UNITED STATES NUCLEAR REGULATORY COMMISSION
PRESSURIZED WATER REACTOR GENERIC FUNDAMENTALS EXAMINATION
JUNE 2002--FORM A

Please Print

Name: _____

Facility: _____

Docket No.: _____

Start Time: _____ Stop Time: _____

INSTRUCTIONS TO APPLICANT

Answer all the test items using the answer sheet provided. Each item 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 4.0 hours after the examination starts. This examination applies to a typical pressurized water reactor (PWR) power plant.

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.

_____
Applicant's Signature

RULES AND GUIDELINES FOR THE GENERIC FUNDAMENTALS EXAMINATION

During the administration of this examination the following rules apply:

NOTE: The generic term "control rod" refers to the length of neutron absorber material that can be positioned by the operator to change core reactivity.

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 your individual docket number.

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. Place your answers on 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 neither given nor received 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 EXAMINATION
EQUATIONS AND CONVERSIONS HANDOUT SHEET

EQUATIONS

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

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

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

$\dot{Q} \propto \dot{m}^3_{Nat\ Circ}$

$\Delta T \propto \dot{m}^2_{Nat\ Circ}$

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

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

$SUR = 26.06/\tau$

$\tau = \dfrac{\overline{\beta} - \rho}{\lambda_{eff}\ \rho}$

$\rho = \dfrac{\ell^*}{\tau} + \dfrac{\overline{\beta}}{1 + \lambda_{eff}\tau}$

$\ell^* = 1 \times 10^{-4}$ sec

$\lambda_{eff} = 0.1\ sec^{-1}$ (for small positive ρ)

$DRW \propto \varphi^2_{tip}/\varphi^2_{avg}$

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

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

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

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

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

$1/M = CR_1/CR_X$

$A = \pi r^2$

$F = PA$

$\dot{m} = \rho A\vec{v}$

$\dot{W}_{Pump} = \dot{m}\Delta P\upsilon$

$E = IR$

Eff. = Net Work Out/Energy In

$\upsilon(P_2 - P_1) + \dfrac{(\vec{v}_2^{\,2} - \vec{v}_1^{\,2})}{2g_c} + \dfrac{g(z_2 - z_1)}{g_c} = 0$

$g_c = 32.2$ lbm-ft/lbf-sec^2

CONVERSIONS

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1 Mw	= 3.41×10^6 Btu/hr	1 Curie	= 3.7×10^{10} dps
1 hp	= 2.54×10^3 Btu/hr	1 kg	= 2.21 lbm
1 Btu	= 778 ft-lbf	1 gal_{water}	= 8.35 lbm
°C	= (5/9)(°F - 32)	1 ft^3_{water}	= 7.48 gal
°F	= (9/5)(°C) + 32		

QUESTION: 1

Given the following pressure specifications for operation of a main steam safety valve (MSSV):

Setpoint pressure (MSSV starts to open): 1200 psia
Maximum pressure (MSSV will be fully open): 1230 psia
Reseat pressure (MSSV will be fully closed): 1140 psia

Which one of the following is the percent blowdown for the MSSV?

A. 2.5%

B. 5.0%

C. 7.5%

D. 10.0%

QUESTION: 2

Refer to the drawing of a spring-loaded air-operated valve shown in a throttled position (see figure below).

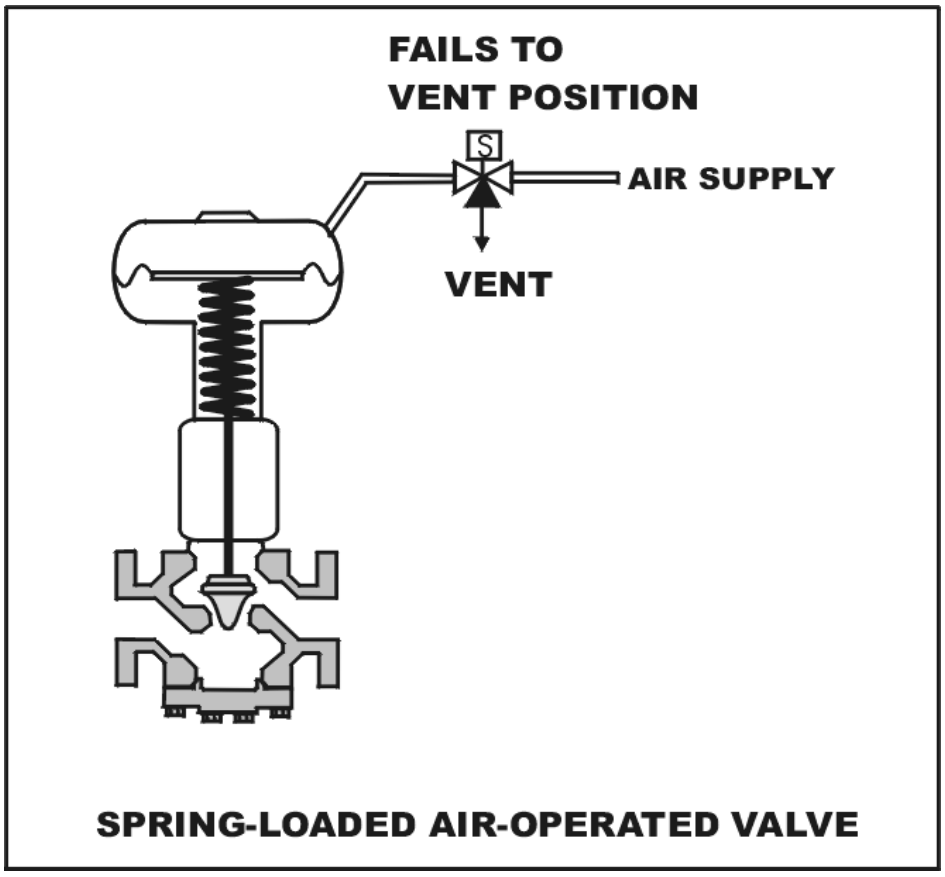
What will be the valve position following a loss of electrical power to the solenoid? (The figure currently depicts normal air supply pressure and an energized solenoid.)

A. As is

B. More open

C. More closed

D. Varies with system flow



QUESTION: 3

A stop check valve is a type of check valve that:

A. cannot be shut remotely.

B. can be used to prevent flow in both directions.

C. contains both a gate valve disk and a check valve disk.

D. can be opened manually to allow flow in both directions.

QUESTION: 4

When comparing a 3-inch gate valve to a 3-inch globe valve in the same application in an operating cooling water system, if both valves are fully open, the globe valve produces the _____ head loss and the _____ flow rate.

A. larger; larger

B. larger; smaller

C. smaller; larger

D. smaller; smaller

QUESTION: 5

The most probable cause for fluctuating indication from a liquid flow rate differential pressure detector is:

A. gas or steam being trapped in the liquid.

B. unequal temperature gradients in the liquid.

C. vortexing of the liquid passing through the flow device.

D. the valve on the high pressure sensing line being partially closed.

QUESTION: 6

Refer to the drawing in which subcooled water is flowing through a convergent-divergent venturi (see figure below). The pipe diameters at P1 and P2 are equal.

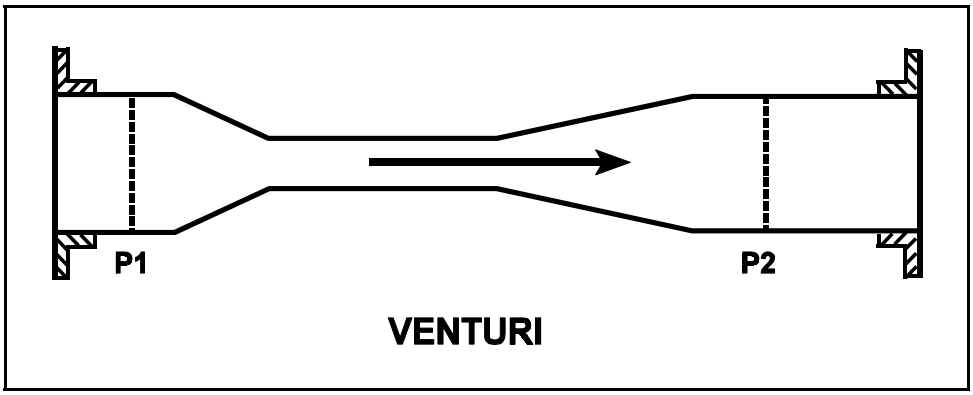
Compared to conditions at the inlet of the venturi (P1), pressure at the outlet of the venturi (P2) has _____ and water velocity at the outlet of the venturi has _____. (Assume "real" conditions.)

A. decreased slightly; remained the same

B. decreased slightly; decreased slightly

C. remained the same; decreased slightly

D. remained the same; remained the same



QUESTION: 7

Refer to the drawing of a tank with a differential pressure (D/P) level detector (see figure below). Assume that the initial temperature of the reference leg and the water in the tank are the same, and that reference leg temperature and level do not change.

The level detector is being used in a level control system (not shown) that is calibrated to maintain tank level at 75% at the current tank water temperature (70°F) and pressure (5 psig).

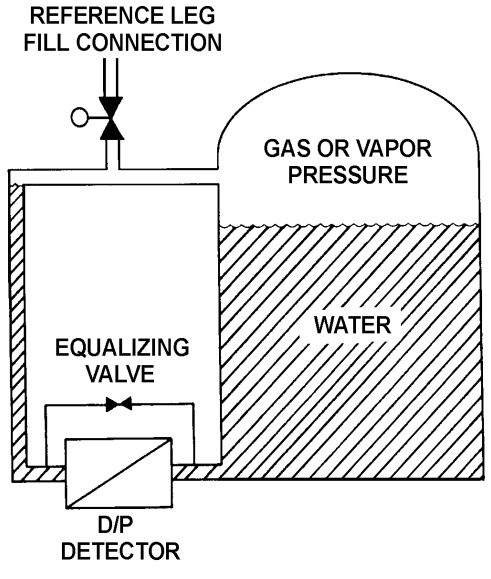
If the tank water temperature remains constant, but the tank pressure is increased by 10 psig, the level control system will cause actual tank level to:

A. remain at 75%.

B. increase and stabilize above 75%.

C. oscillate around 75%.

D. decrease and stabilize below 75%.



TANK DIFFERENTIAL PRESSURE LEVEL DETECTOR

QUESTION: 8

Refer to the drawing of a steam generator differential pressure level detector that was calibrated at normal operating conditions (see figure below).

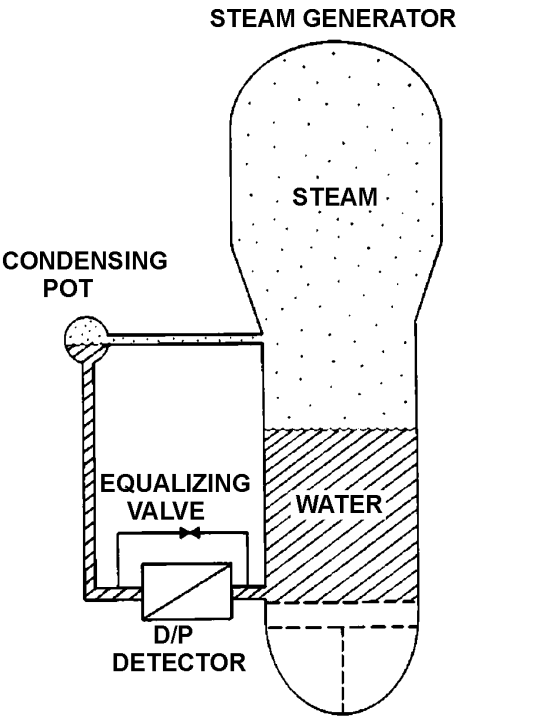
A reactor coolant system cooldown has resulted in a decrease in steam generator pressure from 900 psia to 400 psia. Without density compensation of the level instrumentation, at the end of the cooldown, steam generator level indication would indicate _____ than actual level because the density of the water in the _____ has changed significantly.

A. lower; reference leg

B. lower; steam generator

C. higher; reference leg

D. higher; steam generator



STEAM GENERATOR DIFFERENTIAL PRESSURE LEVEL DETECTOR

QUESTION: 9

A bourdon-tube pressure detector was indicating 50% of scale when it was suddenly exposed to a high-pressure transient that caused permanent strain to the bourdon tube. The detector remained intact and actual pressure was restored to its original value.

During the pressure transient, the affected pressure indication initially went off-scale high. After the original pressure was restored, the indication was:

A. unpredictable.

B. less than 50% of scale.

C. 50% of scale.

D. greater than 50% of scale.

QUESTION: 10

Refer to the drawing of a simple thermocouple circuit (see figure below).

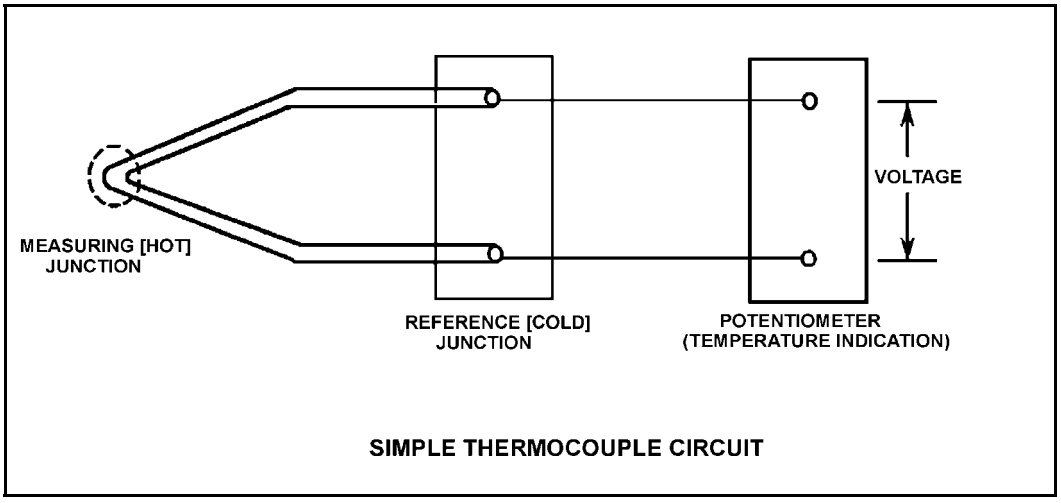
Thermocouple temperature indication is 410°F with the reference (cold) junction at 125°F. If an ambient temperature decrease lowers reference junction temperature to 110°F, what will the new thermocouple temperature indication be? (Assume measuring junction temperature remains constant.)

A. 380°F

B. 395°F

C. 410°F

D. 425°F



SIMPLE THERMOCOUPLE CIRCUIT

QUESTION: 11

Refer to the simplified drawing of an example control rod position detector (see figure below).

Coils of wire connected to an ac power supply are being used to monitor the position of a control rod in a reactor. The coils are mounted in a column outside the reactor vessel head such that the steel control rod drive shaft passes upward through the coils as the control rod is withdrawn. Currently, the top of a control rod drive shaft is located between coils A and B as shown. The control rod is to be withdrawn until the top of the control rod drive shaft is located just below coil C.

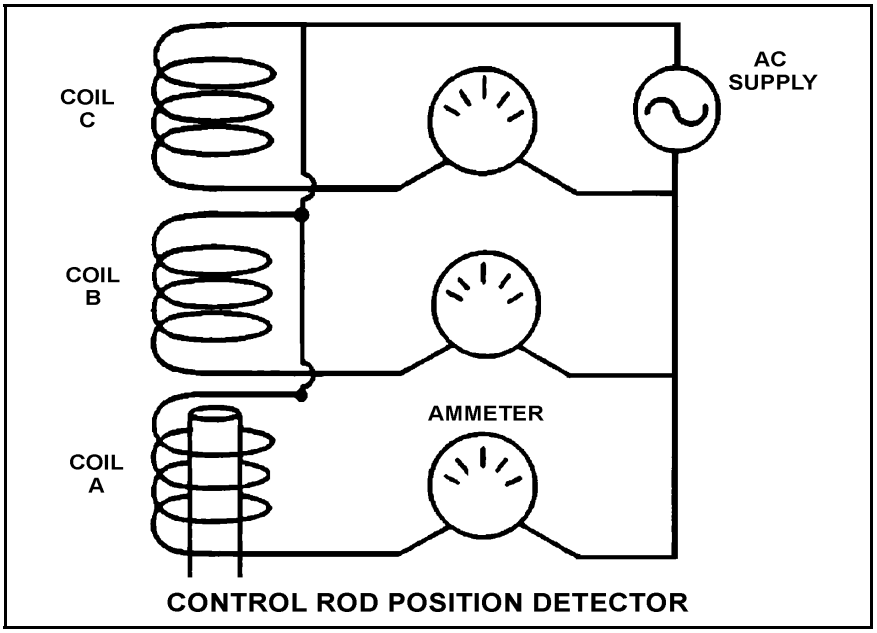
Compared to the initial coil output currents, after the control rod is withdrawn, the output current of coil A will be _____ and the output current of coil B will be _____.

A. higher; higher.

B. higher; lower.

C. the same; higher.

D. the same; lower.



QUESTION: 12

A plant startup is in progress immediately following a reactor refueling. The external nuclear instrumentation (NI) was calibrated just prior to the refueling shutdown and has not been readjusted.

If actual power level is stabilized at 90%, NI power level will be _____ than actual power level because, compared to pre-shutdown 90% power level operation, _____.

A. higher; total core neutron production rate has increased

B. lower; total core neutron production rate has decreased

C. higher; power production in the outer portion of the core has increased

D. lower; power production in the outer portion of the core has decreased

QUESTION: 13

A boron trifluoride (BF_3) detector (proportional counter) is normally used to monitor only source range core neutron level. How will the detector be affected if normal detector high voltage is inadvertently applied during reactor operation in the power range?

A. The BF_3 gas will become completely ionized and source range indication will stabilize at a constant low value.

B. The BF_3 gas will become completely ionized and source range indication will stabilize at a constant high value.

C. The detector electrodes will become exposed to an extremely high neutron flux and cause a false high reading on the source range indication.

D. The detector electrodes will become exposed to an extremely high gamma flux and cause a false high reading on the source range indication.

QUESTION: 14

Which one of the following lists the two types of gas-filled radiation detectors whose outputs will be least affected by a small variation (± 10 volts) in the voltage applied to the detectors? (Assume voltage remains within normal range.)

A. Ion chamber and proportional

B. Geiger Mueller and ion chamber

C. Proportional and limited proportional

D. Limited proportional and Geiger Mueller

QUESTION: 15

If the turbine shaft speed signal received by a typical turbine governor control system fails low during turbine startup, the turbine governor will cause turbine speed to:

A. decrease to a minimum speed setpoint.

B. increase, until the mismatch with demanded turbine speed is nulled.

C. decrease, until the mismatch with demanded turbine speed is nulled.

D. increase, until an upper limit is reached or the turbine trips on overspeed.

QUESTION: 16

Refer to the drawing of a pressure bistable in an alarm circuit (see figure below).

The orientation of the bistable symbol indicates the characteristics of the bistable as is normal for a control circuit diagram. The bistable turns on to actuate an alarm at a system pressure of 100 psig. The bistable has a 5 psig dead band, or neutral zone.

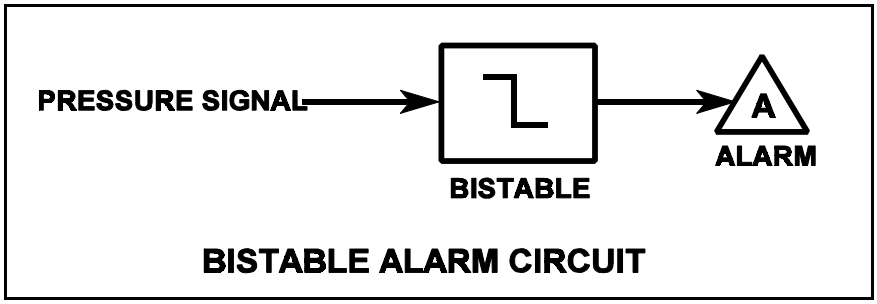
If current system pressure is 90 psig, which one of the following describes the alarm response as system pressure is slowly increased to 110 psig?

A. The alarm is currently actuated and will turn off at 95 psig.

B. The alarm will actuate at 100 psig and will not turn off.

C. The alarm is currently actuated and will turn off at 105 psig.

D. The alarm will actuate at 100 psig and will turn off at 105 psig.



QUESTION: 17

Which one of the following describes a characteristic of pneumatic valve positioners?

A. They can increase air pressure to valve actuators above existing main air header pressure.

B. They can provide auto and manual demand signals to valve controllers and valve actuators.

C. They can either receive or supply air to/from valve controllers, depending on the direction of valve travel.

D. They can automatically increase or decrease air pressure to valve actuators to overcome sluggish valve response.

QUESTION: 18

A diesel generator is supplying an isolated electrical bus with the governor operating in the isochronous mode. If a large electrical load is started on the bus, generator frequency will:

A. remain constant during and after the load start.

B. initially decrease, then increase and stabilize below the initial value.

C. initially decrease, then increase and stabilize at the initial value.

D. initially decrease, then increase and stabilize above the initial value.

QUESTION: 19

Refer to the drawing of a water storage tank with a level control system (see figure below). The tank water level is being automatically controlled at 50% by a proportional-integral (PI) controller that positions the drain valve. Tank water level is currently stable with 500 gpm entering the tank and the drain valve 50% open.

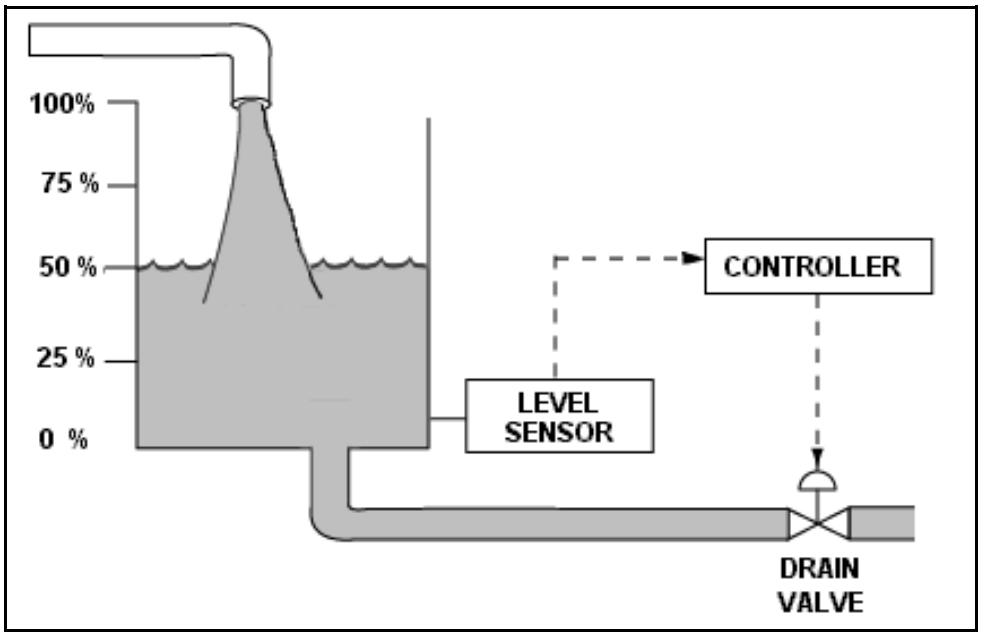
The tank suddenly develops a constant 200 gpm leak, while the input flow rate remains constant at 500 gpm. When tank water level stabilizes, level will be _____, and the drain valve position will be _____.

A. 50%; more open

B. 50%; more closed

C. lower than 50%; more open

D. lower than 50%; more closed



QUESTION: 20

Which one of the following contains indications of cavitation for an operating centrifugal pump?

A. Low flow rate with low discharge pressure

B. Low flow rate with high discharge pressure

C. High motor amps with low discharge pressure

D. High motor amps with high discharge pressure

QUESTION: 21

A centrifugal pump is taking suction on an open storage tank that has been filled to a level of 40 feet with 10,000 gallons of 60°F water. The pump is located at the base of the tank, takes a suction from the bottom of the tank, and discharges through a fire hose.

Given:

- The pump is currently operating at its design flow rate of 200 gpm and a total developed head of 150 feet.
- The pump requires 4 feet of net positive suction head (NPSH).

How will the centrifugal pump flow rate be affected as the water storage tank level decreases?

A. Flow rate will remain constant until the pump begins to cavitate at a tank level of about 4 feet.

B. Flow rate will remain constant until the pump becomes air bound when the tank empties.

C. Flow rate will gradually decrease until the pump begins to cavitate at a tank level of about 4 feet.

D. Flow rate will gradually decrease until the pump becomes air bound when the tank empties.

QUESTION: 22

An ac motor-driven centrifugal pump was just started. During the start, motor current remained peaked for 6 seconds before decreasing to standard running current. Normally, the starting current peak lasts about 4 seconds.

Which one of the following could have caused the extended starting current peak?

A. The pump shaft was seized and did not turn.

B. The pump was initially rotating slowly in the reverse direction.

C. The pump discharge check valve was stuck closed and did not open.

D. The pump was initially air bound, and then primed itself after 6 seconds of operation.

QUESTION: 23

Which one of the following contains two reasons for starting a centrifugal pump with the discharge piping full of water and the discharge valve shut?

A. Prevent pump runout and prevent motor overspeed

B. Prevent pump runout and ensure lubrication of pump seals

C. Prevent water hammer and prevent excessive starting current

D. Prevent water hammer and ensure adequate pump recirculation flow

QUESTION: 24

Which one of the following is an indication of pump runout?

A. Low pump flow rate

B. High pump vibration

C. Low pump motor current

D. High pump discharge pressure

QUESTION: 25

A section of reactor coolant piping is being hydrostatically tested to 2900 psig using a positive displacement pump. The operating characteristics of the positive displacement pump are shown below, identifying ideal, expected, and actual pump performance during the test.

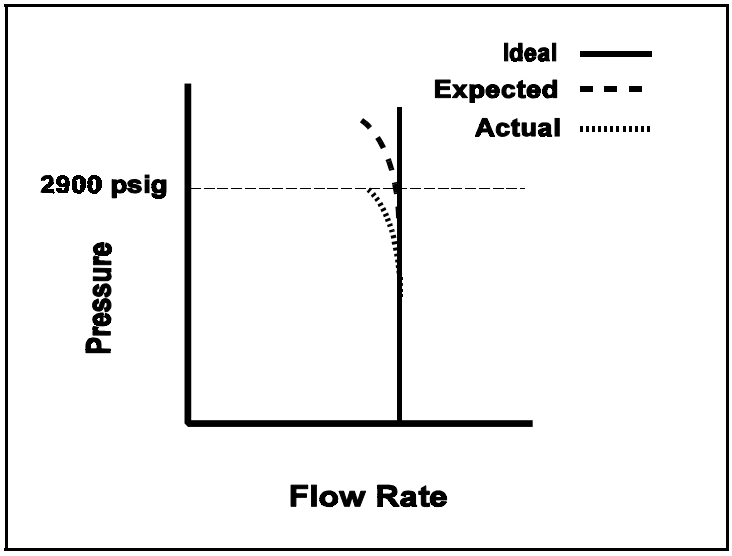
Which one of the following could have caused the observed difference between the expected and the actual pump performance?

A. Available NPSH decreased to slightly below the required NPSH for the pump.

B. Available NPSH decreased to slightly above the required NPSH for the pump.

C. A relief valve on the pump discharge piping opened prior to its set point of 2900 psig.

D. A relief valve on the pump discharge piping failed to open at its set point of 2900 psig.



QUESTION: 26

What is the purpose of the safety/relief valve located between the pump outlet and discharge isolation valve of most positive displacement pumps?

A. Protect the pump and suction piping from overpressure if the discharge valve is open during system startup.

B. Protect the pump and suction piping from overpressure if the suction valve is closed during pump operation.

C. Protect the pump and discharge piping from overpressure if the discharge valve is closed during pump operation.

D. Protect the pump and discharge piping from overpressure due to thermal expansion of pump contents when the pump is shutdown with its suction valve closed.

QUESTION: 27

Reactor coolant pump motor amps will _____ if the rotor is locked, and the motor speed will _____ if the rotor shears.

A. increase; increase

B. increase; decrease

C. decrease; increase

D. decrease; decrease

QUESTION: 28

To provide protection against damage to a motor, which one of the following breaker trip signals will trip the motor breaker if a motor bearing seizes while the motor is running?

A. Undervoltage

B. Underfrequency

C. Time-delayed overcurrent

D. Instantaneous overcurrent

QUESTION: 29

A main generator is operating on the grid with the following indications:

600 MWe
100 MVAR (VARs in)
13,800 amps
25,000 volts

If main generator excitation is decreased slightly, amps will _____ and MVAR will _____.

A. increase; increase

B. increase; decrease

C. decrease; increase

D. decrease; decrease

QUESTION: 30

A centrifugal pump is operating at 600 rpm with the following parameters:

Current = 100 amperes
Pump head = 50 psid
Pump flow rate = 880 gpm

What will be the approximate value of pump head if pump speed is increased such that the pump now draws 640 amperes?

A. 93 psid

B. 126 psid

C. 173 psid

D. 320 psid

QUESTION: 31

Frequent starts of large motors will result in overheating of the motor windings due to high current flow caused by:

A. windage losses between the rotor and stator.

B. low electrical resistance of the motor windings.

C. an electrical short circuit between the rotor and stator.

D. high counter electromotive force at low rotor speeds.

QUESTION: 32

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

Given the following existing conditions:

$\dot{m}_{oil}$ = 1.8×10^4 lbm/hr
$\dot{m}_{water}$ = 3.3×10^4 lbm/hr
$C_{p\text{-}oil}$ = 1.1 Btu/lbm-°F
$C_{p\text{-}water}$ = 1.0 Btu/lbm-°F
$T_{cw\text{-}in}$ = 90°F
$T_{cw\text{-}out}$ = 120°F
$T_{oil\text{-}in}$ = 170°F
$T_{oil\text{-}out}$ = ?

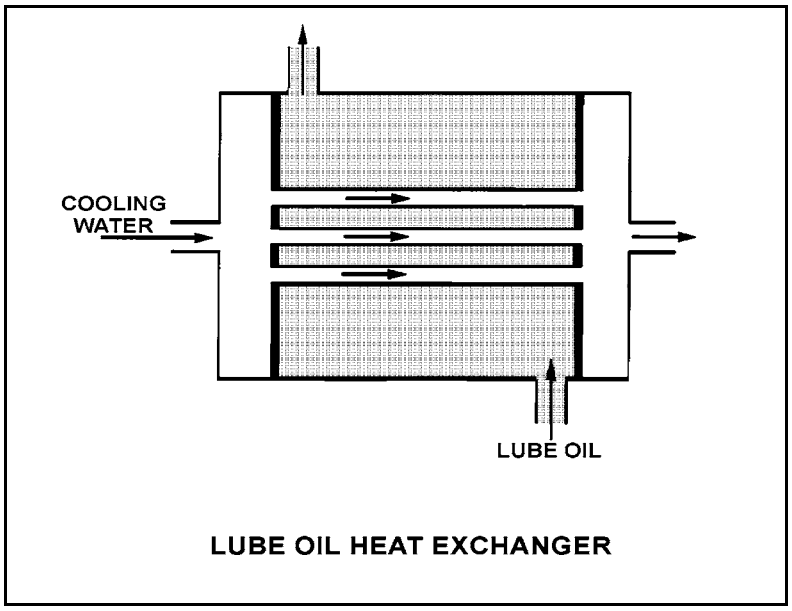
What is the approximate temperature of the oil exiting the heat exchanger ($T_{oil\text{-}out}$)?

A. 110°F

B. 120°F

C. 130°F

D. 140°F



LUBE OIL HEAT EXCHANGER

QUESTION: 33

Steam has been admitted to a condenser for 25 minutes with no cooling water during a condenser startup. Initiating full cooling water flow rate at this time will:

A. induce large thermal stresses on the condenser shell.

B. reduce the stress on the condenser tubes by gradually cooling the tubes.

C. reduce the stress on the condenser shell because the shell has been pre-warmed.

D. induce large thermal stresses on the junctions between the condenser tubes and the tubesheet.

QUESTION: 34

Which one of the following will have the <u>least</u> degrading effect on vacuum when an equal mass of each is introduced into the main condenser during full power operations? (Consider each separately.)

A. Water vapor with a low moisture content

B. Water vapor with a high moisture content

C. A chemically nonreactive gas such as argon

D. A chemically reactive gas such as carbon dioxide

QUESTION: 35

The decontamination factor (also called the demineralization factor) of a condensate demineralizer has just been determined to be 50, based on conductivity measurements.

If condensate having a conductivity of 20 µmho/cm is flowing into this demineralizer, which one of the following is the conductivity of the condensate at the outlet of the demineralizer?

A. 0.4 µmho/cm

B. 1.0 µmho/cm

C. 4.0 µmho/cm

D. 10.0 µmho/cm

QUESTION: 36

A PWR plant has two identical mixed resin bed reactor coolant ion exchangers, A and B, which were each conditioned and placed in parallel service continuously for about two weeks with the plant at full power after a refueling outage. Then, ion exchanger A was isolated for standby use while ion exchanger B remained in service. After 10 months of continuous operation at full power, it is necessary to place ion exchanger A in service and isolate ion exchanger B.

Which one of the following describes why ion exchanger A is initially placed in service with a small coolant flow rate rather than immediately admitting full flow?

A. Avoids an undesired increase in reactor coolant pH.

B. Avoids an undesired decrease in reactor coolant pH.

C. Avoids an undesired increase in reactor coolant boron concentration.

D. Avoids an undesired decrease in reactor coolant boron concentration.

QUESTION: 37

A nuclear plant was operating at steady-state 100% power when the reactor coolant system experienced a large crud burst. Shortly afterward, the operators began to record parameters for the in-service coolant purification ion exchanger.

Assuming no additional operator actions, what trend will the recorded parameters show during the next few hours?

A. Increasing flow rate through the ion exchanger

B. Increasing pressure drop across the ion exchanger

C. Increasing ion exchanger inlet water conductivity

D. Increasing ion exchanger outlet water conductivity

QUESTION: 38

To properly deenergize an electrical component and its associated control and indication circuits, the component circuit breaker should be:

A. open with the control switch in Pull-To-Lock.

B. open with the control switch tagged in the open position.

C. racked out and tagged in racked-out position.

D. racked out with control power fuses removed.

QUESTION: 39

How is typical breaker operation affected when the associated breaker control power transfer switch is placed in the "Local" position?

A. Control power will be available to provide protective trips, and the breaker can be electrically operated only from the control room.

B. Control power will be removed from both the open and close circuits, and the breaker can be electrically operated only from the control room.

C. Control power will be available to provide protective trips, and the breaker can be electrically operated only from the breaker cabinet.

D. Control power will be removed from both the open and close circuits, and the breaker can be electrically operated only from the breaker cabinet.

QUESTION: 40

Two identical 1000 Mw electrical generators are operating in parallel, supplying the same isolated electrical bus. The generator output breakers also provide identical protection for the generators. Generator A and B output indications are as follows:

Generator A	Generator B
22.5 Kv	22.5 Kv
60.2 Hertz	60.2 Hertz
750 Mw	750 Mw
25 MVAR (VARs out)	50 MVAR (VARs out)

A malfunction causes the voltage regulator for generator B to slowly and continuously increase the terminal voltage for generator B. If no operator action is taken, which one of the following describes the electrical current indications for generator A?

A. Current will decrease continuously until the output breaker for generator A trips on reverse power .

B. Current will decrease continuously until the output breaker for generator B trips on reverse power .

C. Current will initially decrease, and then increase until the output breaker for generator A trips on overcurrent.

D. Current will initially decrease, and then increase until the output breaker for generator B trips on overcurrent.

QUESTION: 41

Refer to the drawing of a valve control circuit (see figure below).

Pushbutton PB2 was depressed to open the valve, and the current contact status is as shown with the following exceptions:

LS1 is closed.
LS3 is closed.
#1 contact is closed.
#2 contact is closed.

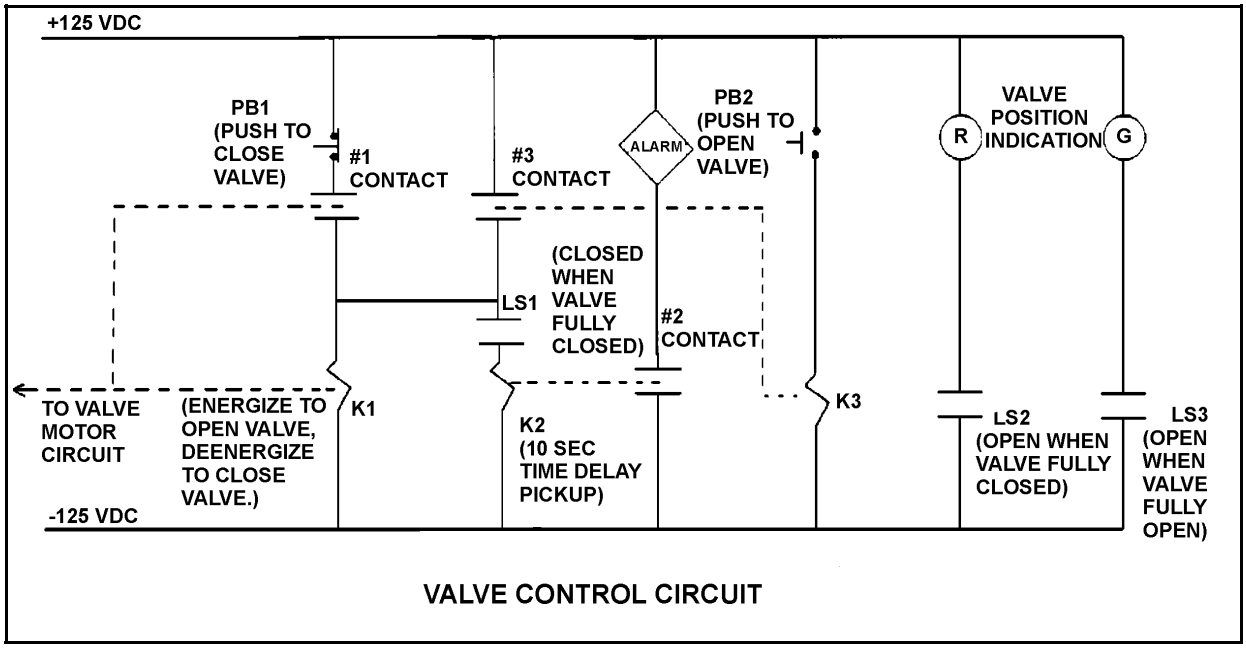
Which one of the following describes the condition of the valve and its control circuit?

A. The valve is closed and an open demand signal has existed for at least 10 seconds.

B. The valve is closed and the valve motor circuit has just been energized to open the valve.

C. The valve is partially open and an open demand signal has existed for at least 10 seconds.

D. The valve is partially open and the valve motor circuit is deenergized as PB2 was prematurely released.



VALVE CONTROL CIRCUIT

QUESTION: 42

Which one of the following is an unsafe practice if performed when working on or near energized electrical equipment?

A. Stand on insulating rubber material to prevent yourself from being grounded.

B. Use two hands for balance and to prevent dropping tools onto energized equipment.

C. Have a person standing by to deenergize the equipment in the event of an emergency.

D. Cover exposed energized circuits with insulating material to prevent inadvertent contact.

QUESTION: 43

A main generator is being paralleled to a power grid. Generator voltage has been properly adjusted and the synchroscope is rotating slowly in the clockwise direction. The generator output breaker must be closed just prior to the synchroscope pointer reaching the 12 o'clock position to prevent:

A. motoring of the generator due to unequal frequencies.

B. excessive arcing within the breaker due to out-of-phase voltages.

C. excessive MW load transfer to the generator due to unequal frequencies.

D. excessive MVAR load transfer to the generator due to out-of-phase voltages.

QUESTION: 44

Given the following indications for an open 4160 Vac breaker:

- The local OPEN/CLOSED mechanical flag indicates open
- A breaker overcurrent trip flag is actuated on one phase
- The line-side voltmeter indicates 4160 Vac
- The load-side voltmeter indicates 0 volts

Assuming no operator actions were taken since the breaker opened, which one of the following could have caused the breaker to open?

A. A ground fault caused an automatic breaker trip.

B. A loss of control power caused an automatic breaker trip.

C. An operator tripped the breaker normally at the breaker.

D. An operator tripped the breaker normally from a remote location.

QUESTION: 45

Compared to a prompt neutron, a delayed neutron born from the same fission event is more likely to: (Assume both neutrons remain in the core unless otherwise stated.)

A. undergo resonance capture in a Pu-240 nucleus.

B. cause fission of a U-238 nucleus.

C. be absorbed in a B-10 nucleus.

D. leak out of the core.

QUESTION: 46

Which one of the following conditions describes a reactor that is exactly critical?

A. $K_{eff} = 0$; $\Delta K/K = 0$

B. $K_{eff} = 0$; $\Delta K/K = 1$

C. $K_{eff} = 1$; $\Delta K/K = 0$

D. $K_{eff} = 1$; $\Delta K/K = 1$

QUESTION: 47

During core refueling, burnable poisons are often installed in the core to help control K_{excess}. Why are more burnable poison rods installed during fuel load for the first fuel cycle than for subsequent fuel cycles?

A. Control rod worth is lower at the beginning of subsequent fuel cycles.

B. More fuel reactivity is present at the beginning of subsequent fuel cycles.

C. More fission product poisons are present at the beginning of subsequent fuel cycles.

D. Reactor coolant boron concentration is higher at the beginning of subsequent fuel cycles.

QUESTION: 48

During a reactor startup, reactor power increases from $3x10^{-6}$% to $5x10^{-6}$% in 2 minutes with no operator action. Which one of the following was the average reactor period during the power increase?

A. 61 seconds

B. 155 seconds

C. 235 seconds

D. 357 seconds

QUESTION: 49

Two reactors, A and B, are exactly critical low in the intermediate range (well below the point of adding heat). The reactors are identical except that reactor A is near the beginning of core life (BOL) and reactor B is near the end of core life (EOL). Assume that a step addition of positive reactivity (0.001 ΔK/K) is added to each reactor. Select the combination below that completes the following statement.

The size of the prompt jump in core power observed for reactor B (EOL) will be _____ than reactor A (BOL); and the stable startup rate observed for reactor B (EOL) will be _____ than reactor A (BOL).

A. larger; larger

B. larger; smaller

C. smaller; larger

D. smaller; smaller

QUESTION: 50

Moderator temperature coefficient is defined as the change in core reactivity per degree change in:

A. fuel temperature.

B. fuel clad temperature.

C. reactor vessel temperature.

D. reactor coolant temperature.

QUESTION: 51

Which one of the following contains two isotopes, both of which are responsible for the negative reactivity inserted when fuel temperature increases near the end of core life?

A. U-235 and Pu-239

B. U-235 and Pu-240

C. U-238 and Pu-239

D. U-238 and Pu-240

QUESTION: 52

With higher concentrations of boron in the reactor coolant, the core neutron flux distribution shifts to _____ energies where the absorption cross-section of boron is _____.

A. higher; lower

B. higher; higher

C. lower; lower

D. lower; higher

QUESTION: 53

Neglecting the effects of core Xe-135, which one of the following power changes requires the greatest amount of positive reactivity addition?

A. 3% power to 10% power

B. 10% power to 25% power

C. 25% power to 60% power

D. 60% power to 100% power

QUESTION: 54

A reactor has been shut down for three weeks with all control rods fully inserted. If a center control rod is fully withdrawn from the core, neutron population will: (Assume the reactor remains subcritical.)

A. remain the same.

B. increase and stabilize at a new higher level.

C. increase temporarily then return to the original value.

D. increase exponentially until the operator inserts the control rod.

QUESTION: 55

A control rod is positioned in a reactor with the following neutron flux parameters:

Core average thermal neutron flux = 1.0×10^{12} n/cm^2-sec
Control rod tip thermal neutron flux = 4.0×10^{12} n/cm^2-sec

If the control rod is slightly inserted such that the control rod tip is located in a thermal neutron flux of 1.2×10^{13} n/cm^2-sec, then the differential control rod worth will be increased by a factor of _____. (Assume the core average thermal neutron flux is constant.)

A. 1/3

B. 3

C. 9

D. 27

QUESTION: 56

Which one of the following is a reason for neutron flux shaping in a reactor core?

A. To minimize local power peaking by more evenly distributing the core thermal neutron flux

B. To reduce thermal neutron leakage by decreasing the neutron flux at the edge of the reactor core

C. To reduce the size and number of control rods needed to ensure the reactor remains subcritical following a reactor trip

D. To increase control rod worth by peaking the thermal neutron flux at the top of the reactor core

QUESTION: 57

A reactor is operating at equilibrium full power when a single control rod fully inserts (from the fully withdrawn position). Reactor power is returned to full power with the control rod still fully inserted.

Compared to the initial axial neutron flux shape, the current flux shape will have a:

A. minor distortion, because a fully inserted control rod has zero reactivity worth.

B. minor distortion, because the fully inserted control rod is an axially uniform poison.

C. major distortion, because the upper and lower core halves are loosely coupled.

D. major distortion, because power production along the length of the rod drastically decreases.

QUESTION: 58

A 3400 Mw reactor has been operating at 100% power for several months. Which one of the following describes the relative contributions of beta decay and neutron capture to Xe-135 removal from the reactor core?

A. Beta decay and neutron capture contribute equally

B. Primary - beta decay; secondary - neutron capture

C. Primary - neutron capture; secondary - beta decay

D. Not enough information given to make a comparison

QUESTION: 59

Reactors A and B are operating at steady-state 100% power with equilibrium core Xe-135. The reactors are identical except that reactor A is operating at the end of core life (EOL) and reactor B is operating at the beginning of core life (BOL).

Which reactor has the greater concentration of core Xe-135?

A. Reactor A (EOL) due to the smaller 100% power thermal neutron flux

B. Reactor A (EOL) due to the larger 100% power thermal neutron flux

C. Reactor B (BOL) due to the smaller 100% power thermal neutron flux

D. Reactor B (BOL) due to the larger 100% power thermal neutron flux

QUESTION: 60

A reactor is initially operating at 100% power with equilibrium core xenon-135. Power is decreased to 40% over a 2 hour period and average reactor coolant temperature is adjusted to 562°F using manual rod control. Rod control is left in Manual and no subsequent operator actions are taken.

If only the reactivity effects of core xenon-135 changes are considered, which one of the following describes the status of the average reactor coolant temperature 2 hours after the power change is completed?

A. Greater than 562°F and decreasing slowly

B. Greater than 562°F and increasing slowly

C. Less than 562°F and decreasing slowly

D. Less than 562°F and increasing slowly

QUESTION: 61

How does core xenon-135 change immediately following a reactor trip from 100% equilibrium power operation?

A. Decreases due to xenon removal by decay.

B. Decreases due to the reduction in xenon production directly from fission.

C. Increases due to xenon production from the decay of iodine-135.

D. Increases due to xenon production from the spontaneous fission of uranium.

QUESTION: 62

A nuclear plant was shut down following three months of operation at full power. The shutdown occurred over a 3 hour period with a constant rate of power decrease.

Which one of the following describes the reactivity added by core xenon during the shutdown?

A. Xenon buildup added negative reactivity.

B. Xenon buildup added positive reactivity.

C. Xenon burnout added negative reactivity.

D. Xenon burnout added positive reactivity.

QUESTION: 63

A reactor has been operating at 100% power for three months following a refueling outage. If the reactor is operated at 100% power without making RCS boron additions or dilutions for the next month, RCS boron concentration will:

A. decrease because irradiated boron-10 atoms undergo a neutron-alpha reaction.

B. decrease because boron atoms decompose at normal RCS operating temperatures.

C. remain constant because irradiated boron-10 atoms become stable boron-11 atoms.

D. remain constant because irradiated boron-10 atoms still have large absorption cross sections for thermal neutrons.

QUESTION: 64

A nuclear plant was operating at steady-state 100% power near the end of a fuel cycle when a reactor trip occurred. Four hours after the trip, reactor coolant temperature is being maintained at normal no-load temperature in anticipation of commencing a reactor startup.

At this time, which one of the following will cause the fission rate in the reactor core to decrease?

A. The operator fully withdraws the shutdown control rods.

B. Reactor coolant temperature is allowed to decrease by 3°F.

C. Reactor coolant boron concentration is decreased by 10 ppm.

D. An additional two hours is allowed to pass with no other changes in plant parameters.

QUESTION: 65

The following data was obtained at steady-state conditions during a reactor startup:

ROD POSITION (UNITS WITHDRAWN)	COUNT RATE (CPS)
10	360
15	400
20	450
25	514
30	600
35	720
40	900

Assuming uniform differential rod worth, at what approximate rod position will criticality occur?

A. 50 units withdrawn

B. 60 units withdrawn

C. 70 units withdrawn

D. 80 units withdrawn

QUESTION: 66

To predict critical control rod position prior to performing a reactor startup, the operator must determine the amount of reactivity added by post-shutdown changes in:

A. reactor coolant boron concentration, moderator voids, and burnable poisons.

B. power defect, reactor coolant boron concentration, and control rod positions.

C. moderator temperature, burnable poisons, and core xenon-135 concentration.

D. control rod positions, core xenon-135 concentration, and moderator temperature.

QUESTION: 67

A reactor core is exactly critical well below the point of adding heat during a plant startup. A small amount of positive reactivity is then added to the core, and a stable positive startup rate (SUR) is established.

With the stable positive SUR, the following is observed:

Time	Power Level
0 sec	3.16×10^{-7}%
90 sec	1.0×10^{-5}%

Which one of the following will be the reactor power at time = 120 seconds?

A. 3.16×10^{-5}%

B. 5.0×10^{-5}%

C. 6.32×10^{-5}%

D. 1.0×10^{-4}%

QUESTION: 68

A reactor is critical just below the point of adding heat when an inadvertent reactor trip occurs. All control rods fully insert except for one rod, which remains fully withdrawn. Five minutes after the reactor trip, with reactor startup rate (SUR) stable at approximately -1/3 dpm, the remaining withdrawn control rod suddenly drops (fully inserts).

Which one of the following describes the reactor response to the drop of the last control rod?

A. SUR will remain stable at approximately -1/3 dpm.

B. SUR will immediately become more negative, and then return to and stabilize at approximately -1/3 dpm.

C. SUR will immediately become more negative, and then turn and stabilize at a value more negative than -1/3 dpm.

D. SUR will immediately become more negative, and then turn and stabilize at a value less negative than -1/3 dpm.

QUESTION: 69

One week after a refueling outage, a reactor is operating at 80% power with all control rods fully withdrawn. During the outage, the entire core was replaced by new fuel assemblies and new burnable poison assemblies were installed at various locations in the core.

Assume reactor power and control rod position do not change. If no operator action is taken, how and why will reactor coolant average temperature change during the next week?

A. Decrease slowly due to fuel burnup only.

B. Decrease slowly due to fuel burnup and fission product poison buildup.

C. Increase slowly due to burnable poison burnout only.

D. Increase slowly due to burnable poison burnout and fission product poison decay.

QUESTION: 70

A reactor plant is operating at 100% power near the end of core life when the main turbine trips. If the reactor does not immediately scram, which one of the following will act first to change reactor power?

A. Positive reactivity addition from the Doppler coefficient will cause reactor power to initially increase.

B. Positive reactivity addition from the moderator temperature coefficient will cause reactor power to initially increase.

C. Negative reactivity addition from the Doppler coefficient will cause reactor power to initially decrease.

D. Negative reactivity addition from the moderator temperature coefficient will cause reactor power to initially decrease.

QUESTION: 71

A nuclear plant is being returned to operation following a refueling outage. Fuel preconditioning requires reactor power to be increased from 10% to full power gradually over a one week period.

During this slow power increase, most of the positive reactivity added by the operator is required to overcome the negative reactivity from:

A. fuel burnup.

B. xenon buildup.

C. fuel temperature increase.

D. moderator temperature increase.

QUESTION: 72

Which one of the following describes the process for inserting control rods during a normal reactor shutdown?

A. Control rods are inserted in reverse order one bank at a time to maintain acceptable power distribution.

B. Control rods are inserted in reverse order one bank at a time to maintain a rapid shutdown capability from the remainder of the control rods.

C. Control rods are inserted in reverse order in a bank overlapping sequence to maintain a relatively constant differential control rod worth.

D. Control rods are inserted in reverse order in a bank overlapping sequence to limit the amount of positive reactivity added during a rod ejection accident.

QUESTION: 73

Refer to the drawing of four differential pressure (D/P) level detectors (see figure below).

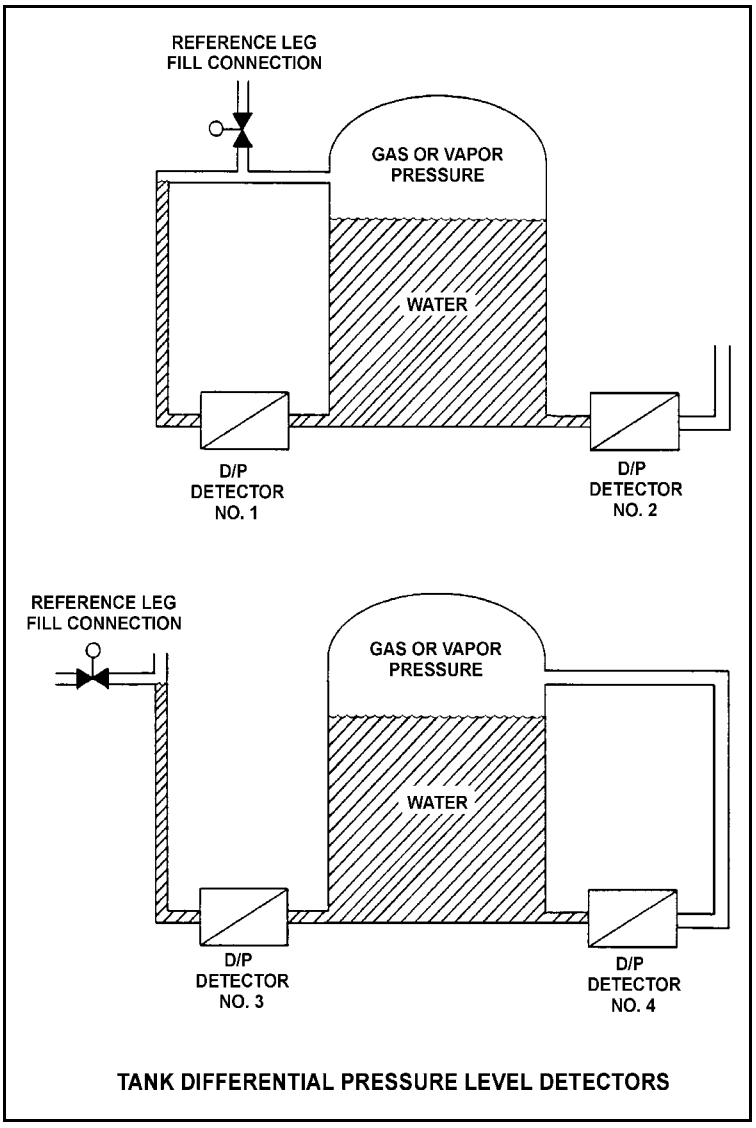
The tanks are identical and are being maintained at 17 psia and 50% water level. They are surrounded by atmospheric pressure. Which one of the level detectors will sense the greatest D/P?

A. 1

B. 2

C. 3

D. 4



TANK DIFFERENTIAL PRESSURE LEVEL DETECTORS

QUESTION: 74

Consider a saturated water/steam mixture at 500°F with a quality of 90%. If the pressure of the mixture is decreased with no heat gain or loss, the temperature of the mixture will _____ and the quality of the mixture will _____. (Assume the mixture remains saturated.)

A. decrease; increase

B. decrease; decrease

C. remain the same; increase

D. remain the same; decrease

QUESTION: 75

Which one of the following is the approximate amount of heat required to convert 2 lbm of water at 100°F and 100 psia to a saturated vapor at 100 psia?

A. 559.6 Btu

B. 1119.2 Btu

C. 2238.4 Btu

D. 3357.6 Btu

QUESTION: 76

Which one of the following is the approximate amount of condensate subcooling in a condenser operating at 26 inches Hg vacuum with a condensate temperature of 100°F?

A. 2°F

B. 19°F

C. 26°F

D. 53°F

QUESTION: 77

A pressurizer safety valve is leaking by, allowing the 100% quality steam in the pressurizer to flow to the pressurizer relief tank (PRT). The reactor has been shut down, and a plant cooldown and depressurization are in progress. PRT pressure is being maintained constant at 20 psig.

Which one of the following describes how safety valve tailpipe temperature will be affected as pressurizer pressure slowly decreases from 1500 psia to 500 psia? (Assume there is no heat loss from the tailpipe.)

A. Increases, because the entropy of the pressurizer steam will be increasing.

B. Increases, because the enthalpy of the pressurizer steam will be increasing.

C. Decreases, because the mass flow rate of the leaking steam will be decreasing.

D. Decreases, because the temperature of the pressurizer steam will be decreasing.

QUESTION: 78

Turbine X and turbine Y are ideal steam turbines that exhaust to a condenser at 1.0 psia. Turbine X is driven by saturated steam (100% quality) at 500 psia. Turbine Y is driven by saturated steam (100% quality) at 700 psia.

The greatest amount of specific work is being performed by turbine _____, and the greatest moisture content exists in the exhaust of turbine _____.

A. X; X

B. X; Y

C. Y; X

D. Y; Y

QUESTION: 79

Reactor coolant system (RCS) hot leg temperature is constant at 538°F while RCS pressure is decreasing due to a small reactor coolant leak. Which one of the following RCS pressure ranges includes the pressure at which two-phase flow will <u>first</u> occur in the hot leg?

A. 1100 to 1151 psig

B. 1050 to 1001 psig

C. 1000 to 951 psig

D. 950 to 901 psig

QUESTION: 80

A plant is recovering from a loss of offsite power that caused all reactor coolant pumps (RCPs) to stop. Pressurizer level indication is off-scale high.

Which one of the following is most likely to occur if the steam generator (S/G) temperatures are higher than their associated reactor coolant system (RCS) loop temperatures just prior to restarting an RCP?

A. Localized water hammer in the RCS

B. Pressurized thermal shock to the S/Gs

C. A large pressure spike throughout the RCS

D. Inadvertent lifting of a S/G atmospheric relief valve

QUESTION: 81

Refer to the drawing of a cooling water system (see figure below).

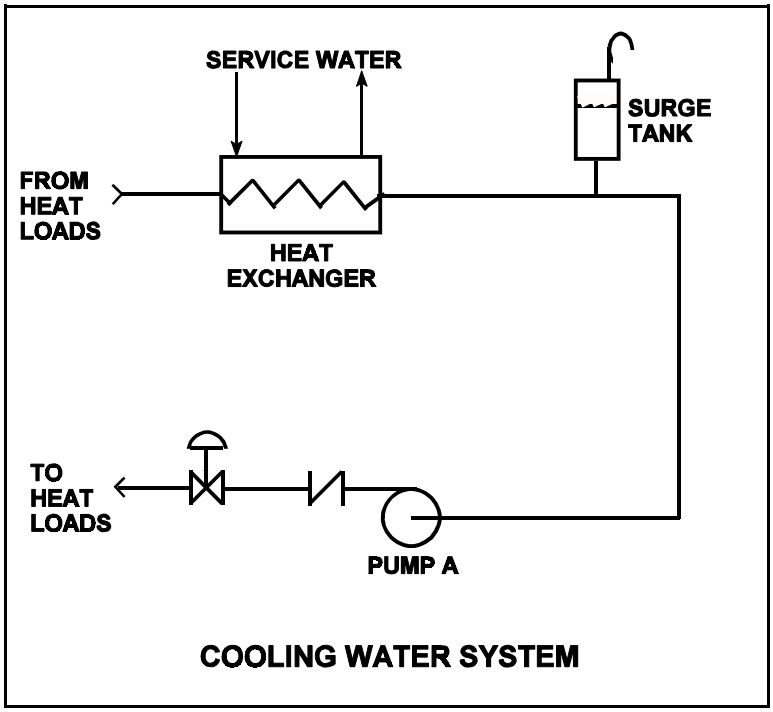
The centrifugal pump is circulating water at 100°F. Which one of the following will cause the centrifugal pump to operate closer to a condition in which gas/vapor binding can occur?

A. Surge tank level is raised by 5%.

B. Service water flow rate is decreased by 5%.

C. The pump discharge valve is used to decrease cooling water system flow rate by 5%.

D. Makeup water containing a high concentration of total dissolved solids is added to the cooling water system.



QUESTION: 82

Which one of the following will increase the possibility of water hammer?

A. Opening and closing system valves very slowly

B. Venting liquid systems only after initiating system flow

C. Starting centrifugal pumps with the discharge valve closed

D. Starting positive displacement pumps with the discharge valve open

QUESTION: 83

Two centrifugal pumps and two positive displacement pumps are able to be cross-connected to provide makeup flow to a system. Each pump will produce 100 gpm at 1000 psig backpressure and has a design maximum pressure of 1500 psig.

If system pressure is 800 psig, which one of the following combinations will produce the greatest flow rate to the system?

A. Two centrifugal pumps in parallel

B. Two centrifugal pumps in series

C. Two positive displacement pumps in parallel

D. Two positive displacement pumps in series

QUESTION: 84

A multi-loop reactor plant is operating at 50% power with manual rod control when the main steam isolation valve (MSIV) for one steam generator inadvertently closes. Assume that no reactor trip or other protective action occurs, and no operator action is taken.

Immediately after the MSIV closure, the cold leg temperature (Tc) in the reactor coolant loop with the closed MSIV will _____; and the Tc in a loop with an open MSIV will immediately _____.

A. increase; increase

B. increase; decrease

C. decrease; increase

D. decrease; decrease

QUESTION: 85

A reactor is operating with the following parameters:

Reactor power:	100%
Core ΔT:	60°F
Reactor coolant system flow rate:	100%
Average coolant temperature:	587°F

A station blackout occurs and natural circulation is established with the following stable parameters:

Decay heat:	1%
Core ΔT:	30°F
Average coolant temperature:	572°F

What is the core mass flow rate in percent?

A. 2.0%

B. 2.5%

C. 3.0%

D. 4.0%

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

Refer to the drawing of a pool boiling curve (see figure below).

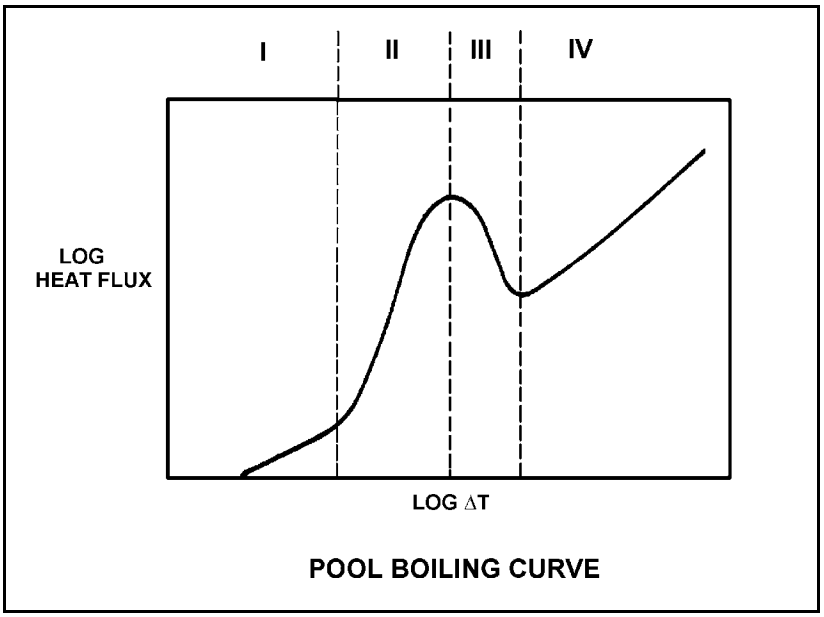
Choose the region of the curve where transition boiling is the primary heat transfer process.

A. Region I

B. Region II

C. Region III

D. Region IV



QUESTION: 88

During a loss of coolant accident, the reactor fuel may experience stable film boiling. Which one of the following types of heat transfer from the fuel cladding will increase significantly when stable film boiling begins?

A. Forced convection

B. Natural convection

C. Conduction

D. Radiation

QUESTION: 89

A reactor is operating at 100% steady-state power at the end of core life with all control rods fully withdrawn. At what axial location in a typical fuel assembly will the maximum departure from nucleate boiling ratio occur?

A. At the top of the fuel assembly

B. At the bottom of the fuel assembly

C. Between the bottom and midplane of the fuel assembly

D. Between the midplane and the top of the fuel assembly

QUESTION: 90

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

A. increases; increases

B. increases; decreases

C. decreases; increases

D. decreases; decreases

QUESTION: 91

Which one of the following will increase the reactor coolant system (RCS) subcooling margin with the reactor operating at full power?

A. Decreased RCS pressure

B. Decreased RCS hot leg temperature

C. Increased RCS cold leg temperature

D. Increased concentration of soluble gases in the RCS

QUESTION: 92

A reactor plant is experiencing natural circulation core cooling following a loss of coolant accident. Which one of the following, when it first occurs, marks the beginning of reflux core cooling? (Assume the steam generators contain U-tubes.)

A. Reactor core steam production results in two-phase coolant entering the hot leg and being delivered to the steam generators.

B. Hot leg steam quality is so high that the steam generators cannot fully condense it and two-phase coolant is returned to the reactor vessel via the cold leg.

C. Hot leg condensation is unable to pass completely through the steam generators to enter the cold legs.

D. The steam generators are no longer able to condense any of the steam contained in the hot leg.

QUESTION: 93

A reactor coolant system cooldown is in progress on natural circulation via the steam generator (S/G) atmospheric steam relief valves (operated in manual control). If high point voiding interrupts natural circulation, which one of the following will occur? (Assume feed flow rate, relief valve position, and decay heat level are constant.)

A. S/G level increases and S/G pressure increases.

B. S/G level increases and S/G pressure decreases.

C. S/G level decreases and S/G pressure increases.

D. S/G level decreases and S/G pressure decreases.

QUESTION: 94

A reactor is operating at 80% of rated thermal power with the radial power distribution peaked in the center of the core. Reactor power is then decreased to 60% over the next two hours using only reactor coolant boron adjustments for reactivity control.

When power is stabilized at 60%, the value of the core maximum radial peaking factor will be _____; and the primary contributor to the change in the value of the core maximum radial peaking factor will be the change in _____.

A. lower; fuel temperature

B. lower; moderator temperature

C. higher; fuel temperature

D. higher; moderator temperature

QUESTION: 95

Given the following initial core parameters for a segment of a fuel rod:

Power density = 3 kW/ft
$T_{coolant}$ = 579°F
$T_{fuel\ centerline}$ = 2400°F

Reactor power is increased such that the following core parameters now exist for the same fuel rod segment:

Power density = 5 kW/ft
$T_{coolant}$ = 590°F
$T_{fuel\ centerline}$ = ?°F

Assuming no boiling occurs and coolant flow rate is unchanged, what will be the new stable $T_{fuel\ centerline}$?

A. 3035°F

B. 3614°F

C. 3625°F

D. 4590°F

QUESTION: 96

Which one of the following comparisons will result in a higher probability of brittle fracture of the reactor vessel?

A. A high reactor gamma flux rather than a high neutron flux

B. A high reactor coolant oxygen content rather than a low oxygen content

C. A high reactor vessel material strength rather than a high material ductility

D. A rapid 100°F reactor cooldown at a high temperature rather than a low temperature

QUESTION: 97

Stress on the reactor vessel inner wall is greater during cooldown than heatup because:

A. heatup stress totally offsets pressure stress at the inner wall.

B. both pressure stress and cooldown stress are tensile at the inner wall.

C. cooldown stress and heatup stress are both tensile at the inner wall, but cooldown stress is greater in magnitude.

D. the tensile cooldown stress at the inner wall is greater in magnitude than the compressive pressure stress at the same location.

QUESTION: 98

Two identical reactors are currently shut down for refueling. Reactor A has an average lifetime power capacity of 60% and has been operating for 15 years. Reactor B has an average lifetime power capacity of 75% and has been operating for 12 years.

Which reactor, if any, will have the lowest reactor vessel nil ductility transition temperature?

A. Reactor A due to the lower average lifetime power capacity

B. Reactor B due to the higher average lifetime power capacity

C. Both reactors will have approximately the same nil ductility transition temperature because each core has produced approximately the same number of fissions.

D. Both reactors will have approximately the same nil ductility transition temperature because fast neutron irradiation from a shut down core is not significant.

QUESTION: 99

A plant is shut down with the reactor coolant system at 1200 psia and 350°F. Which one of the following would be most likely to cause pressurized thermal shock of the reactor vessel?

A. A rapid depressurization followed by a rapid heatup

B. A rapid depressurization followed by a rapid cooldown

C. A rapid cooldown followed by a rapid pressurization

D. A rapid heatup followed by a rapid pressurization

QUESTION: 100

During an uncontrolled cooldown of a reactor coolant system, the component most susceptible to pressurized thermal shock is the:

A. reactor vessel.

B. steam generator tube sheet.

C. cold leg accumulator penetration.

D. loop resistance temperature detector penetration.

***** FINAL ANSWER KEY *****

JUNE 2002 NRC GENERIC FUNDAMENTALS EXAMINATION
PRESSURIZED WATER REACTOR - ANSWER KEY

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