the examination and answer key will be placed in the NRC's Public Document Room (PDR). The individual results and answer sheets are exempt from public disclosure and therefore will not be placed in the PDR.

Questions concerning this examination should be directed to Dr. George Usova at (301) 504-1064.

Sincerely,

Original Signed By

A. Bill Beach, Director
Division of Reactor Projects

Enclosures: As stated

cc: next page

IE42 1/1

cc:
Omaha Public Power District
ATTN: J. K. Gasper, Training
Manager
P.O. Box 399
Fort Calhoun, NE 68023

DRS:OLS:LA
EMHimes
2/25/92

DRS:OLS:SC
JLPellet
2/25/92

DRS:DivDir
SJCollins
2/26/92

DRS:DivDir
ABBeach
2/26/92

FEB 26 1992

bcc to DCB (IE42)

bcc distribution by RIV:
DRP Section Chief
Resident Inspector
NRR Project Manager
MIS System
Leah Tremper, OC:LFDCB (4503 MNBB)
RIV file
L. Miller, TTC
R. D. Martin, RA
E. M. Himes: GFES file
J. L. Pellet: Rdg file

FEBRUARY 1992 GENERIC FUNDAMENTALS EXAM
PRESSURIZED WATER REACTOR

FORM A	FORM B	ANS
1	29	A or B
2	30	C
3	31	D
4	32	D
5	33	B
6	34	C
7	35	A
8	36	B
9	37	B
10	38	B
11	39	D
12	40	A
13	41	A
14	42	C
15	43	D
16	44	D
17	45	C
18	46	B
19	47	A
20	48	A
21	49	B
22	50	B
23	51	C
24	52	B
25	53	B
26	54	C
27	55	D
28	56	D
29	57	B
30	58	A
31	59	A
32	60	A
33	61	A
34	62	C
35	63	C
36	64	B
37	65	D
38	66	C
39	67	D
40	68	A
41	69	C
42	70	B
43	71	A
44	72	C
45	73	C
46	74	D
47	75	C
48	76	D
49	77	A
50	78	C
51	79	B
52	80	D
53	81	C
54	82	A
55	83	C
56	84	B
57	85	B
58	86	D
59	87	A
60	88	C
61	89	C
62	90	C
63	91	D
64	92	B
65	93	D
66	94	B
67	95	B
68	96	C
69	97	D
70	98	C
71	99	B
72	100	B
73	1	C
74	2	D
75	3	A
76	4	C
77	5	C
78	6	A
79	7	D
80	8	B
81	9	C
82	10	B
83	11	C
84	12	A
85	13	D
86	14	D
87	15	A
88	16	A
89	17	A
90	18	A
91	19	D
92	20	A
93	21	A
94	22	D
95	23	B
96	24	A
97	25	A
98	26	B
99	27	C
100	28	A

UNITED STATES NUCLEAR REGULATORY COMMISSION
PRESSURIZED WATER REACTOR GENERIC FUNDAMENTALS EXAMINATION
FEBRUARY 1992 - FORM A

Please Print:

Name: _____

Facility: _____

ID Number: _____

Start Time: _____ Stop Time: _____

INSTRUCTIONS TO CANDIDATE

Use the answer sheet provided. Each question has equal point value. A score of at least 80% is required to pass this portion of the written licensing examination. All examination papers will be collected 2.5 hours after the examination starts.

SECTION	QUESTIONS	% OF TOTAL	SCORE
COMPONENTS	1 - 44		
REACTOR THEORY	45 - 72		
THERMODYNAMICS	73 - 100		
TOTALS	100		

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

_____

Candidate's Signature

RULES AND GUIDELINES FOR THE GENERIC FUNDAMENTALS EXAMINATION

During the administration of this examination the following rules apply:

1. Print your name in the blank provided on the cover sheet of the examination.

2. Fill in the name of your facility.

3. Fill in the ID Number you were given at registration.

4. Fill in your start and stop times at the appropriate time.

5. Two aids are provided for your use during the examination:

   (1) An equations and conversions sheet contained within the examination copy, and

   (2) Steam tables provided by your proctor.

6. Use only the answer sheet provided. Credit will only be given for answers properly marked on this sheet. Follow the instructions for filling out the answer sheet.

7. Scrap paper will be provided for calculations.

8. Cheating on the examination will result in the automatic forfeiture of this examination. Cheating could also result in severe penalties.

9. Restroom trips are limited. Only <u>ONE</u> examinee may leave the room at a time. In order to avoid the appearance or possibility of cheating, avoid all contact with anyone outside of the examination room.

10. After you have completed the examination, sign the statement on the cover sheet indicating that the work is your own and you have not received or been given any assistance in completing the examination.

11. Turn in your examination materials, answer sheet on top, followed by the examination booklet, then examination aids - steam table booklets, handouts and scrap paper used during the examination.

12. After turning in your examination materials, leave the examination area, as defined by the proctor. If after leaving you are found in the examination area while the examination is in progress, your examination may be forfeited.

GENERIC FUNDAMENTALS EXAMINATIONS SECTION
EQUATIONS AND CONVERSIONS HANDOUT SHEET

EQUATIONS

$\dot{Q} = \dot{m}c_p\Delta T$

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

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

$SUR = 26.06/\tau$

$SUR = \dfrac{26.06(\lambda_{eff}\rho)}{(\bar{\beta} - \rho)}$

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

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

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

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

$\rho = \Delta K_{eff}/K_{eff}$

$$\upsilon(P_e - P_i) + \frac{(\bar{v}_e^2 - \bar{v}_i^2)}{2} + g(z_e - z_i) = 0$$

Cycle Efficiency $= \dfrac{\text{Net Work (out)}}{\text{Energy (in)}}$

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

$CR_1(1 - K_{eff})_1 = CR_2(1 - K_{eff})_2$

$M = 1/(1 - K_{eff}) = CR_1/CR_0$

$M = \dfrac{(1 - K_{eff})_0}{(1 - K_{eff})_1}$

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

$Pwr = W_f\dot{m}$

$\tau = l^*/(\rho - \bar{\beta})$

$l^* = 1 \times 10^{-5}$ seconds

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

CONVERSIONS

1 Curie = 3.7×10^{10} dps

1 hp = 2.54×10^3 BTU/hr

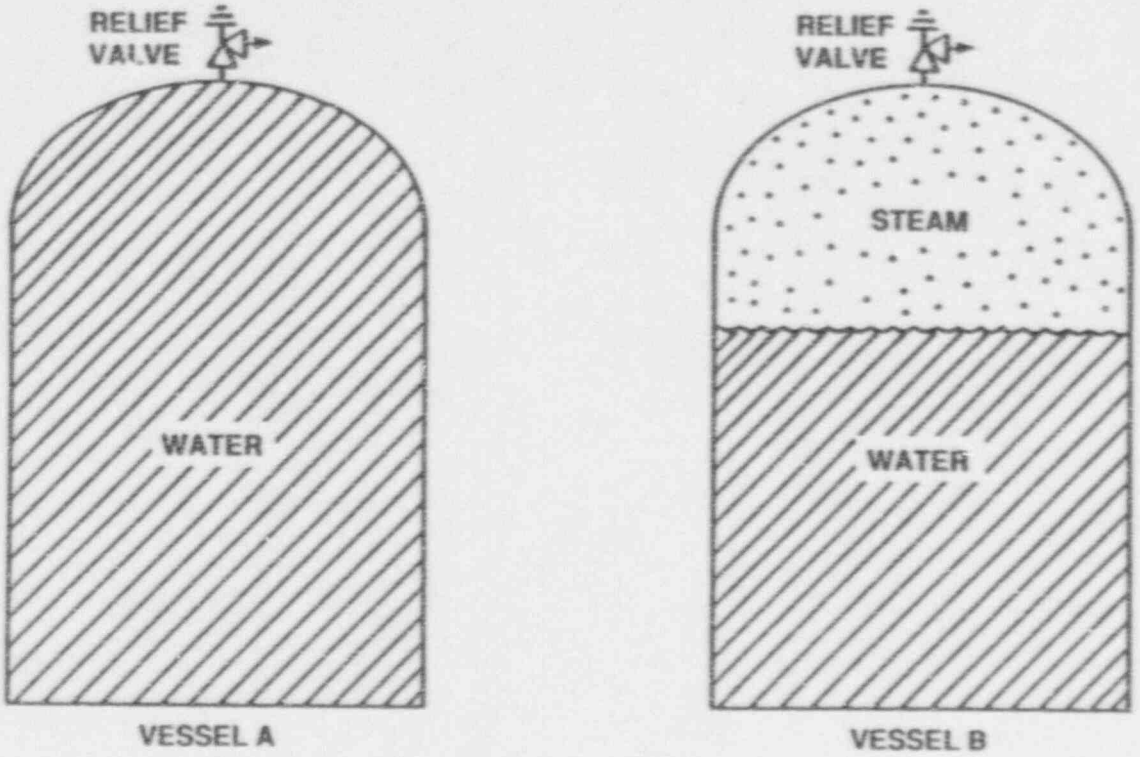
1 BTU = 778 ft-lbf

°C = 5/9(°F - 32)

1 kg = 2.21 lbm

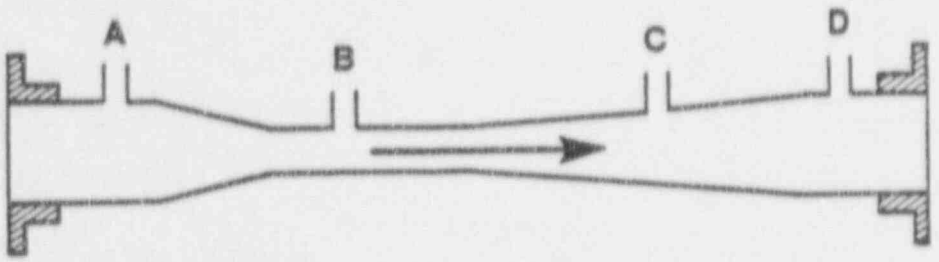
1 Mw = 3.41×10^6 BTU/hr

°F = 9/5 °C + 32



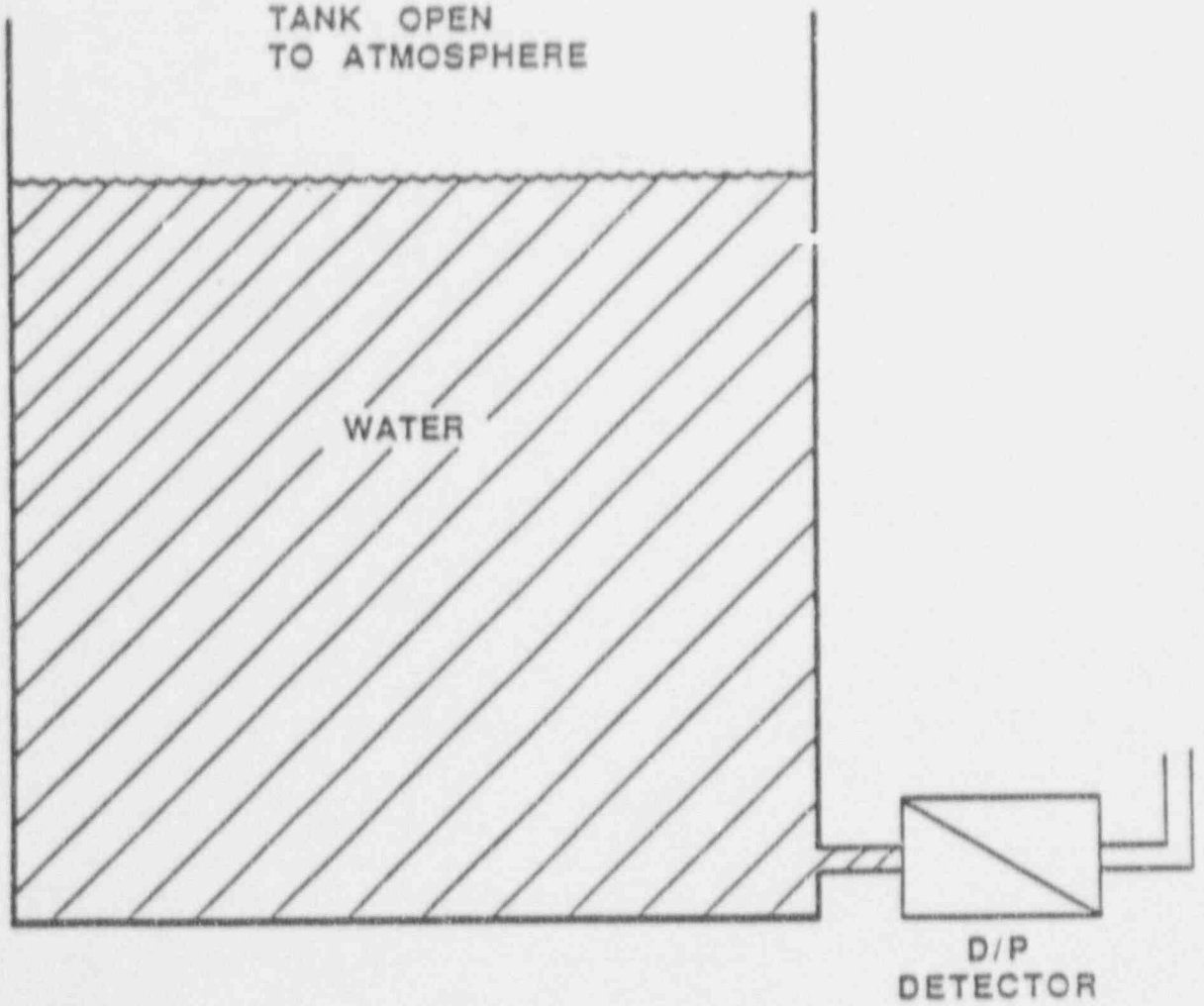
PRESSURE VESSELS WITH RELIEF PROTECTION

FIGURE 1



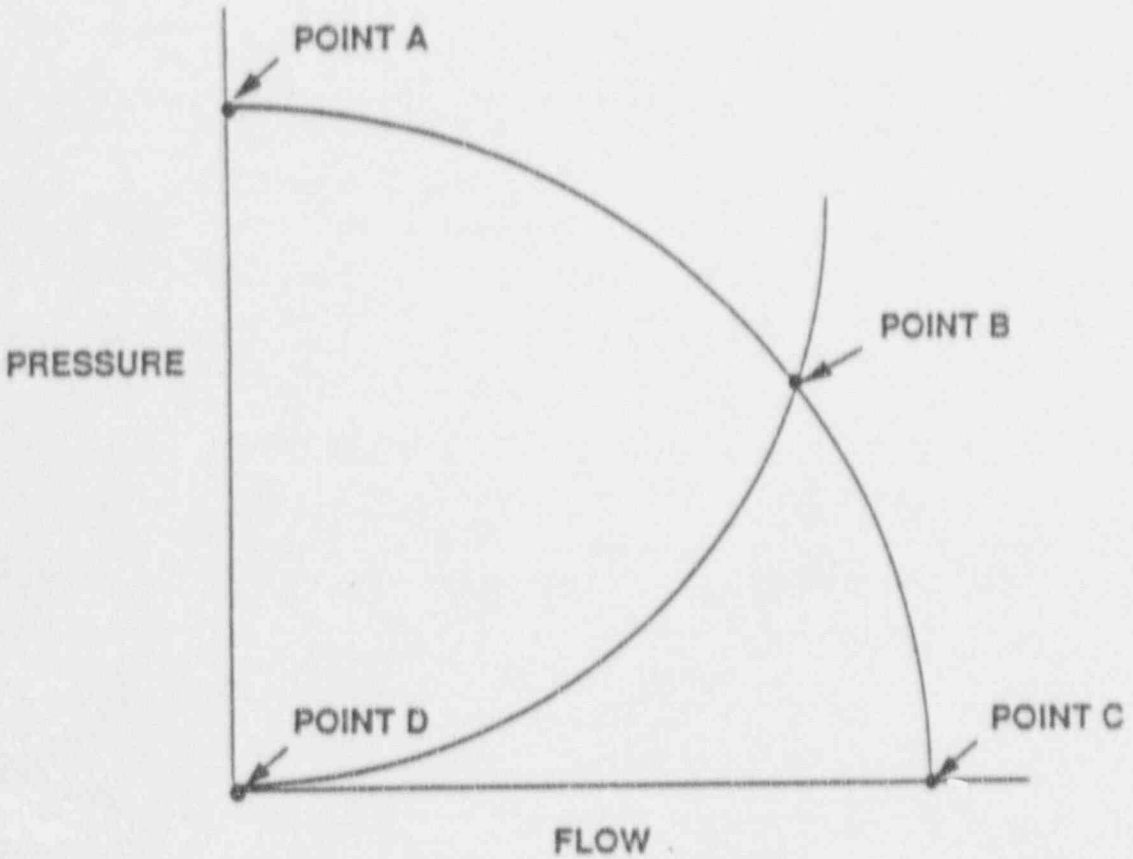
VENTURI FLOW ELEMENT

FIGURE 2



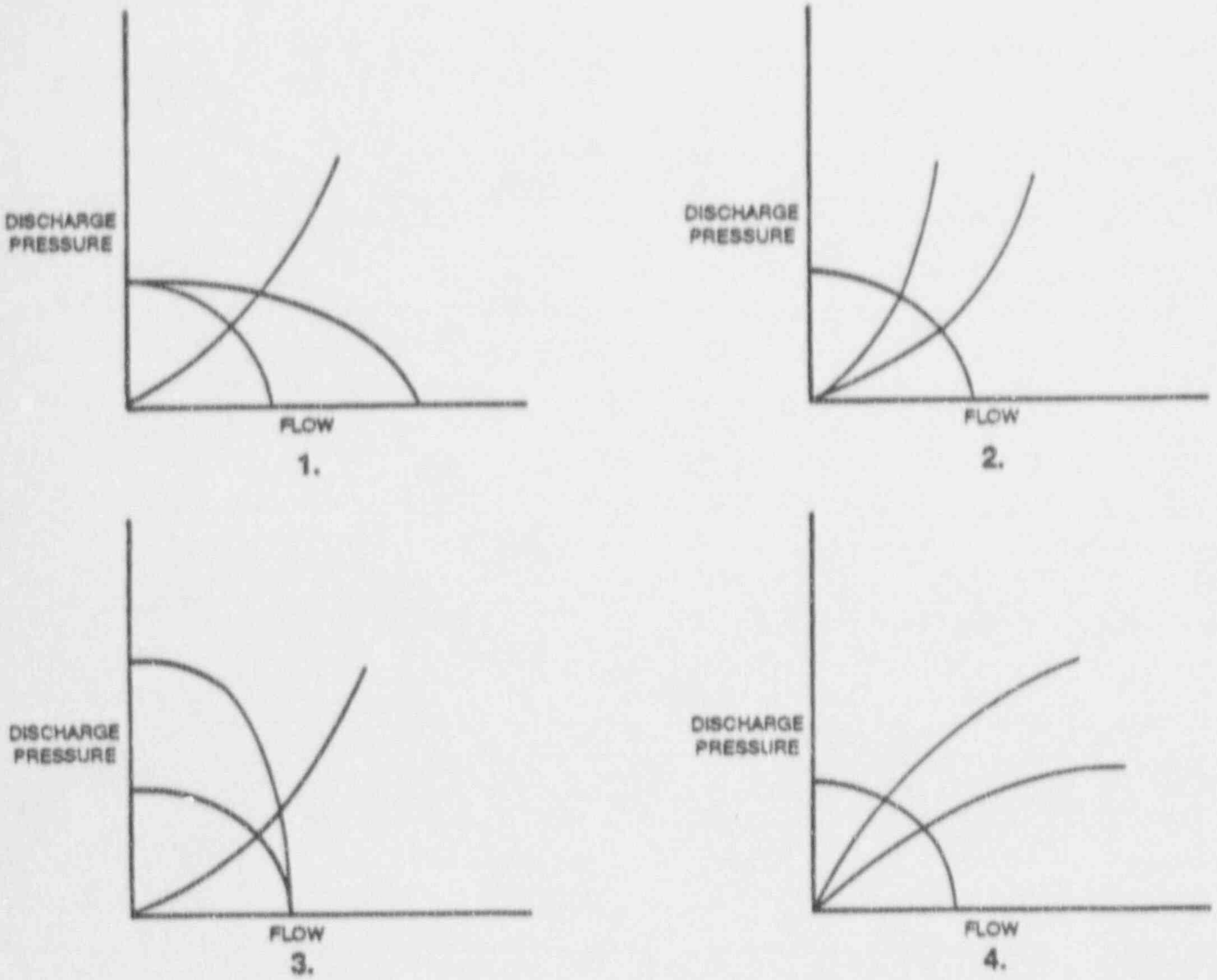
TANK DIFFERENTIAL PRESSURE LEVEL DETECTOR

FIGURE 3



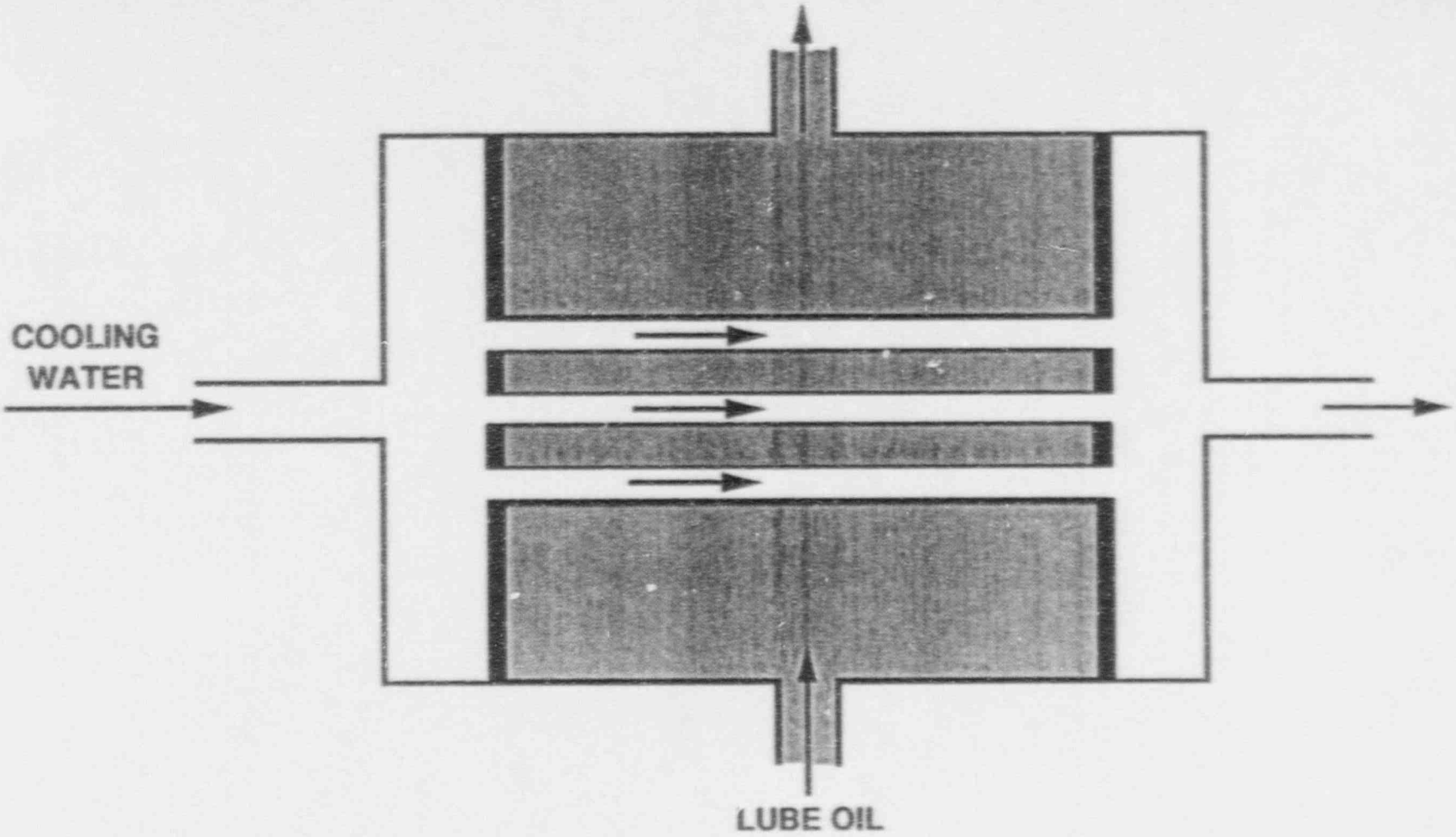
CENTRIFUGAL PUMP OPERATING CURVE

FIGURE 4



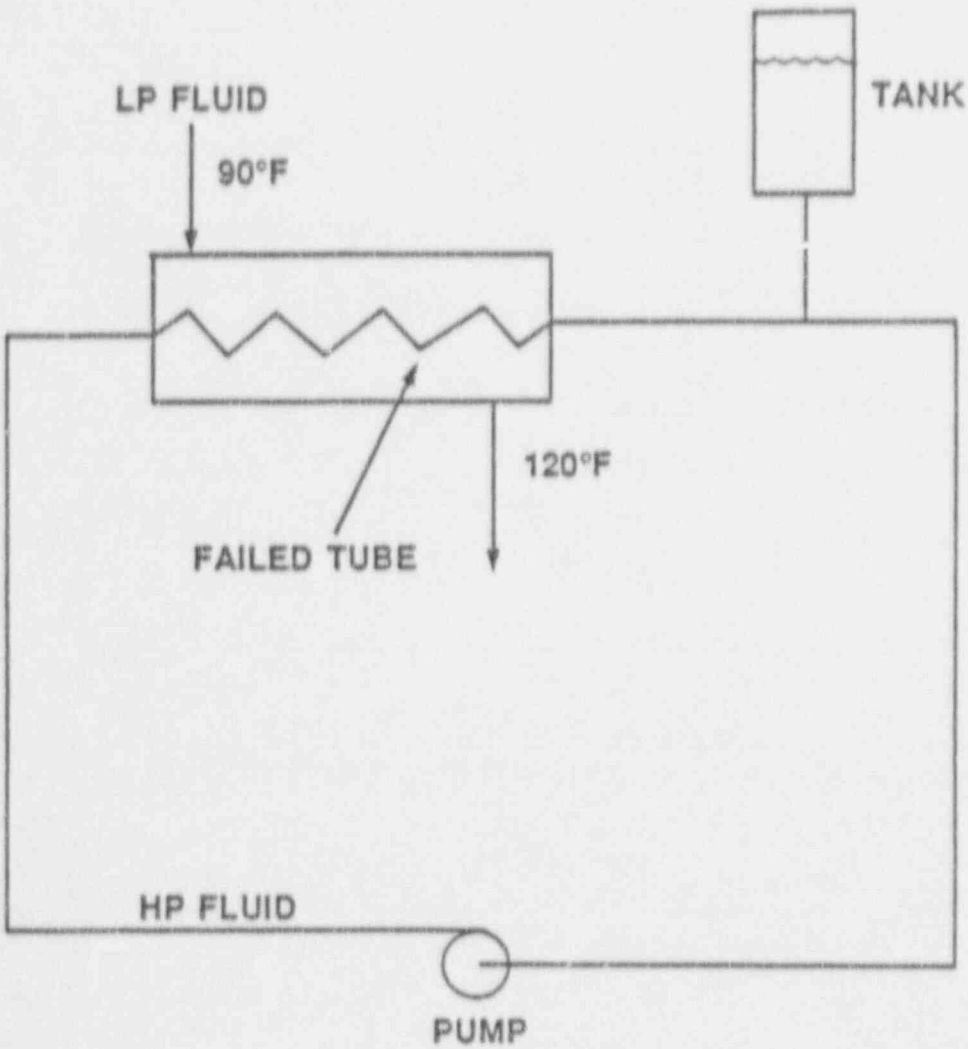
CENTRIFUGAL PUMP OPERATING CURVES

FIGURE 5



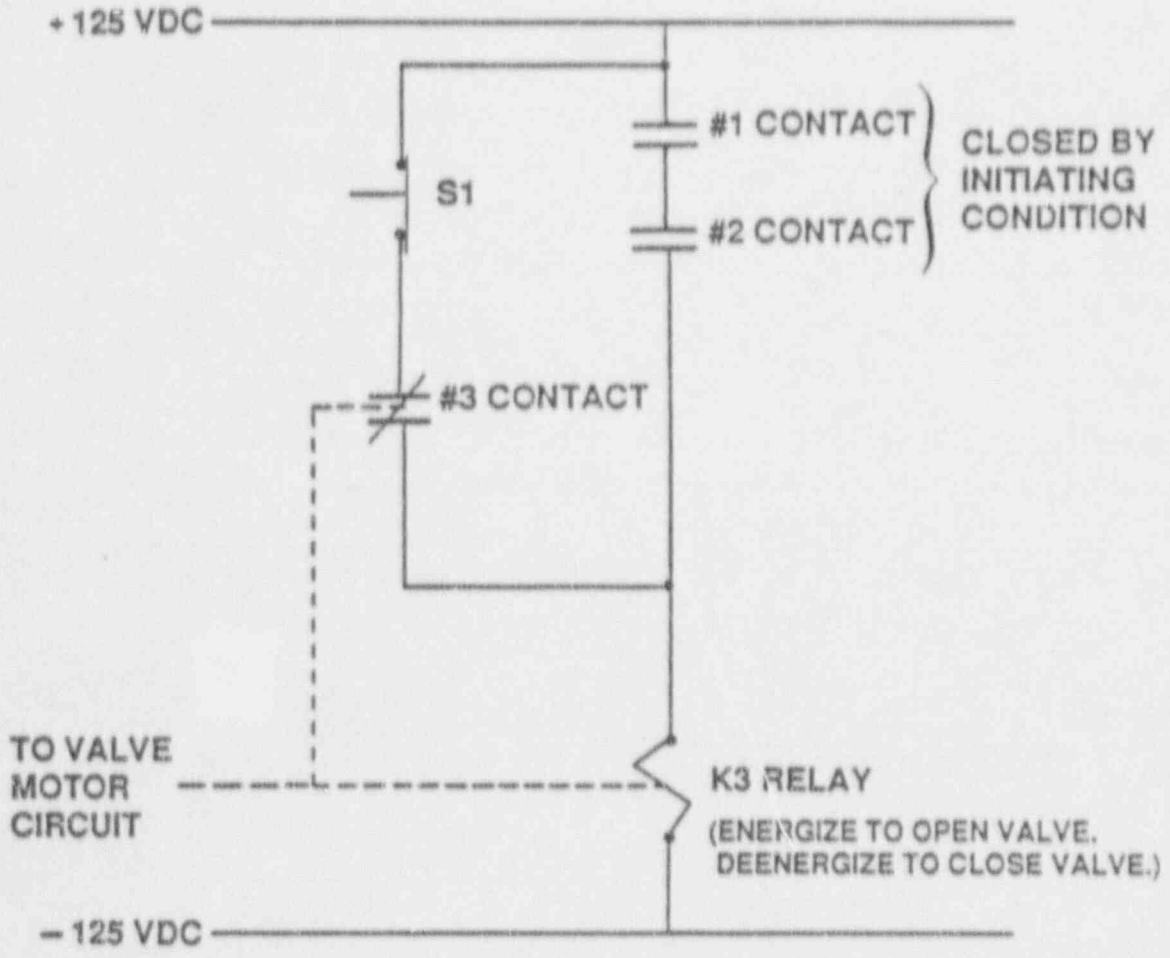
LUBE OIL HEAT EXCHANGER

FIGURE 6



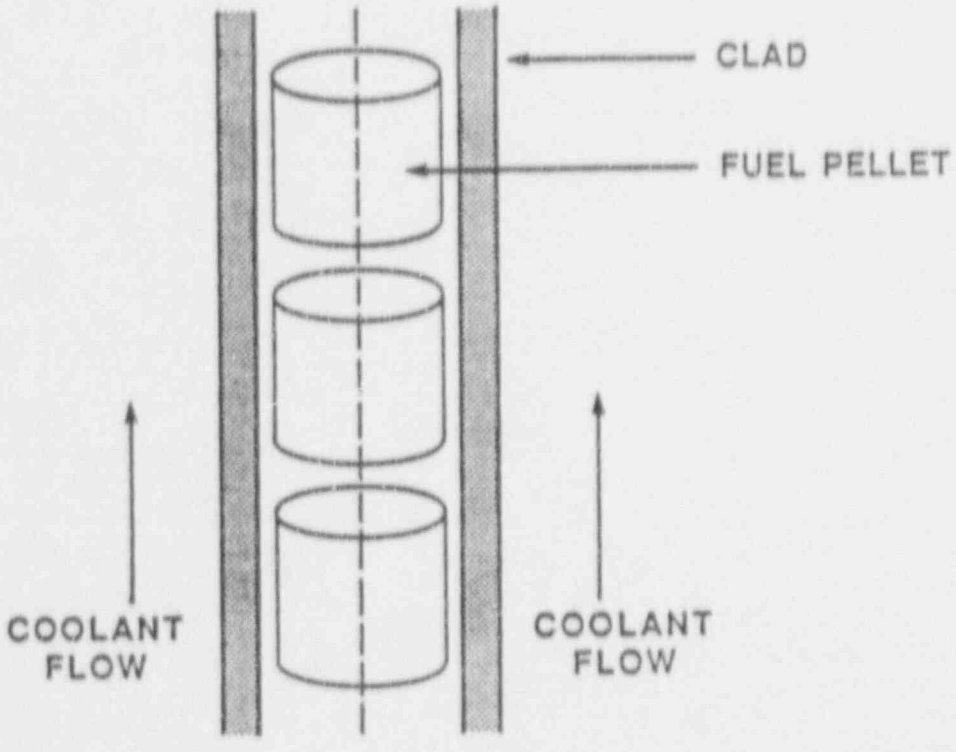
COOLING WATER SYSTEM

FIGURE 7



TYPICAL VALVE CONTROL CIRCUIT

FIGURE 8



FUEL ROD AND COOLANT FLOW CHANNEL

FIGURE 9

USNRC GENERIC FUNDAMENTALS EXAMINATION
PWR - FORM A

QUESTION: 1

Refer to the drawing of two pressure vessels with relief protection (see figure 1).

Vessel A is completely filled with subcooled water and vessel B is in a saturated, two-phase condition. Both vessels are currently isolated and pressurized to 50 psig and are protected by identical relief valves.

If both relief valves open simultaneously and remain open, the faster pressure reduction will occur in vessel _____ and the greater mass loss will occur in vessel _____.

A. A; A

B. A; B

C. B; A

D. B; B

QUESTION: 2

Three common types of check valves used in power plants are:

A. swing, lift, and gate valves.

B. lift, ball, and needle valves.

C. ball, swing, and lift valves.

D. swing, lift, and diaphragm valves.

QUESTION: 3

When comparing the characteristics of gate and globe valves in an operating system, a globe valve generally has the _____ pressure drop when fully open and is the better valve for _____ flow.

A. lower; isolating

B. higher; isolating

C. lower; throttling

D. higher; throttling

QUESTION: 4

An operator should never attempt to manually engage the handwheel on a motor-operated valve whose motor is operating because it might damage the:

A. worm gear pinion.

B. torque switches.

C. limit switches.

D. clutch.

QUESTION: 5

Which type of radiation detector is the most sensitive to LOW level gamma radiation?

A. Ion chamber

B. Geiger-Mueller

C. Proportional

D. Scintillation

QUESTION: 6

If the equalizing line on a differential pressure flow detector is opened, the flow detector indication will:

A. increase slightly.

B. decrease slightly.

C. go to zero.

D. not change.

QUESTION: 7

Refer to the drawing of a venturi flow element (see figure 2).

Where should the high pressure tap of a differential pressure flow detector be connected?

A. Point A

B. Point B

C. Point C

D. Point D

QUESTION: 8

Refer to the drawing of a tank differential pressure (D/P) level detector (see figure 3).

The level detector is being used in a level control system that is calibrated to maintain tank level at 80 percent at the current tank temperature of 100 degrees F. If tank temperature gradually increases and stabilizes at 150 degrees F, the level control system will cause ACTUAL tank level to:

A. remain at 80 percent.

B. increase and stabilize above 80 percent.

C. oscillate around 80 percent.

D. decrease and stabilize below 80 percent.

QUESTION: 9

Please complete the following statement to describe the theory of operation of a differential pressure level detector using a wet reference leg.

The pressure differential between a _____ height of liquid and the pressure sensed at the bottom of a tank is _____ proportional to the height of liquid in the tank.

A. known, directly

B. known, inversely

C. variable, directly

D. variable, inversely

QUESTION: 10

In a diaphragm type pressure detector, pressure is measured using _____ of the diaphragm.

A. radial deflection

B. axial deflection

C. a change in circumference

D. a change in diameter

QUESTION: 11

A bourdon-tube pressure detector that is indicating 50 percent of scale is suddenly exposed to a high-pressure transient that permanently distorts the detector. Actual pressure returns to its original value.

Assuming the detector remains intact, the affected pressure indication will initially go off-scale high, and then:

A. become unpredictable until the instrument is calibrated.

B. return to a pressure less than original pressure.

C. return to original pressure.

D. return to a pressure greater than original pressure.

QUESTION: 12

The output voltage of a thermocouple is _____ proportional to the _____. (Assume reference junction temperature remains constant.)

A. directly; measuring junction temperature

B. directly; square of measuring junction temperature

C. inversely; measuring junction temperature

D. inversely; square of measuring junction temperature

QUESTION: 13

What is the most common type of position sensor used to provide remote indication of a valve that is normally fully open or fully closed?

A. Limit switch

B. Reed switch

C. Linear variable differential transformer (LVDT)

D. Servo transmitter

QUESTION: 14

An automatic tank level controller uses a potentiometer for manual adjustment of the level setpoint which is currently 40 percent. An operator lowers the potentiometer setting to raise the level setpoint signal to a value previously known to maintain tank level at 50 percent. However, actual tank level stabilizes at 60 percent.

The most likely cause is that the potentiometer:

A. slide bar has developed a thin film of corrosion, thereby increasing the resistance of the potentiometer.

B. wiper has lost contact with the slide bar, thereby allowing only fine setpoint adjustments.

C. wiper and slide bar have developed a short circuit, thereby decreasing the resistance of the potentiometer.

D. locking device has not been released, thereby allowing only coarse setpoint adjustments.

QUESTION: 15

A BF3 proportional counter detects both neutrons and gammas. Which of the following best describes the method used to eliminate the gamma contribution from the detector output?

A. Two counters are used, one sensitive to neutron and gamma and the other sensitive to gamma only. The outputs are electrically opposed to cancel the gamma-induced currents and yield a neutron-only signal for indication use.

B. The BF3 proportional detector records neutron flux of sufficient intensity that the gamma signal is insignificant compared to the neutron signal and yields a neutron-only signal for indication use.

C. Gamma-induced detector pulses are of insufficient width to generate a significant log-level amplifier output. Neutron pulses are the only ones with sufficient width to yield a neutron-only signal for indication use.

D. Neutron-induced current pulses are significantly larger than those from gamma. The detector signal is applied to a circuit which filters out the smaller gamma pulses yielding a neutron-only signal for indication use.

QUESTION: 16

The difference between the setpoint and the measured parameter in an automatic flow controller is called:

A. gain.

B. bias.

C. feedback.

D. error.

QUESTION: 17

The output pressure of a pneumatic controller is typically insufficient to drive a valve actuator accurately. To overcome this problem, a control loop would NORMALLY employ a:

A. valve actuating lead/lag unit.

B. pressure regulator.

C. valve positioner.

D. pressure modulator.

QUESTION: 18

The level in a tank is being controlled by an automatic level controller and is initially at the controller setpoint. A drain valve is then opened, causing tank level to begin to decrease. The decreasing level causes the controller to begin to open a makeup supply valve. After a few minutes, a new, steady-state tank level below the original level is established, with the supply rate equal to the drain rate.

The controller in this system uses _____ control.

A. on-off

B. proportional

C. derivative (rate)

D. integral (reset) plus derivative (rate)

QUESTION: 19

When shifting from automatic to manual valve control, the manual and automatic output signals should be MATCHED to:

A. prevent a sudden valve repositioning upon the transfer.

B. ensure the valve will operate upon demand.

C. move the valve to the new position prior to the transfer.

D. ensure valve position indication is accurate.

QUESTION: 20

Refer to the drawing of a centrifugal pump operating curve (see figure 4).

Which point represents the pump shutoff head?

A. Point A

B. Point B

C. Point C

D. Point D

QUESTION: 21

A pump is circulating 200°F water in a closed system equipped with a surge tank. Several hours later, after system cooldown and no lineup changes, the pump is circulating 120°F water.

During the system cooldown, pump motor current has:

A. decreased because water density has increased.

B. increased because water density has increased.

C. decreased because pump motor efficiency has decreased.

D. increased because pump motor efficiency has decreased.

QUESTION: 22

Many larger centrifugal pumps are started with their discharge valves CLOSED to prevent:

A. loss of recirculation (miniflow).

B. overloading the pump motor.

C. cavitation in the pump.

D. lifting the discharge relief valve.

QUESTION: 23

Which of the following is an indication of pump runout?

A. High discharge pressure

B. Low pump motor current

C. High pump flow rate

D. Pump flow reversal

QUESTION: 24

Refer to the drawing of four centrifugal pump operating curves (see figure 5).

A centrifugal pump in a closed system is operating with a partially open discharge valve. The discharge valve is then opened fully. Which set of curves illustrates the initial and final operating conditions?

A. 1.

B. 2.

C. 3.

D. 4.

QUESTION: 25

When flow from a centrifugal pump is increased by throttling open the discharge valve, AVAILABLE net positive suction head (NPSH) _____, and REQUIRED NPSH _____.

A. decreases, decreases

B. decreases, increases

C. increases, increases

D. increases, decreases

QUESTION: 26

The discharge valve of an ideal reciprocating positive displacement pump is throttled toward the closed direction. This causes pump flow to _____ and pump head to _____. (Assume "ideal" pump response.)

A. remain constant; remain constant

B. decrease; remain constant

C. remain constant; increase

D. decrease; increase

QUESTION: 27

If the generator bearings on a motor-generator begin to fail from overheating, then:

A. generator current will increase.

B. generator windings will overheat.

C. motor current will decrease.

D. motor windings will overheat.

QUESTION: 28

Excessive AC motor current can be caused DIRECTLY by operating the motor:

A. completely unloaded.

B. at full load.

C. with open-circuited windings.

D. with short-circuited windings.

QUESTION: 29

A centrifugal pump has been running at an elevated temperature due to insufficient ventilation when an operator changes the ventilation lineup to cool the pump motor. Assuming pump flow rate and applied voltage remain constant, how will decreasing motor temperature affect the motor current?

A. Increase, because motor efficiency decreases

B. Decrease, because motor efficiency increases

C. Increase, because stator resistance decreases

D. Decrease, because stator resistance increases

QUESTION: 30

A centrifugal pump has a flow rate of 3,000 gpm and a current requirement of 200 amps. If the speed is reduced such that the flow rate is 2,000 gpm, what is the final CURRENT requirement at the new lower speed? (Assume a constant motor voltage.)

A. 59 amps

B. 89 amps

C. 133 amps

D. 150 amps

QUESTION: 31

If the discharge valve of a large AC motor-driven centrifugal pump remains closed during a normal pump start, the motor ammeter indication will rise to:

A. several times the full-load current value and then decrease to the no-load current value.

B. approximately the full-load current value and then decrease to the no-load current value.

C. several times the full-load current value and then decrease to the full-load value.

D. approximately the full-load current value and then stabilize at the full-load current value.

QUESTION: 32

Refer to the drawing of a lube oil heat exchanger (see figure 6).

Increasing the oil flow rate through the heat exchanger will cause the oil outlet temperature to _____ and the cooling water outlet temperature to _____. (Assume cooling water flow rate remains the same.)

A. increase; increase

B. increase; decrease

C. decrease; increase

D. decrease; decrease

QUESTION: 33

During normal steady-state plant operation with a constant generator load, plugging of 1 percent of the tubes in the main condenser will cause absolute pressure in the condenser to _____ and hotwell temperature to _____.

A. increase; increase

B. decrease; increase

C. increase; decrease

D. decrease; decrease

QUESTION: 34

Refer to the drawing of an operating cooling water system (see figure 7).

Which of the following effects would occur as a result of a tube FAILURE in the heat exchanger?

A. Pressure in the low pressure system decreases.

B. Flow in the low pressure system reverses.

C. Temperature in the low pressure system increases.

D. Level in the tank increases.

QUESTION: 35

The demineralization factor (DF) of a demineralizer can be expressed as:

A. (Inlet Conductivity) - (Outlet Conductivity).

B. (Outlet Conductivity) - (Inlet Conductivity).

C. (Inlet Conductivity) + (Outlet Conductivity).

D. (Outlet Conductivity) + (Inlet Conductivity).

QUESTION: 36

A lower than expected differential pressure across a demineralizer is an indication of:

A. depletion of the cation resin.

B. channeling through the resin bed.

C. improper resin regeneration.

D. excessive accumulation of suspended solids.

QUESTION: 37

The temperature of the water passing through a demineralizer must be controlled because EXCESSIVELY HOT water will:

A. increase the ion exchange rate for hydronium ions, thereby changing effluent pH.

B. degrade the corrosion inhibitor applied to the inner wall of the demineralizer.

C. result in excessive demineralizer retention element thermal expansion, thereby releasing resin.

D. reduce the affinity of the demineralizer resin for ion exchange.

QUESTION: 38

Which of the following describes the normal operation of a local circuit breaker overcurrent trip flag indicator?

A. Actuates to cause a breaker trip when the overcurrent trip setpoint is reached and must be manually reset when the overcurrent condition clears.

B. Actuates to satisfy an electrical interlock when no lockout is present which is necessary to remotely close a breaker.

C. Actuates when a breaker overcurrent trip has occurred and must be manually reset when the overcurrent condition clears.

D. Actuates when the associated breaker has failed to trip on an overcurrent condition and must be manually reset when the overcurrent condition clears.

QUESTION: 39

Which of the following would cause a loss of ability to remotely trip a circuit breaker AND a loss of position indication?

A. Failure of breaker control switch

B. Breaker in "test" position

C. Mechanical binding of breaker

D. Loss of breaker control power

QUESTION: 40

A typical 120 VAC manual circuit breaker has tripped due to overload. Which of the following must be performed to CLOSE this circuit breaker?

A. The handle must be moved from the mid-position to the OFF position to reset the trip latch, and then to the ON position.

B. The handle must be moved from the OFF position to the mid-position to reset the trip latch, and then to the ON position.

C. The handle must be moved from the mid-position directly to the ON position. Trip latch reset is not required.

D. The handle must be moved from the OFF position directly to the ON position. Trip latch reset is not required.

QUESTION: 41

A thermal overload protective device protects a motor by:

A. adding series resistors to limit starting current.

B. adding parallel resistors to limit starting current.

C. deenergizing the motor if current becomes excessive.

D. slowing down the motor if current becomes excessive.

QUESTION: 42

Refer to the drawing of a typical valve control circuit for a 480 VAC motor-operated valve (see figure 8).

The valve is currently open with the contact configuration as shown. If the S1 pushbutton is depressed, the valve will _____ and when the S1 pushbutton is subsequently released, the valve will _____.

A. remain open; remain open

B. close; remain closed

C. remain open; clos.

D. close; open

QUESTION: 43

Closing a generator output breaker with generator voltage equal to grid voltage and generator frequency much less than grid frequency (but still "in sync") will cause the breaker to trip on:

A. reverse power.

B. underfrequency.

C. overcurrent.

D. overspeed.

QUESTION: 44

High voltage electrical disconnects function to:

A. adjust the voltage output from a main power transformer.

B. trip open before bus feeder breakers upon electrical bus faults.

C. provide equipment isolation under no load conditions.

D. bypass and isolate an electrical bus while maintaining the downstream buses energized.

QUESTION: 45

Delayed neutrons are neutrons that:

A. have reached thermal equilibrium with the surrounding medium.

B. are born within 10^{-14} seconds of the fission event.

C. are born at the lowest average kinetic energy of all fission neutrons.

D. are responsible for the majority of U-235 fissions.

QUESTION: 46

Which term is described by the following?

"The fractional change of the effective multiplication factor from criticality." OR "A measure of a reactor's departure from criticality."

A. 1/M

B. K_{eff}

C. Reactor period

D. Reactivity

QUESTION: 47

With K_{eff} = 0.985, how much reactivity must be added to make the reactor critical?

A. 1.48%, delta-K/K

B. 1.50%, delta-K/K

C. 1.52%, delta-K/K

D. 1.54%, delta-K/K

QUESTION: 48

A subcritical reactor has an initial K_{eff} of 0.8 at a source range count rate of 100 cps. Positive reactivity is added until K_{eff} equals 0.95. What is the final equilibrium source range count rate?

A. 150 cps

B. 200 cps

C. 300 cps

D. 400 cps

QUESTION: 49

Which one of the following conditions will initially result in a positive startup rate when the reactor is at power?

A. Increase in turbine loading

B. Unintentional boration

C. Turbine runback

D. Accidental closure of a main steam isolation valve

QUESTION: 50

In which of the following conditions is the moderator temperature coefficient most negative?

A. BOL, high temperature.

B. BOL, low temperature.

C. EOL, high temperature.

D. EOL, low temperature.

QUESTION: 51

Which one of the following contains parameters that, if varied, will each have a direct effect on the power defect?

A. Control rod position, reactor power, and moderator voids

B. Moderator voids, fuel temperature, and moderator temperature

C. Fuel temperature, xenon level, and control rod position

D. Moderator temperature, RCS pressure, and xenon level

QUESTION: 52

Given the following initial parameters, select the final reactor coolant boron concentration required to increase average coolant temperature by 6 degrees F. (Assume no change in rod position or reactor/turbine power.)

Initial RCS boron concentration	= 500 ppm
Moderator temperature coef.	= -0.012% delta-K/K per degree F
Differential boron worth	= -0.008% delta-K/K per ppm
Inverse boron worth	= -125 ppm/% delta-K/K

A. 509 ppm

B. 504 ppm

C. 496 ppm

D. 491 ppm

QUESTION: 53

A reactivity coefficient measures _____ change while a reactivity defect (deficit) measures a _____ change in reactivity due to a change in the measured parameter.

A. an integrated, total

B. a rate of, differential

C. a differential, total

D. a total, differential

QUESTION: 54

The reactor is exactly critical below the point of adding heat when control rods (CEAs) are manually inserted for 5 seconds. Reactor power will:

A. decrease to a shutdown power level low in the source (startup) range.

B. decrease temporarily, then return to the original value due to the resulting decrease in moderator temperature.

C. decrease until inherent positive reactivity feedback causes the reactor to become critical at a lower neutron level.

D. decrease temporarily, then return to the original value due to subcritical multiplication.

QUESTION: 55

The total amount of reactivity added by a control rod (CEA) position change from a reference height to any other rod height is called:

A. differential rod (CEA) worth.

B. shutdown reactivity.

C. integral rod (CEA) worth.

D. reference reactivity.

QUESTION: 56

The differential control rod (CEA) worth is small at the top and bottom of the core compared to the center due to the effects of:

A. boron concentration.

B. neutron flux distribution.

C. xenon concentration.

D. fuel temperature distribution.

QUESTION: 57

The main reason for designing and operating a reactor with a flattened neutron flux distribution is to:

A. provide even burnup of control rods (CEAs).

B. allow a higher average power density.

C. provide more accurate nuclear power indication.

D. improve fuel efficiency by reducing neutron leakage.

QUESTION: 58

Fission product poisons can be differentiated from other fission products in that fission product poisons:

A. have a higher fission cross section for thermal neutrons.

B. have a longer half-life.

C. are produced in a larger percentage of fissions.

D. are stronger absorbers of thermal neutrons.

QUESTION: 59

In a shutdown reactor, which decay chain describes the primary means of removing Xenon-135?

A. $^{135}Xe \xrightarrow{\beta^-} {}^{135}Cs$

B. $^{135}Xe \xrightarrow{n} {}^{134}Xe$

C. $^{135}Xe \xrightarrow{\alpha} {}^{131}Te$

D. $^{135}Xe \xrightarrow{\beta^+} {}^{135}I$

QUESTION: 60

A reactor has been operating at 50 percent power for a week when power is quickly ramped (over 4 hours) to 100 percent. How will the xenon concentration in the core respond?

A. Decreases initially, then builds to a new equilibrium concentration in 8 to 10 hours.

B. Increases steadily to a new equilibrium concentration in 20 to 30 hours.

C. Decreases initially, then builds to a new equilibrium concentration in 40 to 50 hours.

D. Increases steadily to a new equilibrium concentration in 60 to 70 hours.

QUESTION: 61

Which one of the following occurrences can cause reactor power to fluctuate between the top and bottom of the core when steam demand is constant?

A. Steam generator level transients

B. Iodine spiking

C. Xenon oscillations

D. Inadvertent boron dilution

QUESTION: 62

A reactor has been operating at full power for several days when a reactor trip occurs. If the reactor had been operating at 50 percent power, xenon would have peaked _____ and the peak xenon reactivity would have been _____.

A. earlier; the same

B. at the same time; the same

C. earlier; less negative

D. at the same time; less negative

QUESTION: 63

Twenty-four hours after a reactor trip from a long-term, steady-state, rated-power run, the xenon concentration will be:

A. much higher than at the time of the trip and increasing.

B. much lower than at the time of the trip and decreasing.

C. approximately the same as at the time of the trip and increasing.

D. approximately the same as at the time of the trip and decreasing.

QUESTION: 64

Burnable poisons are installed in a new reactor core instead of using a higher soluble boron concentration to:

A. prevent boron precipitation during normal operation.

B. develop a less positive moderator temperature coefficient.

C. allow control rods (CEAs) to be withdrawn farther upon initial criticality.

D. maintain reactor coolant pH above a minimum acceptable value.

QUESTION: 65

While withdrawing control rods (CEAs) during an approach to criticality, the stable count rate doubles. If the same amount of reactivity that caused the first doubling is added again, stable count rate will _____ and the reactor will be _____.

A. double; subcritical

B. more than double; subcritical

C. double; critical

D. more than double; critical

QUESTION: 66

At end of core life, critical rod (CEA) position has been calculated for a reactor startup 4 hours after a trip from 100 percent power equilibrium conditions. The actual critical rod (CEA) position will be LOWER than the predicted critical rod (CEA) position if:

A. the startup is delayed until 8 hours after the trip.

B. the steam dump pressure setpoint is lowered by 100 psi prior to reactor startup.

C. actual boron concentration is 10 ppm more than the assumed boron concentration.

D. one control rod (CEA) remains fully inserted during the approach to criticality.

QUESTION: 67

To predict criticality, the operator must predict the amount of positive reactivity that must be added to overcome the effects of:

A. boron, moderator voids, and burnable poisons.

B. control rods (CEAs), xenon, and moderator temperature.

C. power defect, burnable poisons, and control rods (CEAs).

D. moderator temperature, moderator voids, and xenon.

QUESTION: 68

Which of the following indicates that the reactor has achieved criticality during a normal reactor startup?

A. Constant positive startup rate during rod withdrawal

B. Increasing positive startup rate during rod withdrawal

C. Constant positive startup rate with no rod motion

D. Increasing positive startup rate with no rod motion

QUESTION: 69

The reactor is operating at 100 percent reactor power at the end of core life with all control systems in manual. The reactor operator inadvertently adds 10 gallons of boric acid to the Reactor Coolant System (RCS).

Which of the following will occur as a result of the boric acid addition? (Assume megawatt output remains constant.)

A. RCS pressure will increase and stabilize at a higher value.

B. Reactor power will decrease and stabilize at a lower value.

C. T_{ave} will increase and stabilize at a higher value.

D. Pressurizer level will decrease and stabilize at a lower value.

QUESTION: 70

The reactor is critical at a stable power level below the point of adding heat (POAH). An unisolable steam line break occurs and 3 percent of rated steam flow is escaping.

Assuming no reactor trip, which one of the following describes the response of the reactor? (Assume a negative moderator temperature coefficient.)

A. The reactor will go subcritical. T_{ave} will decrease.

B. The reactor will go to 3 percent power. T_{ave} will increase.

C. The reactor will go to 3 percent power. T_{ave} will decrease.

D. Power will not change because the reactor was below the POAH. T_{ave} will decrease.

QUESTION: 71

Shortly after a reactor trip, reactor power indicates 0.05 percent when a stable negative startup rate is attained. How much additional time is required for reactor power to decrease to 0.005 percent?

A. 90 seconds

B. 180 seconds

C. 270 seconds

D. 360 seconds

QUESTION: 72

After one month of operation at 100 percent reactor power, the fraction of thermal power being produced from the decay of fission products in the operating reactor is:

A. greater than 10 percent.

B. greater than 5 percent but less than 10 percent.

C. greater than 1 percent but less than 5 percent.

D. less than 1 percent.

QUESTION: 73

If a main steam line pressure gauge reads 900 psig, what is the absolute pressure?

A. 870 psia

B. 885 psia

C. 915 psia

D. 930 psia

QUESTION: 74

Consider a water/steam mixture with a current quality of 99%. If pressure remains constant and heat is removed from the mixture, the temperature of the mixture will _____ and the quality of the mixture will _____. (Assume the mixture remains saturated.)

A. decrease; remain the same

B. decrease; decrease

C. remain the same; remain the same

D. remain the same; decrease

QUESTION: 75

If a wet vapor is at 130 degrees F and has a quality of 90 percent, its specific enthalpy is:

A. 1,015.7 BTU/lbm.

B. 1,019.8 BTU/lbm.

C. 1,117.8 BTU/lbm.

D. 1,215.8 BTU/lbm.

QUESTION: 76

What is the condensate depression in a condenser operating at 26 inches Hg vacuum with a condensate temperature of 100°F?

A. 2°F

B. 15°F

C. 26°F

D. 53°F

QUESTION: 77

The reactor is operating at 100% power. Which of the following steam parameters will increase as steam escapes via a main steam header-to-atmosphere leak?

A. Enthalpy

B. Pressure

C. Specific volume

D. Temperature

QUESTION: 78

The addition of feedwater heaters increases secondary plant efficiency because:

A. the average temperature at which heat is transferred in the steam generators is increased.

B. less steam flow passes through the turbine, thereby increasing turbine efficiency.

C. increased feedwater temperature lowers the temperature at which heat is rejected in the condenser.

D. less power is required by the feedwater pumps to pump the warmer feedwater.

QUESTION: 79

The main reason for keeping condensate out of the steam lines is to:

A. minimize corrosion buildup.

B. reduce heat losses.

C. eliminate steam traps.

D. prevent water/steam hammer.

QUESTION: 80

Mass flow rate equals volumetric flow rate ($\dot{V}$) times:

A. specific volume.

B. density.

C. specific gravity.

D. velocity.

QUESTION: 81

The piping system pressure change caused by suddenly stopping fluid flow is referred to as:

A. cavitation.

B. shutoff head.

C. water hammer.

D. flow head.

QUESTION: 82

Cavitation in an operating pump may be caused by:

A. lowering the suction temperature.

B. throttling down on the pump suction valve.

C. throttling down on the pump discharge valve.

D. decreasing the pump speed.

QUESTION: 83

Flow instruments used to measure the mass flow rate of saturated steam are density compensated because, for a steam pressure increase at a constant volumetric flow rate, steam density will _____ and the actual mass flow rate will _____.

A. decrease; increase

B. increase; decrease

C. increase; increase

D. decrease; decrease

QUESTION: 84

Refer to the drawing of a fuel rod and coolant flow channel at beginning of core life (see figure 9).

What is the PRIMARY method of heat transfer through the gap between the reactor fuel and the fuel clad?

A. Conduction

B. Convection

C. Radiation

D. Natural circulation

QUESTION: 85

In a two-loop pressurized water reactor, feedwater flow to each steam generator (S/G) is 3.3×10^6 lbm/hr at an enthalpy of 419 BTU/lbm. The steam exiting each S/G is at 800 psia with 100 percent steam quality.

Ignoring blowdown and pump heat, what is the core thermal power?

A. 3,411 MWt

B. 2,915 MWt

C. 2,212 MWt

D. 1,509 MWt

QUESTION: 86

Convection heat transfer improves when nucleate boiling begins on the surface of a fuel rod because:

A. steam bubble formation decreases coolant flow along the fuel rod.

B. steam bubble formation increases coolant flow along the fuel rod.

C. a steam blanket begins to form along the surface of the fuel rod.

D. the motion of the steam bubbles causes rapid mixing of the coolant.

QUESTION: 87

How does critical heat flux vary from the bottom to the top of the reactor core during normal full power operation?

A. Decreases continuously

B. Decreases then increases

C. Increases continuously

D. Increases then decreases

QUESTION: 88

Select the statement that describes the effect of transition (partial film) boiling at the fuel clad surface-to-coolant interface.

A. A small increase in heat flux causes increased steam blanketing and a large increase in clad temperature.

B. The temperature of the fuel clad surface is so high that thermal radiation heat transfer becomes significant, which causes heat flux to increase.

C. A small increase in heat flux increases the formation of steam bubbles causing increased agitation and turbulence of the boundary layer, consequently decreasing clad temperature.

D. As the heat flux increases, a few vapor bubbles are formed but collapse when they enter into the bulk of the fluid, which decreases clad temperature.

QUESTION: 89

If heat flux in a reactor core steadily increases, the boiling heat transfer regime that will be achieved once the critical heat flux is exceeded is:

A. transition boiling.

B. subcooled nucleate boiling.

C. saturated nucleate boiling.

D. stable film boiling.

QUESTION: 90

In the definition of the departure from nucleate boiling ratio, the term ACTUAL HEAT FLUX refers to the:

A. heat transfer rate per unit area at any point along the fuel rod.

B. heat transfer rate along the entire fuel rod.

C. average heat transfer rate per unit area across the core.

D. total heat transferred along the fuel rod.

QUESTION: 91

Increasing coolant flow rate through the reactor core improves heat transfer from the fuel because it _____ laminar flow and _____ the temperature of the coolant adjacent to the fuel.

A. increases; increases

B. increases; decreases

C. decreases; increases

D. decreases; decreases

QUESTION: 92

Refer to the drawing of a fuel rod and coolant flow channel (see figure 9).

At 100 percent reactor power, the GREATEST temperature difference in a fuel channel radial temperature profile will occur across the: (Assume the temperature profile begins at fuel centerline.)

A. fuel.

B. fuel-to-clad gap.

C. zircalloy cladding.

D. flow channel boundary (laminar) layer.

QUESTION: 93

The driving head for natural circulation flow through the core is developed by differences in _____ between the hot leg and the cold leg.

A. water density

B. water volume

C. pipe diameter

D. piping length

QUESTION: 94

During normal operation, fuel clad integrity is ensured by:

A. the primary system relief valves.

B. core bypass flow restrictions.

C. the secondary system relief valves.

D. operating within core thermal limits.

QUESTION: 95

Refer to the drawing of a fuel rod and coolant flow channel (see figure 9) at beginning of core life.

Given the following initial core parameters:

Reactor power = 100 percent
$T_{coolant}$ = 500 degrees F
$T_{fuel\ centerline}$ = 3000 degrees F

What would the fuel centerline temperature be if, over core life, the total fuel-to-coolant thermal conductivity were doubled? (Assume reactor power is constant.)

A. 2000 degrees F

B. 1750 degrees F

C. 1500 degrees F

D. 1250 degrees F

QUESTION: 96

The nil-ductility temperature is that temperature:

A. below which the probability of brittle fracture significantly increases.

B. determined by fracture mechanics to be equivalent to reference transition temperature.

C. determined by Charpy V-notch test to be equivalent to reference transition temperature.

D. below which the yield stress of the metal is inversely proportional to Young's modulus of elasticity.

QUESTION: 97

A heatup stress applied to the reactor vessel is:

A. compressive at the inner wall and tensile at the outer wall.

B. tensile at the inner wall and compressive at the outer wall.

C. tensile across the entire wall.

D. compressive across the entire wall.

QUESTION: 98

The likelihood of brittle fracture failure of the reactor vessel is reduced by:

A. increasing vessel age.

B. reducing reactor vessel pressure.

C. reducing reactor vessel temperature.

D. reducing gamma flux exposure.

QUESTION: 99

After several years of operation the maximum allowable stress to the reactor pressure vessel is more limited by the inner wall than the outer wall because:

A. there is a temperature gradient across the reactor pressure vessel wall.

B. the inner wall has a smaller surface area than the outer wall.

C. the inner wall experiences more neutron-induced embrittlement than the outer wall.

D. the inner wall experiences more tensile stress than the outer wall.

USNRC GENERIC FUNDAMENTALS EXAMINATION
PWR - FORM A

QUESTION: 100

Pressurized thermal shock would most likely be a concern during an uncontrolled:

A. cooldown followed by a rapid repressurization.

B. depressurization followed by a rapid repressurization.

C. cooldown followed by a rapid depressurization.

D. depressurization followed by a rapid cooldown.

UNITED STATES NUCLEAR REGULATORY COMMISSION
PRESSURIZED WATER REACTOR GENERIC FUNDAMENTALS EXAMINATION
FEBRUARY 1992 - FORM B

Please Print:

Name: _____

Facility: _____

ID Number: _____

Start Time: _____ Stop Time: _____

INSTRUCTIONS TO CANDIDATE

Use the answer sheet provided. Each question has equal point value. A score of at least 80% is required to pass this portion of the written licensing examination. All examination papers will be collected 2.5 hours after the examination starts.

SECTION	QUESTIONS	% OF TOTAL	SCORE
THERMODYNAMICS	1 - 28		
COMPONENTS	29 - 72		
REACTOR THEORY	73 - 100		
TOTALS	100		

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

_____

Candidate's Signature

RULES AND GUIDELINES FOR THE GENERIC FUNDAMENTALS EXAMINATION

During the administration of this examination the following rules apply:

1. Print your name in the blank provided on the cover sheet of the examination.

2. Fill in the name of your facility.

3. Fill in the ID Number you were given at registration.

4. Fill in your start and stop times at the appropriate time.

5. Two aids are provided for your use during the examination:

   (1) An equations and conversions sheet contained within the examination copy, and

   (2) Steam tables provided by your proctor.

6. Use only the answer sheet provided. Credit will only be given for answers properly marked on this sheet. Follow the instructions for filling out the answer sheet.

7. Scrap paper will be provided for calculations.

8. Cheating on the examination will result in the automatic forfeiture of this examination. Cheating could also result in severe penalties.

9. Restroom trips are limited. Only ONE examinee may leave the room at a time. In order to avoid the appearance or possibility of cheating, avoid all contact with anyone outside of the examination room.

10. After you have completed the examination, sign the statement on the cover sheet indicating that the work is your own and you have not received or been given any assistance in completing the examination.

11. Turn in your examination materials, answer sheet on top, followed by the examination booklet, then examination aids - steam table booklets, handouts and scrap paper used during the examination.

12. After turning in your examination materials, leave the examination area, as defined by the proctor. If after leaving you are found in the examination area while the examination is in progress, your examination may be forfeited.

GENERIC FUNDAMENTALS EXAMINATIONS SECTION
EQUATIONS AND CONVERSIONS HANDOUT SHEET

EQUATIONS

$\dot{Q} = \dot{m}c_p\Delta T$

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

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

$SUR = 26.06/\tau$

$SUR = \dfrac{26.06(\lambda_{eff}\rho)}{(\bar{\beta} - \rho)}$

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

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

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

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

$\rho = \Delta K_{eff}/K_{eff}$

$v(P_e - P_i) + \dfrac{(\bar{v}_e^2 - \bar{v}_i^2)}{2} + g(z_e - z_i) = 0$

Cycle Efficiency $= \dfrac{\text{Net Work (out)}}{\text{Energy (in)}}$

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

$CR_1(1 - K_{eff})_1 = CR_2(1 - K_{eff})_2$

$M = 1/(1 - K_{eff}) = CR_1/CR_0$

$M = \dfrac{(1 - K_{eff})_0}{(1 - K_{eff})_1}$

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

$Pwr = W_f\dot{m}$

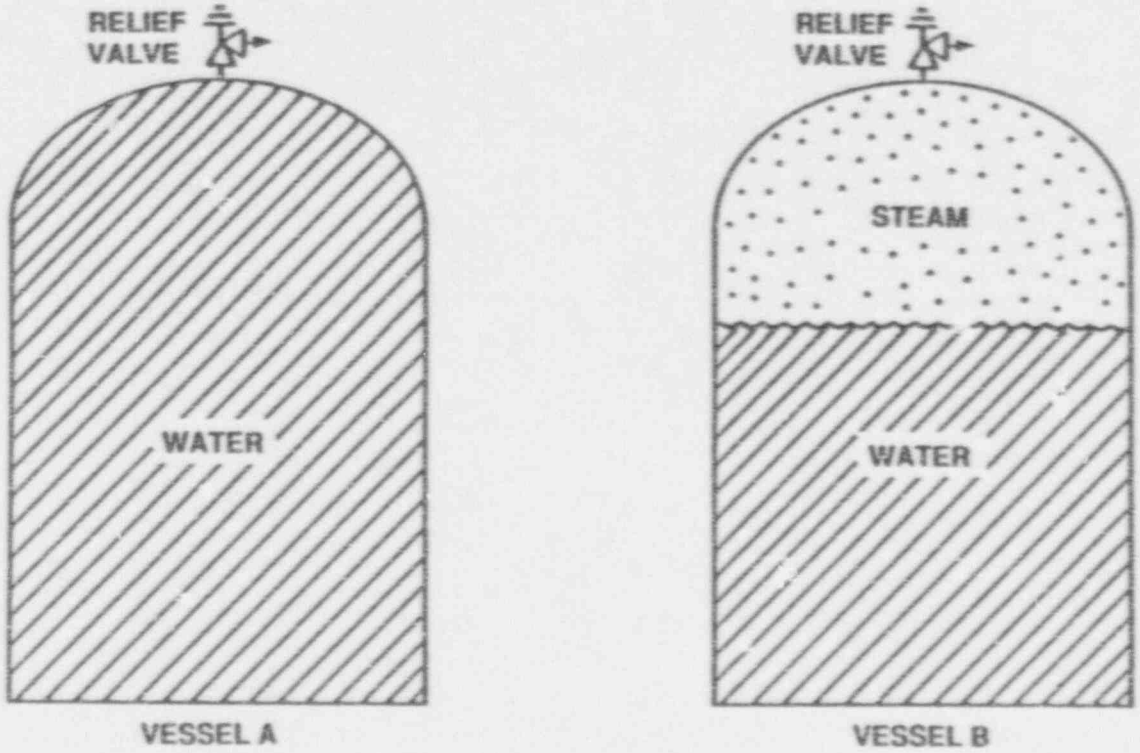
$\tau = l^*/(\rho - \bar{\beta})$

$l^* = 1 \times 10^{-5}$ seconds

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

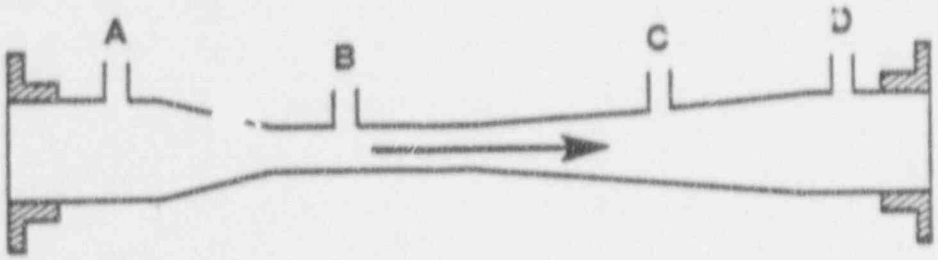
CONVERSIONS

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 BTU	=	778 ft-lbf	°F	=	9/5 °C + 32
°C	=	5/9(°F - 32)			



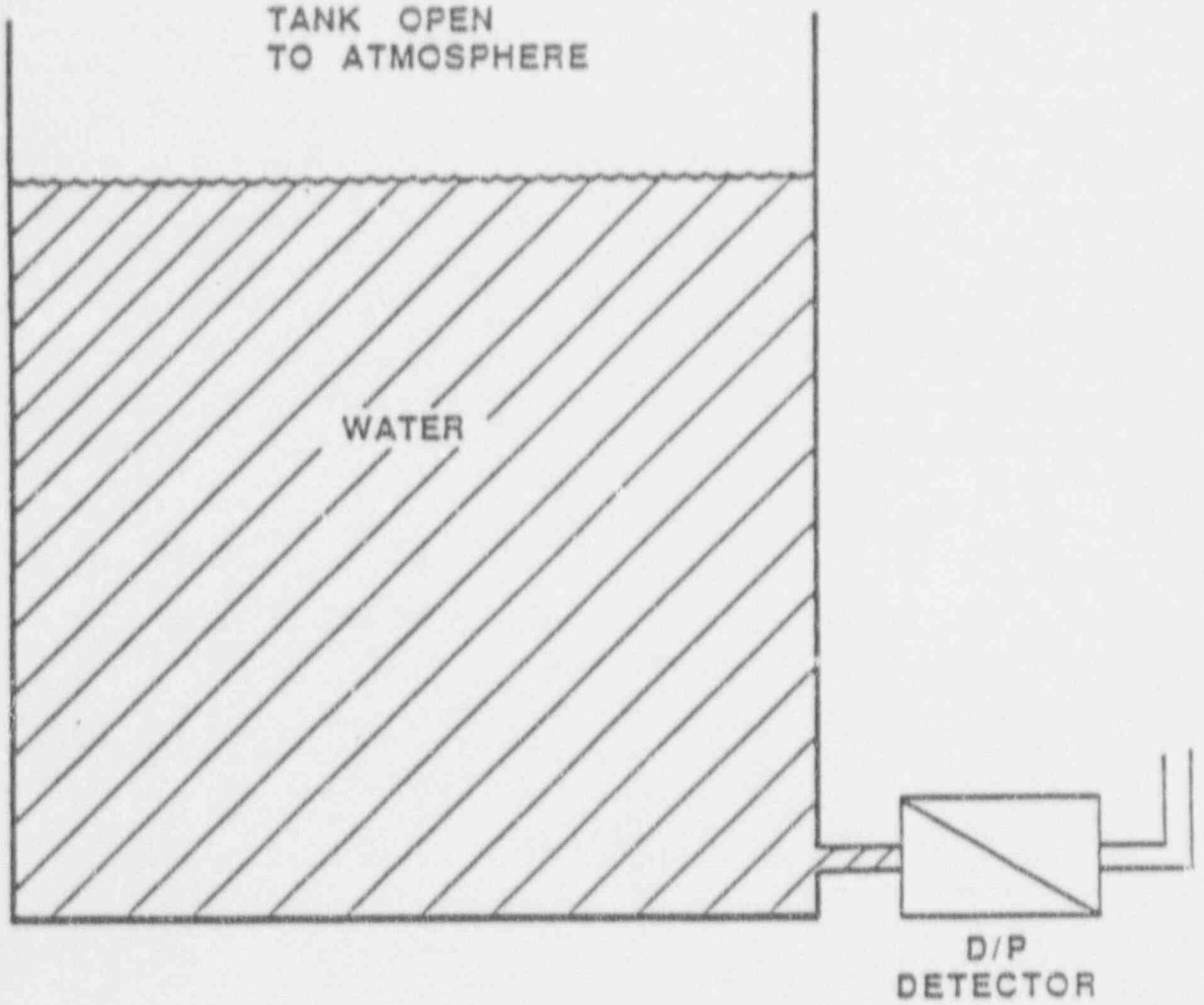
PRESSURE VESSELS WITH RELIEF PROTECTION

FIGURE 1



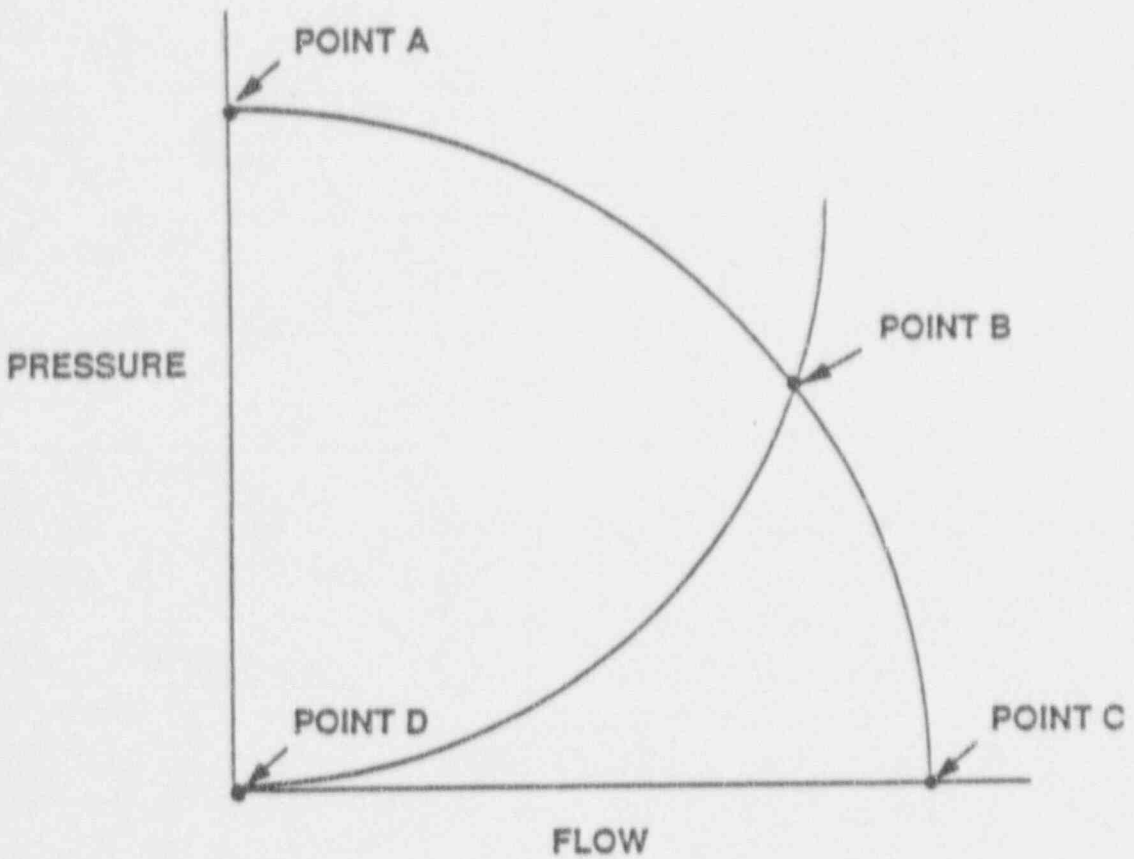
VENTURI FLOW ELEMENT

FIGURE 2



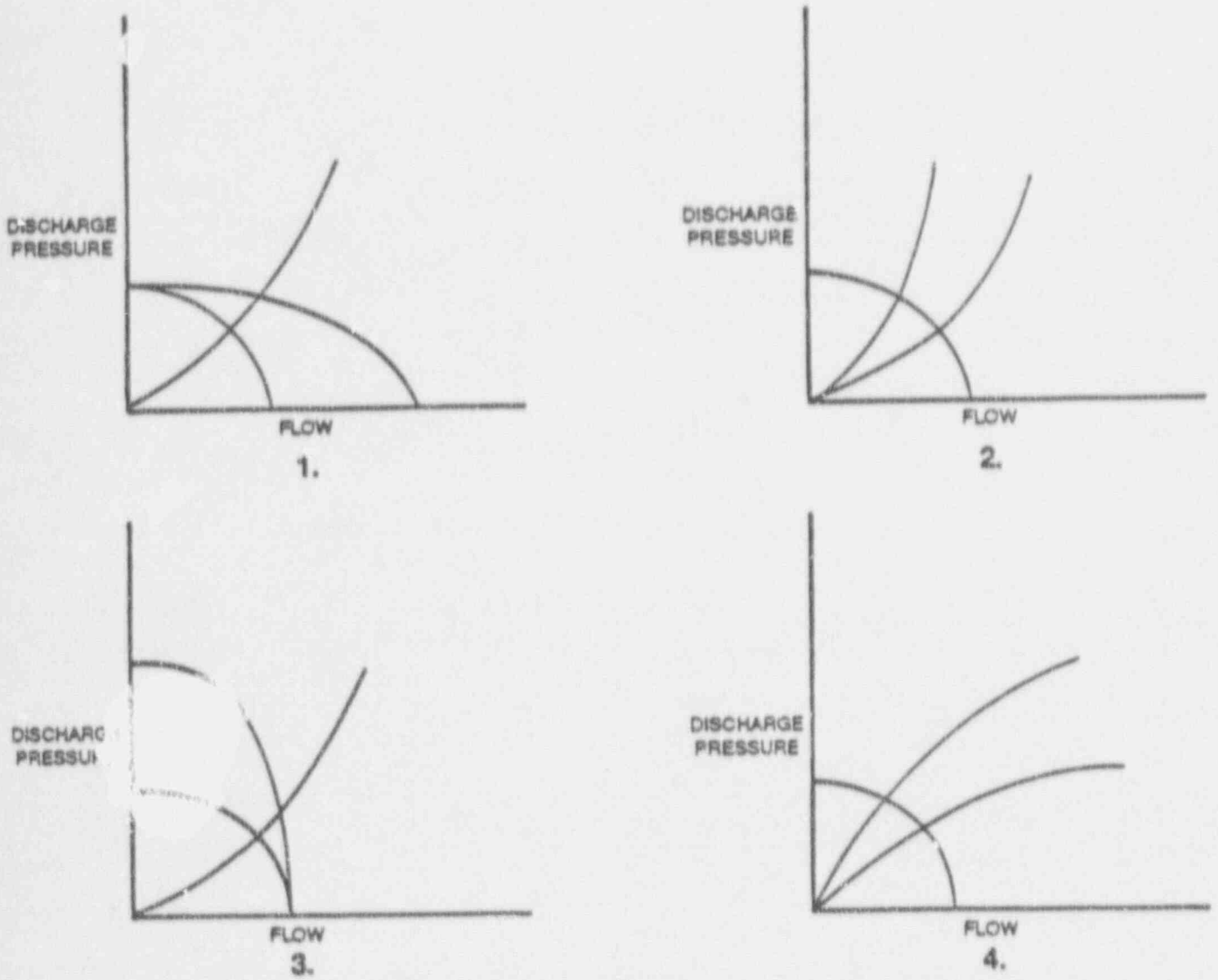
TANK DIFFERENTIAL PRESSURE LEVEL DETECTOR

FIGURE 3



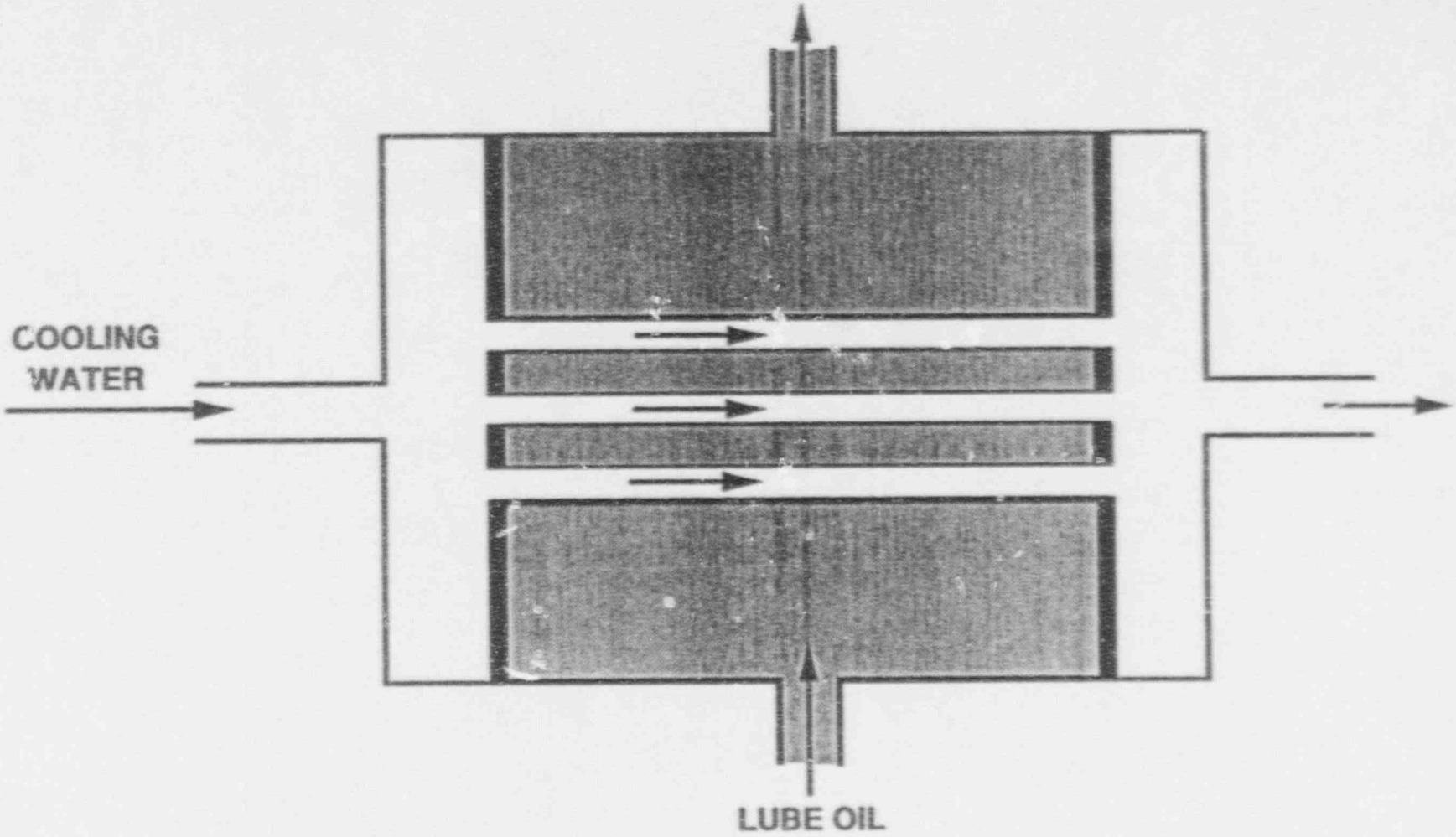
CENTRIFUGAL PUMP OPERATING CURVE

FIGURE 4



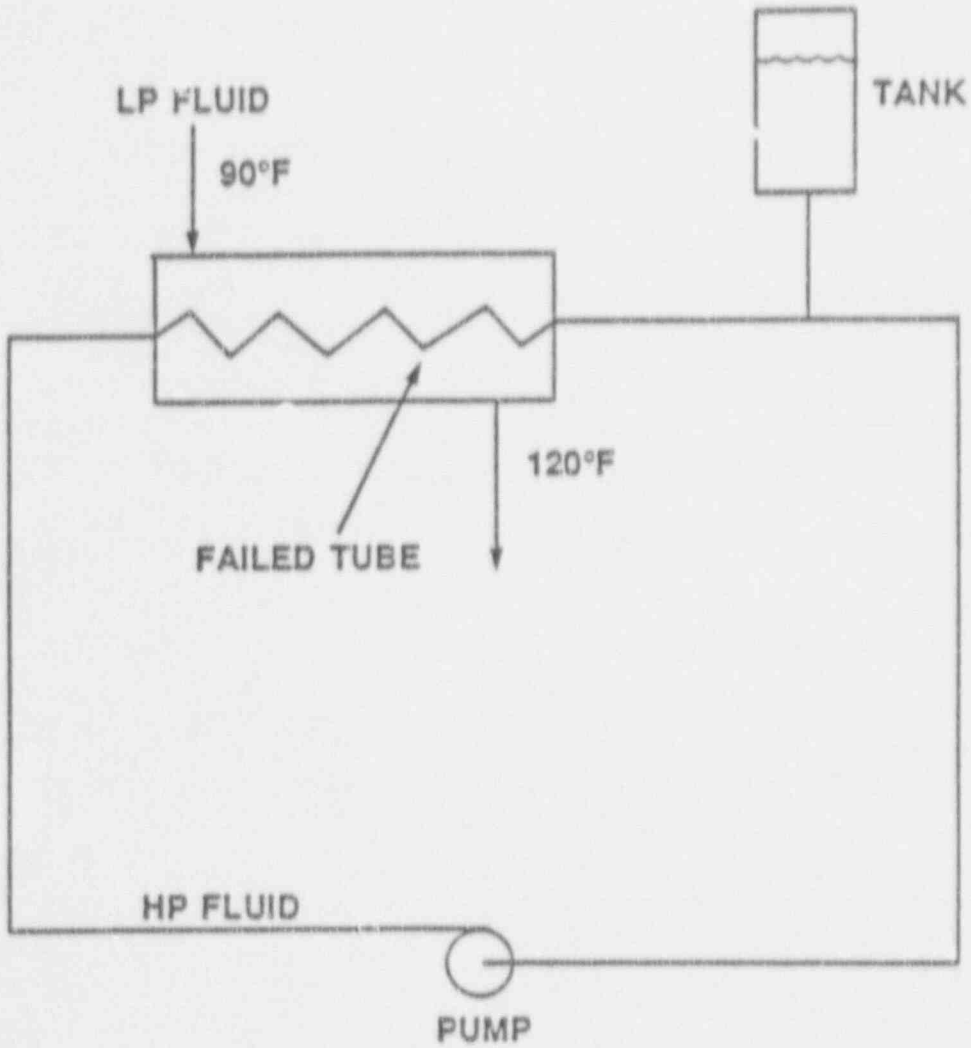
CENTRIFUGAL PUMP OPERATING CURVES

FIGURE 5



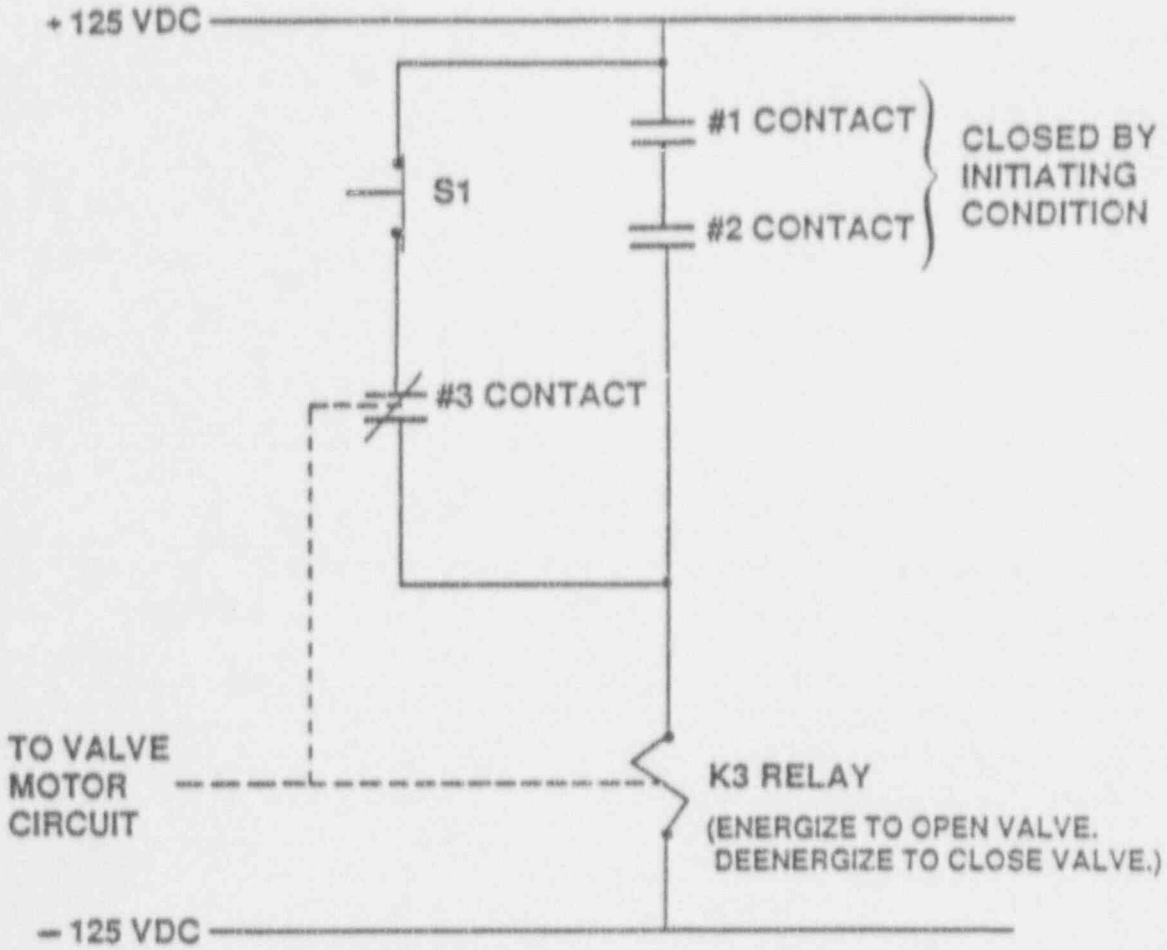
LUBE OIL HEAT EXCHANGER

FIGURE 6



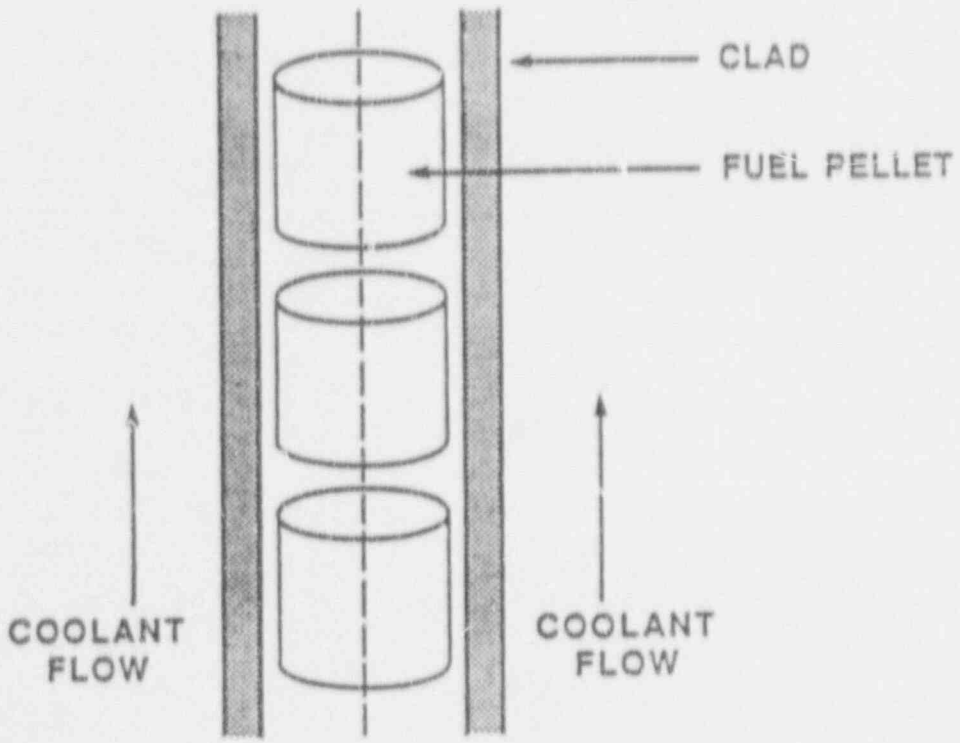
COOLING WATER SYSTEM

FIGURE 7



TYPICAL VALVE CONTROL CIRCUIT

FIGURE 8



FUEL ROD AND COOLANT FLOW CHANNEL

FIGURE 9

USNRC GENERIC FUNDAMENTALS EXAMINATION
PWR - FORM B

QUESTION: 1

If a main steam line pressure gauge reads 900 psig, what is the absolute pressure?

A. 870 psia

B. 885 psia

C. 915 psia

D. 930 psia

QUESTION: 2

Consider a water/steam mixture with a current quality of 99%. If pressure remains constant and heat is removed from the mixture, the temperature of the mixture will _____ and the quality of the mixture will _____. (Assume the mixture remains saturated.)

A. decrease; remain the same

B. decrease; decrease

C. remain the same; remain the same

D. remain the same; decrease

QUESTION: 3

If a wet vapor is at 130 degrees F and has a quality of 90 percent, its specific enthalpy is:

A. 1,015.7 BTU/lbm.

B. 1,019.8 BTU/lbm.

C. 1,117.8 BTU/lbm.

D. 1,215.8 BTU/lbm.

QUESTION: 4

What is the condensate depression in a condenser operating at 26 inches Hg vacuum with a condensate temperature of 100°F?

A. 2°F

B. 15°F

C. 26°F

D. 53°F

QUESTION: 5

The reactor is operating at 100% power. Which of the following steam parameters will increase as steam escapes via a main steam header-to-atmosphere leak?

A. Enthalpy

B. Pressure

C. Specific volume

D. Temperature

QUESTION: 6

The addition of feedwater heaters increases secondary plant efficiency because:

A. the average temperature at which heat is transferred in the steam generators is increased.

B. less steam flow passes through the turbine, thereby increasing turbine efficiency.

C. increased feedwater temperature lowers the temperature at which heat is rejected in the condenser.

D. less power is required by the feedwater pumps to pump the warmer feedwater.

QUESTION: 7

The main reason for keeping condensate out of the steam lines is to:

A. minimize corrosion buildup.

B. reduce heat losses.

C. eliminate steam traps.

D. prevent water/steam hammer.

QUESTION: 8

Mass flow rate equals volumetric flow rate ($\dot{V}$) times:

A. specific volume.

B. density.

C. specific gravity.

D. velocity.

QUESTION: 9

The piping system pressure change caused by suddenly stopping fluid flow is referred to as:

A. cavitation.

B. shutoff head.

C. water hammer.

D. flow head.

QUESTION: 10

Cavitation in an operating pump may be caused by:

A. lowering the suction temperature.

B. throttling down on the pump suction valve.

C. throttling down on the pump discharge valve.

D. decreasing the pump speed.

QUESTION: 11

Flow instruments used to measure the mass flow rate of saturated steam are density compensated because, for a steam pressure increase at a constant volumetric flow rate, steam density will _____ and the actual mass flow rate will _____.

A. decrease; increase

B. increase; decrease

C. increase; increase

D. decrease; decrease

QUESTION: 12

Refer to the drawing of a fuel rod and coolant flow channel at beginning of core life (see figure 9).

What is the PRIMARY method of heat transfer through the gap between the reactor fuel and the fuel clad?

A. Conduction

B. Convection

C. Radiation

D. Natural circulation

QUESTION: 13

In a two-loop pressurized water reactor, feedwater flow to each steam generator (S/G) is 3.3×10^6 lbm/hr at an enthalpy of 419 BTU/lbm. The steam exiting each S/G is at 800 psia with 100 percent steam quality.

Ignoring blowdown and pump heat, what is the core thermal power?

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B. 2,915 MWt

C. 2,212 MWt

D. 1,509 MWt

QUESTION: 14

Convection heat transfer improves when nucleate boiling begins on the surface of a fuel rod because:

A. steam bubble formation decreases coolant flow along the fuel rod.

B. steam bubble formation increases coolant flow along the fuel rod.

C. a steam blanket begins to form along the surface of the fuel rod.

D. the motion of the steam bubbles causes rapid mixing of the coolant.

QUESTION: 15

How does critical heat flux vary from the bottom to the top of the reactor core during normal full power operation?

A. Decreases continuously

B. Decreases then increases

C. Increases continuously

D. Increases then decreases

QUESTION: 16

Select the statement that describes the effect of transition (partial film) boiling at the fuel clad surface-to-coolant interface.

A. A small increase in heat flux causes increased steam blanketing and a large increase in clad temperature.

B. The temperature of the fuel clad surface is so high that thermal radiation heat transfer becomes significant, which causes heat flux to increase.

C. A small increase in heat flux increases the formation of steam bubbles causing increased agitation and turbulence of the boundary layer, consequently decreasing clad temperature.

D. As the heat flux increases, a few vapor bubbles are formed but collapse when they enter into the bulk of the fluid, which decreases clad temperature.

QUESTION: 17

If heat flux in a reactor core steadily increases, the boiling heat transfer regime that will be achieved once the critical heat flux is exceeded is:

A. transition boiling.

B. subcooled nucleate boiling.

C. saturated nucleate boiling.

D. stable film boiling.

QUESTION: 18

In the definition of the departure from nucleate boiling ratio, the term ACTUAL HEAT FLUX refers to the:

A. heat transfer rate per unit area at any point along the fuel rod.

B. heat transfer rate along the entire fuel rod.

C. average heat transfer rate per unit area across the core.

D. total heat transferred along the fuel rod.

QUESTION: 19

Increasing coolant flow rate through the reactor core improves heat transfer from the fuel because it _____ laminar flow and _____ the temperature of the coolant adjacent to the fuel.

A. increases; increases

B. increases; decreases

C. decreases; increases

D. decreases; decreases

QUESTION: 20

Refer to the drawing of a fuel rod and coolant flow channel (see figure 9).

At 100 percent reactor power, the GREATEST temperature difference in a fuel channel radial temperature profile will occur across the: (Assume the temperature profile begins at fuel centerline.)

A. fuel.

B. fuel-to-clad gap.

C. zircalloy cladding.

D. flow channel boundary (laminar) layer.

QUESTION: 21

The driving head for natural circulation flow through the core is developed by differences in _____ between the hot leg and the cold leg.

A. water density

B. water volume

C. pipe diameter

D. piping length

QUESTION: 22

During normal operation, fuel clad integrity is ensured by:

A. the primary system relief valves.

B. core bypass flow restrictions.

C. the secondary system relief valves.

D. operating within core thermal limits.

QUESTION: 23

[illegible] drawing of a fuel rod and coolant flow channel (see [illegible] t beginning of core life.

Gi[illegible] following initial core parameters:

[illegible]or power = 100 percent
$T_{cool...}$ = 500 degrees F
$T_{fuel\ centerline}$ = 3000 degrees F

[illegible]hat would the fuel centerline temperature be if, over core life, the total fuel-to-coolant thermal conductivity were doubled? (Assume reactor power is constant.)

A. 2000 degrees F

B. 1750 degrees F

C. 1500 degrees F

D. 1250 degrees F

QUESTION: 24

The nil-ductility temperature is that temperature:

A. below which the probability of brittle fracture significantly increases.

B. determined by fracture mechanics to be equivalent to reference transition temperature.

C. determined by Charpy V-notch test to be equivalent to reference transition temperature.

D. below which the yield stress of the metal is inversely proportional to Young's modulus of elasticity.

QUESTION: 25

A heatup stress applied to the reactor vessel is:

A. compressive at the inner wall and tensile at the outer wall.

B. tensile at the inner wall and compressive at the outer wall.

C. tensile across the entire wall.

D. compressive across the entire wall.

QUESTION: 26

The likelihood of brittle fracture failure of the reactor vessel is reduced by:

A. increasing vessel age.

B. reducing reactor vessel pressure.

C. reducing reactor vessel temperature.

D. reducing gamma flux exposure.

QUESTION: 27

After several years of operation the maximum allowable stress to the reactor pressure vessel is more limited by the inner wall than the outer wall because:

A. there is a temperature gradient across the reactor pressure vessel wall.

B. the inner wall has a smaller surface area than the outer wall.

C. the inner wall experiences more neutron-induced embrittlement than the outer wall.

D. the inner wall experiences more tensile stress than the outer wall.

QUESTION: 28

Pressurized thermal shock would most likely be a concern during an uncontrolled:

A. cooldown followed by a rapid repressurization.

B. depressurization followed by a rapid repressurization.

C. cooldown followed by a rapid depressurization.

D. depressurization followed by a rapid cooldown.

QUESTION: 29

Refer to the drawing of two pressure vessels with relief protection (see figure 1).

Vessel A is completely filled with subcooled water and vessel B is in a saturated, two-phase condition. Both vessels are currently isolated and pressurized to 50 psig and are protected by identical relief valves.

If both relief valves open simultaneously and remain open, the faster pressure reduction will occur in vessel _____ and the greater mass loss will occur in vessel _____.

A. A; A

B. A; B

C. B; A

D. B; B

QUESTION: 30

Three common types of check valves used in power plants are:

A. swing, lift, and gate valves.

B. lift, ball, and needle valves.

C. ball, swing, and lift valves.

D. swing, lift, and diaphragm valves.

QUESTION: 31

When comparing the characteristics of gate and globe valves in an operating system, a globe valve generally has the _____ pressure drop when fully open and is the better valve for _____ flow.

A. lower; isolating

B. higher; isolating

C. lower; throttling

D. higher; throttling

QUESTION: 32

An operator should never attempt to manually engage the handwheel on a motor-operated valve whose motor is operating because it might damage the:

A. worm gear pinion.

B. torque switches.

C. limit switches.

D. clutch.

QUESTION: 33

Which type of radiation detector is the most sensitive to LOW level gamma radiation?

A. Ion chamber

B. Geiger-Mueller

C. Proportional

D. Scintillation

QUESTION: 34

If the equalizing line on a differential pressure flow detector is opened, the flow detector indication will:

A. increase slightly.

B. decrease slightly.

C. go to zero.

D. not change.

QUESTION: 35

Refer to the drawing of a venturi flow element (see figure 2).

Where should the high pressure tap of a differential pressure flow detector be connected?

A. Point A

B. Point B

C. Point C

D. Point D

QUESTION: 36

Refer to the drawing of a tank differential pressure (D/P) level detector (see figure 3).

The level detector is being used in a level control system that is calibrated to maintain tank level at 80 percent at the current tank temperature of 100 degrees F. If tank temperature gradually increases and stabilizes at 150 degrees F, the level control system will cause ACTUAL tank level to:

A. remain at 80 percent.

B. increase and stabilize above 80 percent.

C. oscillate around 80 percent.

D. decrease and stabilize below 80 percent.

QUESTION: 37

Please complete the following statement to describe the theory of operation of a differential pressure level detector using a wet reference leg.

The pressure differential between a _____ height of liquid and the pressure sensed at the bottom of a tank is _____ proportional to the height of liquid in the tank.

A. known, directly

B. known, inversely

C. variable, directly

D. variable, inversely

QUESTION: 38

In a diaphragm type pressure detector, pressure is measured using _____ of the diaphragm.

A. radial deflection

B. axial deflection

C. a change in circumference

D. a change in diameter

QUESTION: 39

A bourdon-tube pressure detector that is indicating 50 percent of scale is suddenly exposed to a high-pressure transient that permanently distorts the detector. Actual pressure returns to its original value.

Assuming the detector remains intact, the affected pressure indication will initially go off-scale high, and then:

A. become unpredictable until the instrument is calibrated.

B. return to a pressure less than original pressure.

C. return to original pressure.

D. return to a pressure greater than original pressure.

QUESTION: 40

The output voltage of a thermocouple is _____ proportional to the _____. (Assume reference junction temperature remains constant.)

A. directly; measuring junction temperature

B. directly; square of measuring junction temperature

C. inversely; measuring junction temperature

D. inversely; square of measuring junction temperature

QUESTION: 41

What is the most common type of position sensor used to provide remote indication of a valve that is normally fully open or fully closed?

A. Limit switch

B. Reed switch

C. Linear variable differential transformer (LVDT)

D. Servo transmitter

QUESTION: 42

An automatic tank level controller uses a potentiometer for manual adjustment of the level setpoint which is currently 40 percent. An operator lowers the potentiometer setting to raise the level setpoint signal to a value previously known to maintain tank level at 50 percent. However, actual tank level stabilizes at 60 percent.

The most likely cause is that the potentiometer:

A. slide bar has developed a thin film of corrosion, thereby increasing the resistance of the potentiometer.

B. wiper has lost contact with the slide bar, thereby allowing only fine setpoint adjustments.

C. wiper and slide bar have developed a short circuit, thereby decreasing the resistance of the potentiometer.

D. locking device has not been released, thereby allowing only coarse setpoint adjustments.

QUESTION: 43

A BF3 proportional counter detects both neutrons and gammas. Which of the following best describes the method used to eliminate the gamma contribution from the detector output?

A. Two counters are used, one sensitive to neutron and gamma and the other sensitive to gamma only. The outputs are electrically opposed to cancel the gamma-induced currents and yield a neutron-only signal for indication use.

B. The BF3 proportional detector records neutron flux of sufficient intensity that the gamma signal is insignificant compared to the neutron signal and yields a neutron-only signal for indication use.

C. Gamma-induced detector pulses are of insufficient width to generate a significant log-level amplifier output. Neutron pulses are the only ones with sufficient width to yield a neutron-only signal for indication use.

D. Neutron-induced current pulses are significantly larger than those from gamma. The detector signal is applied to a circuit which filters out the smaller gamma pulses yielding a neutron-only signal for indication use.

QUESTION: 44

The difference between the setpoint and the measured parameter in an automatic flow controller is called:

A. gain.

B. bias.

C. feedback.

D. error.

QUESTION: 45

The output pressure of a pneumatic controller is typically insufficient to drive a valve actuator accurately. To overcome this problem, a control loop would NORMALLY employ a:

A. valve actuating lead/lag unit.

B. pressure regulator.

C. valve positioner.

D. pressure modulator.

QUESTION: 46

The level in a tank is being controlled by an automatic level controller and is initially at the controller setpoint. A drain valve is then opened, causing tank level to begin to decrease. The decreasing level causes the controller to begin to open a makeup supply valve. After a few minutes, a new, steady-state tank level below the original level is established, with the supply rate equal to the drain rate.

The controller in this system uses _____ control.

A. on-off

B. proportional

C. derivative (rate)

D. integral (reset) plus derivative (rate)

QUESTION: 47

When shifting from automatic to manual valve control, the manual and automatic output signals should be MATCHED to:

A. prevent a sudden valve repositioning upon the transfer.

B. ensure the valve will operate upon demand.

C. move the valve to the new position prior to the transfer.

D. ensure valve position indication is accurate.

QUESTION: 48

Refer to the drawing of a centrifugal pump operating curve (see figure 4).

Which point represents the pump shutoff head?

A. Point A

B. Point B

C. Point C

D. Point D

QUESTION: 49

A pump is circulating 200°F water in a closed system equipped with a surge tank. Several hours later, after system cooldown and no lineup changes, the pump is circulating 120°F water.

During the system cooldown, pump motor current has:

A. decreased because water density has increased.

B. increased because water density has increased.

C. decreased because pump motor efficiency has decreased.

D. increased because pump motor efficiency has decreased.

QUESTION: 50

Many larger centrifugal pumps are started with their discharge valves CLOSED to prevent:

A. loss of recirculation (miniflow).

B. overloading the pump motor.

C. cavitation in the pump.

D. lifting the discharge relief valve.

QUESTION: 51

Which of the following is an indication of pump runout?

A. High discharge pressure

B. Low pump motor current

C. High pump flow rate

D. Pump flow reversal

QUESTION: 52

Refer to the drawing of four centrifugal pump operating curves (see figure 5).

A centrifugal pump in a closed system is operating with a partially open discharge valve. The discharge valve is then opened fully. Which set of curves illustrates the initial and final operating conditions?

A. 1.

B. 2.

C. 3.

D. 4.

QUESTION: 53

When flow from a centrifugal pump is increased by throttling open the discharge valve, AVAILABLE net positive suction head (NPSH) _____, and REQUIRED NPSH _____.

A. decreases, decreases

B. decreases, increases

C. increases, increases

D. increases, decreases

QUESTION: 54

The discharge valve of an ideal reciprocating positive displacement pump is throttled toward the closed direction. This causes pump flow to _____ and pump head to _____. (Assume "ideal" pump response.)

A. remain constant; remain constant

B. decrease; remain constant

C. remain constant; increase

D. decrease; increase

QUESTION: 55

If the generator bearings on a motor-generator begin to fail from overheating, then:

A. generator current will increase.

B. generator windings will overheat.

C. motor current will decrease.

D. motor windings will overheat.

QUESTION: 56

Excessive AC motor current can be caused DIRECTLY by operating the motor:

A. completely unloaded.

B. at full load.

C. with open-circuited windings.

D. with short-circuited windings.

QUESTION: 57

A centrifugal pump has been running at an elevated temperature due to insufficient ventilation when an operator changes the ventilation lineup to cool the pump motor. Assuming pump flow rate and applied voltage remain constant, how will decreasing motor temperature affect the motor current?

A. Increase, because motor efficiency decreases

B. Decrease, because motor efficiency increases

C. Increase, because stator resistance decreases

D. Decrease, because stator resistance increases

QUESTION: 58

A centrifugal pump has a flow rate of 3,000 gpm and a current requirement of 200 amps. If the speed is reduced such that the flow rate is 2,000 gpm, what is the final CURRENT requirement at the new lower speed? (Assume a constant motor voltage.)

A. 59 amps

B. 89 amps

C. 133 amps

D. 150 amps

QUESTION: 59

If the discharge valve of a large AC motor-driven centrifugal pump remains closed during a normal pump start, the motor ammeter indication will rise to:

A. several times the full-load current value and then decrease to the no-load current value.

B. approximately the full-load current value and then decrease to the no-load current value.

C. several times the full-load current value and then decrease to the full-load value.

D. approximately the full-load current value and then stabilize at the full-load current value.

QUESTION: 60

Refer to the drawing of a lube oil heat exchanger (see figure 6).

Increasing the oil flow rate through the heat exchanger will cause the oil outlet temperature to _____ and the cooling water outlet temperature to _____. (Assume cooling water flow rate remains the same.)

A. increase; increase

B. increase; decrease

C. decrease; increase

D. decrease; decrease

QUESTION: 61

During normal steady-state plant operation with a constant generator load, plugging of 1 percent of the tubes in the main condenser will cause absolute pressure in the condenser to _____ and hotwell temperature to _____.

A. increase; increase

B. decrease; increase

C. increase; decrease

D. decrease; decrease

QUESTION: 62

Refer to the drawing of an operating cooling water system (see figure 7).

Which of the following effects would occur as a result of a tube FAILURE in the heat exchanger?

A. Pressure in the low pressure system decreases.

B. Flow in the low pressure system reverses.

C. Temperature in the low pressure system increases.

D. Level in the tank increases.

QUESTION: 63

The demineralization factor (DF) of a demineralizer can be expressed as:

A. (Inlet Conductivity) - (Outlet Conductivity).

B. (Outlet Conductivity) - (Inlet Conductivity).

C. (Inlet Conductivity) + (Outlet Conductivity).

D. (Outlet Conductivity) + (Inlet Conductivity).

QUESTION: 64

A lower than expected differential pressure across a demineralizer is an indication of:

A. depletion of the cation resin.

B. channeling through the resin bed.

C. improper resin regeneration.

D. excessive accumulation of suspended solids.

QUESTION: 65

The temperature of the water passing through a demineralizer must be controlled because EXCESSIVELY HOT water will:

A. increase the ion exchange rate for hydronium ions, thereby changing effluent pH.

B. degrade the corrosion inhibitor applied to the inner wall of the demineralizer.

C. result in excessive demineralizer retention element thermal expansion, thereby releasing resin.

D. reduce the affinity of the demineralizer resin for ion exchange.

QUESTION: 66

Which of the following describes the normal operation of a local circuit breaker overcurrent trip flag indicator?

A. Actuates to cause a breaker trip when the overcurrent trip setpoint is reached and must be manually reset when the overcurrent condition clears.

B. Actuates to satisfy an electrical interlock when no lockout is present which is necessary to remotely close a breaker.

C. Actuates when a breaker overcurrent trip has occurred and must be manually reset when the overcurrent condition clears.

D. Actuates when the associated breaker has failed to trip on an overcurrent condition and must be manually reset when the overcurrent condition clears.

QUESTION: 67

Which of the following would cause a loss of ability to remotely trip a circuit breaker AND a loss of position indication?

A. Failure of breaker control switch

B. Breaker in "test" position

C. Mechanical binding of breaker

D. Loss of breaker control power

QUESTION: 68

A typical 120 VAC manual circuit breaker has tripped due to overload. Which of the following must be performed to CLOSE this circuit breaker?

A. The handle must be moved from the mid-position to the OFF position to reset the trip latch, and then to the ON position.

B. The handle must be moved from the OFF position to the mid-position to reset the trip latch, and then to the ON position.

C. The handle must be moved from the mid-position directly to the ON position. Trip latch reset is not required.

D. The handle must be moved from the OFF position directly to the ON position. Trip latch reset is not required.

QUESTION: 69

A thermal overload protective device protects a motor by:

A. adding series resistors to limit starting current.

B. adding parallel resistors to limit starting current.

C. deenergizing the motor if current becomes excessive.

D. slowing down the motor if current becomes excessive.

QUESTION: 70

Refer to the drawing of a typical valve control circuit for a 480 VAC motor-operated valve (see figure 8).

The valve is currently open with the contact configuration as shown. If the S1 pushbutton is depressed, the valve will _____ and when the S1 pushbutton is subsequently released, the valve will _____.

A. remain open; remain open

B. close; remain closed

C. remain open; close

D. close; open

QUESTION: 71

Closing a generator output breaker with generator voltage equal to grid voltage and generator frequency much less than grid frequency (but still "in sync") will cause the breaker to trip on:

A. reverse power.

B. underfrequency.

C. overcurrent.

D. overspeed.

QUESTION: 72

High voltage electrical disconnects function to:

A. adjust the voltage output from a main power transformer.

B. trip open before bus feeder breakers upon electrical bus faults.

C. provide equipment isolation under no load conditions.

D. bypass and isolate an electrical bus while maintaining the downstream buses energized.

QUESTION: 73

Delayed neutrons are neutrons that:

A. have reached thermal equilibrium with the surrounding medium.

B. are born within 10^{-14} seconds of the fission event.

C. are born at the lowest average kinetic energy of all fission neutrons.

D. are responsible for the majority of U-235 fissions.

QUESTION: 74

Which term is described by the following?

"The fractional change of the effective multiplication factor from criticality." OR "A measure of a reactor's departure from criticality."

A. 1/M

B. K_{eff}

C. Reactor period

D. Reactivity

QUESTION: 75

With K_{eff} = 0.985, how much reactivity must be added to make the reactor critical?

A. 1.48%, delta-K/K

B. 1.50%, delta-K/K

C. 1.52%, delta-K/K

D. 1.54%, delta-K/K

QUESTION: 76

A subcritical reactor has an initial K_{eff} of 0.8 at a source range count rate of 100 cps. Positive reactivity is added until K_{eff} equals 0.95. What is the final equilibrium source range count rate?

A. 150 cps

B. 200 cps

C. 300 cps

D. 400 cps

QUESTION: 77

Which one of the following conditions will initially result in a positive startup rate when the reactor is at power?

A. Increase in turbine loading

B. Unintentional boration

C. Turbine runback

D. Accidental closure of a main steam isolation valve

QUESTION: 78

In which of the following conditions is the moderator temperature coefficient most negative?

A. BOL, high temperature.

B. BOL, low temperature.

C. EOL, high temperature.

D. EOL, low temperature.

QUESTION: 79

Which one of the following contains parameters that, if varied, will each have a direct effect on the power defect?

A. Control rod position, reactor power, and moderator voids

B. Moderator voids, fuel temperature, and moderator temperature

C. Fuel temperature, xenon level, and control rod position

D. Moderator temperature, RCS pressure, and xenon level

QUESTION: 80

Given the following initial parameters, select the final reactor coolant boron concentration required to increase average coolant temperature by 6 degrees F. (Assume no change in rod position or reactor/turbine power.)

Initial RCS boron concentration	= 500 ppm
Moderator temperature coef.	= -0.012% delta-K/K per degree F
Differential boron worth	= -0.008% delta-K/K per ppm
Inverse boron worth	= -125 ppm/% delta-K/K

A. 509 ppm

B. 504 ppm

C. 496 ppm

D. 491 ppm

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QUESTION: 81

A reactivity coefficient measures _____ change while a reactivity defect (deficit) measures a _____ change in reactivity due to a change in the measured parameter.

A. an integrated, total

B. a rate of, differential

C. a differential, total

D. a total, differential

QUESTION: 82

The reactor is exactly critical below the point of adding heat when control rods (CEAs) are manually inserted for 5 seconds. Reactor power will:

A. decrease to a shutdown power level low in the source (startup) range.

B. decrease temporarily, then return to the original value due to the resulting decrease in moderator temperature.

C. decrease until inherent positive reactivity feedback causes the reactor to become critical at a lower neutron level.

D. decrease temporarily, then return to the original value due to subcritical multiplication.

QUESTION: 83

The total amount of reactivity added by a control rod (CEA) position change from a reference height to any other rod height is called:

A. differential rod (CEA) worth.

B. shutdown reactivity.

C. integral rod (CEA) worth.

D. reference reactivity.

QUESTION: 84

The differential control rod (CEA) worth is small at the top and bottom of the core compared to the center due to the effects of:

A. boron concentration.

B. neutron flux distribution.

C. xenon concentration.

D. fuel temperature distribution.

QUESTION: 85

The main reason for designing and operating a reactor with a flattened neutron flux distribution is to:

A. provide even burnup of control rods (CEAs).

B. allow a higher average power density.

C. provide more accurate nuclear power indication.

D. improve fuel efficiency by reducing neutron leakage.

QUESTION: 86

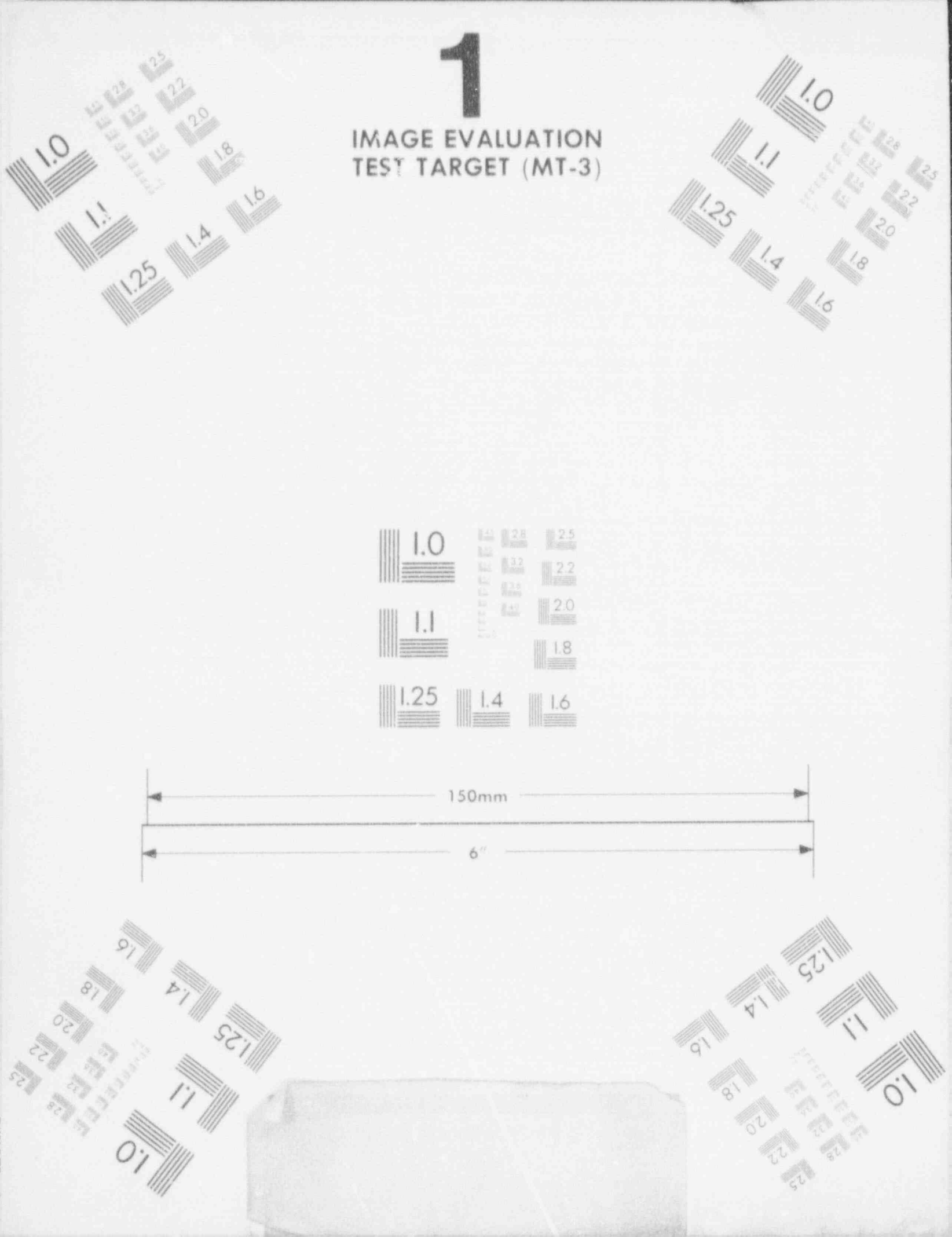
Fission product poisons can be differentiated from other fission products in that fission product poisons:

A. have a higher fission cross section for thermal neutrons.

B. have a longer half-life.

C. are produced in a larger percentage of fissions.

D. are stronger absorbers of thermal neutrons.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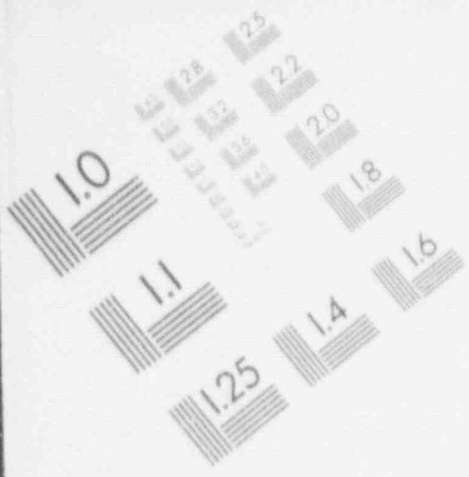

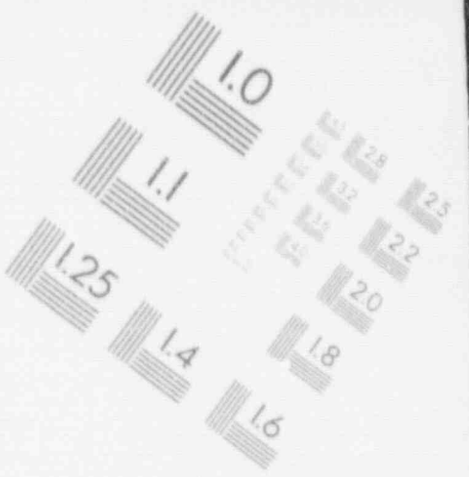

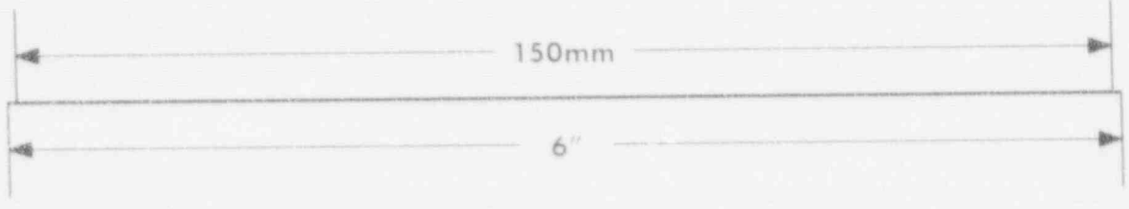

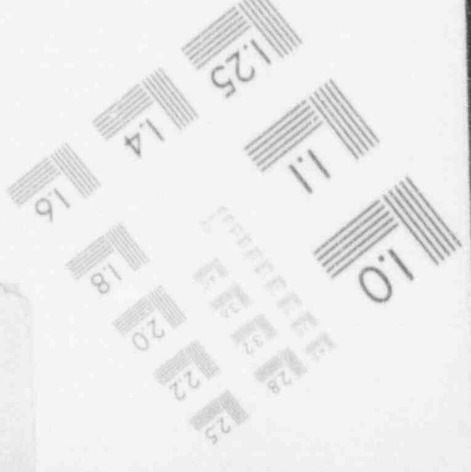

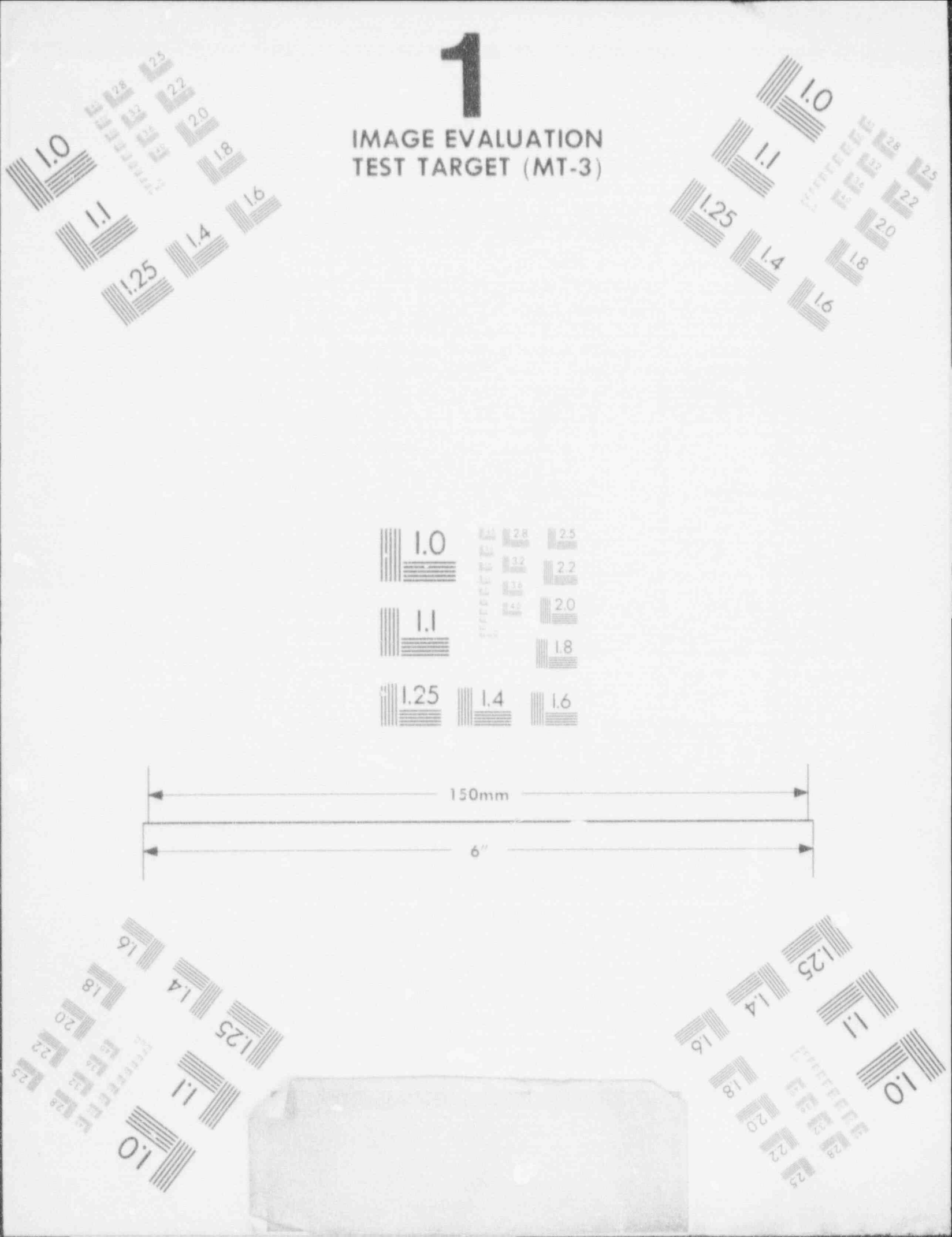
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2.2
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2.8
3.2
3.6
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150mm
6"

QUESTION: 87

In a shutdown reactor, which decay chain describes the primary means of removing Xenon-135?

A. $^{135}Xe \xrightarrow{\beta^-} {}^{135}Cs$

B. $^{135}Xe \xrightarrow{n} {}^{134}Xe$

C. $^{135}Xe \xrightarrow{\alpha} {}^{131}Te$

D. $^{135}Xe \xrightarrow{\beta^+} {}^{135}I$

QUESTION: 88

A reactor has been operating at 50 percent power for a week when power is quickly ramped (over 4 hours) to 100 percent. How will the xenon concentration in the core respond?

A. Decreases initially, then builds to a new equilibrium concentration in 8 to 10 hours.

B. Increases steadily to a new equilibrium concentration in 20 to 30 hours.

C. Decreases initially, then builds to a new equilibrium concentration in 40 to 50 hours.

D. Increases steadily to a new equilibrium concentration in 60 to 70 hours.

QUESTION: 89

Which one of the following occurrences can cause reactor power to fluctuate between the top and bottom of the core when steam demand is constant?

A. Steam generator level transients

B. Iodine spiking

C. Xenon oscillations

D. Inadvertent boron dilution

QUESTION: 90

A reactor has been operating at full power for several days when a reactor trip occurs. If the reactor had been operating at 50 percent power, xenon would have peaked _____ and the peak xenon reactivity would have been _____ _____.

A. earlier; the same

B. at the same time; the same

C. earlier; less negative

D. at the same time; less negative

QUESTION: 91

Twenty-four hours after a reactor trip from a long-term, steady-state, rated-power run, the xenon concentration will be:

A. much higher than at the time of the trip and increasing.

B. much lower than at the time of the trip and decreasing.

C. approximately the same as at the time of the trip and increasing.

D. approximately the same as at the time of the trip and decreasing.

QUESTION: 92

Burnable poisons are installed in a new reactor core instead of using a higher soluble boron concentration to:

A. prevent boron precipitation during normal operation.

B. develop a less positive moderator temperature coefficient.

C. allow control rods (CEAs) to be withdrawn farther upon initial criticality.

D. maintain reactor coolant pH above a minimum acceptable value.

QUESTION: 93

While withdrawing control rods (CEAs) during an approach to criticality, the stable count rate doubles. If the same amount of reactivity that caused the first doubling is added again, stable count rate will _____ and the reactor will be _____.

A. double; subcritical

B. more than double; subcritical

C. double; critical

D. more than double; critical

QUESTION: 94

At end of core life, critical rod (CEA) position has been calculated for a reactor startup 4 hours after a trip from 100 percent power equilibrium conditions. The actual critical rod (CEA) position will be LOWER than the predicted critical rod (CEA) position if:

A. the startup is delayed until 8 hours after the trip.

B. the steam dump pressure setpoint is lowered by 100 psi prior to reactor startup.

C. actual boron concentration is 10 ppm more than the assumed boron concentration.

D. one control rod (CEA) remains fully inserted during the approach to criticality.

QUESTION: 95

To predict criticality, the operator must predict the amount of positive reactivity that must be added to overcome the effects of:

A. boron, moderator voids, and burnable poisons.

B. control rods (CEAs), xenon, and moderator temperature.

C. power defect, burnable poisons, and control rods (CEAs).

D. moderator temperature, moderator voids, and xenon.

QUESTION: 96

Which of the following indicates that the reactor has achieved criticality during a normal reactor startup?

A. Constant positive startup rate during rod withdrawal

B. Increasing positive startup rate during rod withdrawal

C. Constant positive startup rate with no rod motion

D. Increasing positive startup rate with no rod motion

QUESTION: 97

The reactor is operating at 100 percent reactor power at the end of core life with all control systems in manual. The reactor operator inadvertently adds 10 gallons of boric acid to the Reactor Coolant System (RCS).

Which of the following will occur as a result of the boric acid addition? (Assume megawatt output remains constant.)

A. RCS pressure will increase and stabilize at a higher value.

B. Reactor power will decrease and stabilize at a lower value.

C. T_{ave} will increase and stabilize at a higher value.

D. Pressurizer level will decrease and stabilize at a lower value.

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QUESTION: 98

The reactor is critical at a stable power level below the point of adding heat (POAH). An unisolable steam line break occurs and 3 percent of rated steam flow is escaping.

Assuming no reactor trip, which one of the following describes the response of the reactor? (Assume a negative moderator temperature coefficient.)

A. The reactor will go subcritical. T_{ave} will decrease.

B. The reactor will go to 3 percent power. T_{ave} will increase.

C. The reactor will go to 3 percent power. T_{ave} will decrease.

D. Power will not change because the reactor was below the POAH. T_{ave} will decrease.

QUESTION: 99

Shortly after a reactor trip, reactor power indicates 0.05 percent when a stable negative startup rate is attained. How much additional time is required for reactor power to decrease to 0.005 percent?

A. 90 seconds

B. 180 seconds

C. 270 seconds

D. 360 seconds

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PWR - FORM B

QUESTION: 100

After one month of operation at 100 percent reactor power, the fraction of thermal power being produced from the decay of fission products in the operating reactor is:

A. greater than 10 percent.

B. greater than 5 percent but less than 10 percent.

C. greater than 1 percent but less than 5 percent.

D. less than 1 percent.