UNITED STATES NUCLEAR REGULATORY COMMISSION
PRESSURIZED WATER REACTOR GENERIC FUNDAMENTALS EXAMINATION
MARCH 2013--FORM A

Please Print

Name: _____

Docket No.: _____

Facility: _____

Start Time: _____ Stop Time: _____

INSTRUCTIONS TO APPLICANT

Answer all the test items using the answer sheet provided, ensuring a single answer is marked for each test item. Each test item has equal point value. A score of at least 80 percent is required to pass this portion of the NRC operator licensing written examination. All examination materials will be collected 3 hours after the examination begins. This examination applies to a typical U.S. pressurized water reactor (PWR) nuclear power plant.

SECTION	QUESTIONS	% OF TOTAL	SCORE
COMPONENTS	1 - 22		
REACTOR THEORY	23 - 36		
THERMODYNAMICS	37 - 50		
TOTALS	50		

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

_____

Applicant's Signature

RULES AND INSTRUCTIONS FOR THE
NRC GENERIC FUNDAMENTALS EXAMINATION

During the administration of this examination the following rules apply:

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

NOTE: Numerical answers are rounded to the nearest whole number unless otherwise indicated.

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

2. Fill in your individual docket number.

3. Fill in the name of your facility.

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

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 and Mollier Diagram 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 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. Either pencil or pen may be used.

11. Turn in your examination materials, answer sheet on top, followed by the examination copy and the examination aids, e.g., steam tables, handouts, and scrap paper.

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 SHEET

EQUATIONS

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

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

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

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

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

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

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

$SUR = 26.06/\tau$

$$\tau = \frac{\bar{\beta}_{eff} - \rho}{\lambda_{eff}\,\rho}$$

$$\rho = \frac{\ell^*}{\tau} + \frac{\bar{\beta}_{eff}}{1 + \lambda_{eff}\,\tau}$$

$\ell^* = 1.0 \times 10^{-4}$ sec

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

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

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

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

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

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

$CR_1(1 - K_{eff_1}) = CR_2(1 - K_{eff_2})$

$1/M = CR_1/CR_x$

$A = \pi r^2$

$F = PA$

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

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

$P = IE$

$P_A = \sqrt{3}IE$

$P_T = \sqrt{3}IEpf$

$P_R = \sqrt{3}IE\sin\theta$

Thermal Efficiency = Net Work Out/Energy In

$$\frac{g(z_2 - z_1)}{g_c} + \frac{(\vec{v}_2^2 - \vec{v}_1^2)}{2g_c} + \upsilon(P_2 - P_1) + (u_2 - u_1) + (q - w) = 0$$

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

CONVERSIONS

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1 MW $= 3.41 \times 10^6$ Btu/hr

1 hp $= 2.54 \times 10^3$ Btu/hr

1 Btu $= 778$ ft-lbf

°C $= (5/9)(°F - 32)$

°F $= (9/5)(°C) + 32$

1 kg $= 2.21$ lbm

1 $ft^3_{water} = 7.48$ gal

1 $gal_{water} = 8.35$ lbm

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

QUESTION: 1

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

Both vessels have been pressurized to 50 psig and then isolated. Vessel A is completely filled with water at 150°F. Vessel B is in a saturated condition with one-half steam (100 percent quality) and one-half water (0 percent quality) by volume.

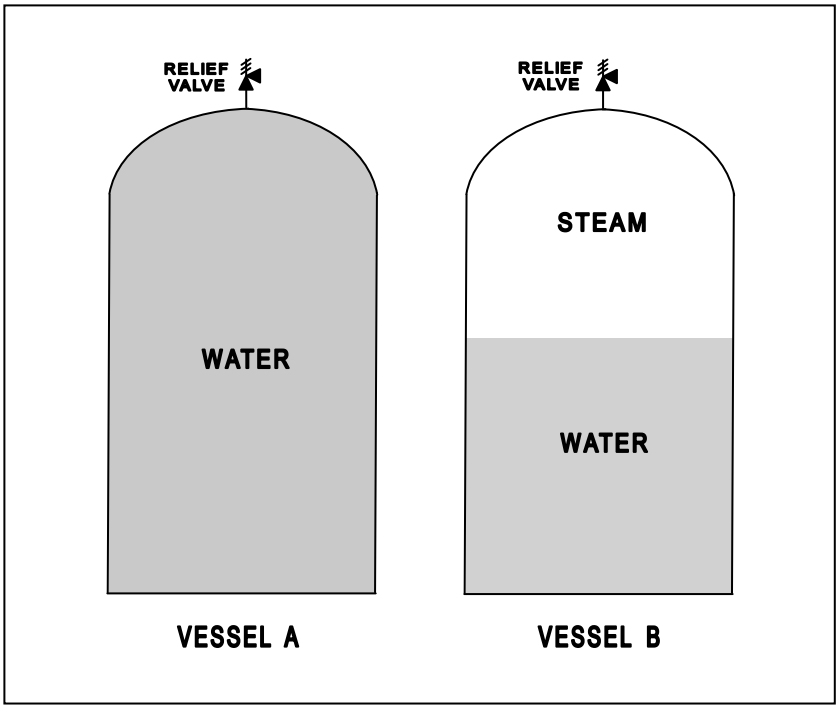
If both relief valves fully open simultaneously, the faster pressure reduction will occur in vessel _____; and if both relief valves close at 40 psig, the greater mass loss will have occurred in vessel _____.

A. A; A

B. A; B

C. B; A

D. B; B



QUESTION: 2

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

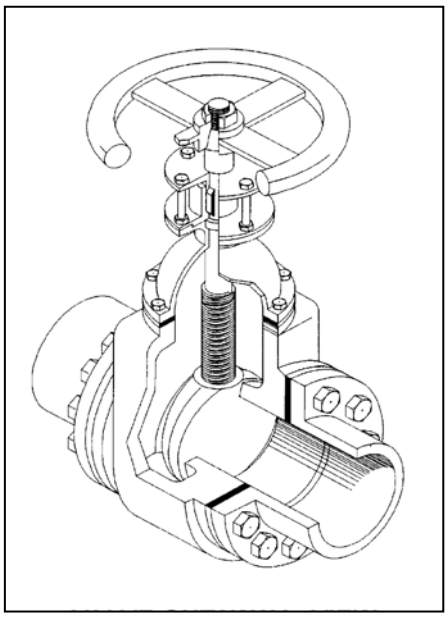
Which one of the following describes the type of valve shown?

A. Rising-stem globe valve

B. Nonrising-stem globe valve

C. Rising-stem gate valve

D. Nonrising-stem gate valve



QUESTION: 3

A cooling water system pressure detector uses a bourdon tube as the sensing element. Which one of the following explains how the indicated system pressure will be affected if a local steam leak raises the temperature of the bourdon tube by 50ºF? (Assume the cooling water system pressure does not change.)

A. Indicated pressure will decrease because the bourdon tube will become more flexible.

B. Indicated pressure will increase because the bourdon tube will become more flexible.

C. Indicated pressure will decrease because the bourdon tube internal pressure will increase.

D. Indicated pressure will increase because the bourdon tube internal pressure will increase.

QUESTION: 4

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

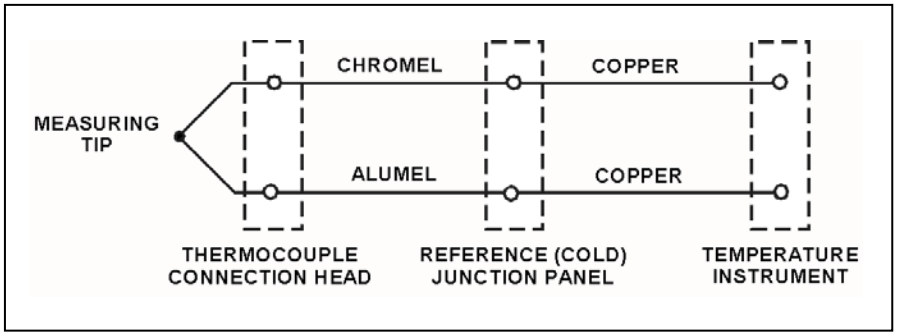
What is the effect on the thermocouple reference junctions if the chromel and alumel extension wires from the thermocouple connection head to the reference junction panel are replaced with copper wires?

A. There will no longer be any reference junctions.

B. The reference junctions will be located in the temperature instrument.

C. The reference junctions will still be located in the reference junction panel.

D. The reference junctions will be located in the thermocouple connection head.



QUESTION: 5

A Geiger-Mueller detector with a "pancake" probe (often called a frisker) is being used to monitor personnel leaving a radiologically controlled area. The probe is equipped with a mica window.

Two individuals have radioactive skin contamination—one individual with only alpha emitters, and the other with only beta emitters. Both types of radiation are being emitted at the same rate. The same percentage of each type of radiation enters the probe's detection chamber and causes ionization.

Which one of the following describes the detector's count rate response to the alpha and beta radiation?

A. The count rate will be higher for the alpha radiation.

B. The count rate will be higher for the beta radiation.

C. The count rate will be the same for both types of radiation.

D. Cannot be determined without knowing the energy levels of the radiation.

QUESTION: 6

Just prior to a plant outage, the power range nuclear instruments (using excore detectors) were calibrated at 50 percent reactor power. During the outage, 40 fuel assemblies from the center of the core were exchanged with 40 higher enriched fuel assemblies from the outer portions of the core. No other fuel assemblies were affected.

Immediately after the outage, when the reactor is stabilized at 50 percent power, indicated reactor power will be _____ than actual reactor power because neutron leakage from the core has _____.

A. lower; decreased

B. lower; increased

C. higher; decreased

D. higher; increased

QUESTION: 7

Refer to the drawing of a temperature bistable in a bistable 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 temperature of 130°F. The bistable has a 5°F deadband, or neutral zone.

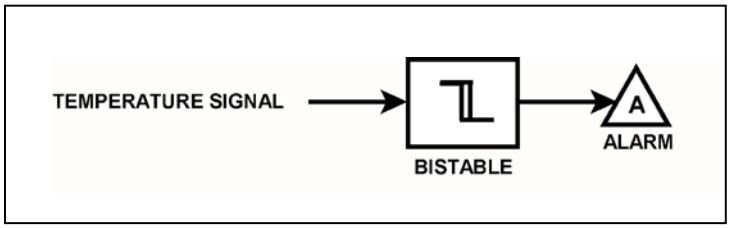
If the current temperature is 150°F, which one of the following describes the alarm circuit response as temperature slowly decreases to 110°F?

A. The alarm is currently actuated and will not turn off.

B. The alarm will actuate at 130°F and will not turn off.

C. The alarm is currently actuated and will turn off at 125°F.

D. The alarm will actuate at 130°F and will turn off at 125°F.



QUESTION: 8

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

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

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

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

D. remain constant during and after the load trip.

QUESTION: 9

Refer to the drawing of a flow control valve (see figure below) that is located in the makeup water supply line to a water storage tank.

The flow control valve is positioned by a tank level controller that can maintain a stable water level anywhere between 10 percent above and 10 percent below the setpoint.

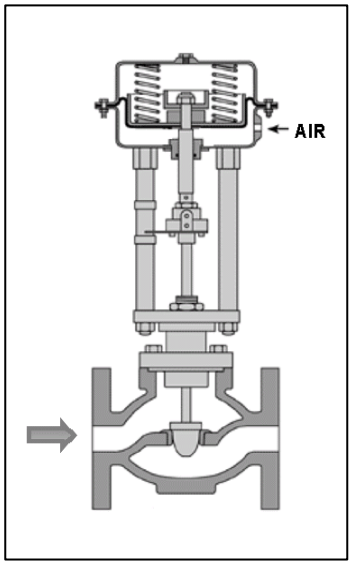
Which one of the following describes the characteristics of the tank level controller?

A. Direct acting with proportional only control.

B. Direct acting with proportional plus integral control.

C. Reverse acting with proportional only control.

D. Reverse acting with proportional plus integral control.



QUESTION: 10

Which one of the following contains three indications of a vapor-bound motor-operated centrifugal pump that is operating in a cooling water system?

A. Fluctuating pump discharge pressure, reduced system flow rate, and increased pump motor current.

B. Reduced system flow rate, increased pump motor current, and increased pump noise level.

C. Increased pump motor current, increased pump noise level, and fluctuating pump discharge pressure.

D. Increased pump noise level, fluctuating pump discharge pressure, and reduced system flow rate.

QUESTION: 11

The discharge valve for a radial-flow centrifugal cooling water pump is closed in preparation for starting the pump.

After the pump is started, the following stable pump pressures are observed:

Pump discharge pressure = 30 psig
Pump suction pressure = 10 psig

With the discharge valve still closed, if the pump speed is doubled, what will be the new pump discharge pressure?

A. 80 psig

B. 90 psig

C. 120 psig

D. 130 psig

QUESTION: 12

A motor-driven centrifugal pump exhibited indications of pump failure while being started. Which one of the following pairs of observations indicate that the pump failure is a sheared impeller shaft?

A. Excessive duration of high starting current and motor breaker trips.

B. Excessive duration of high starting current and no change in system flow rate.

C. Lower than normal running current and motor breaker trips.

D. Lower than normal running current and no change in system flow rate.

QUESTION: 13

An increase in positive displacement pump speed will cause the available net positive suction head for the pump to...

A. decrease, due to the increase in fluid flow rate.

B. decrease, due to the increase in fluid discharge pressure.

C. increase, due to the increase in fluid discharge pressure.

D. increase, due to the increase in fluid flow rate.

QUESTION: 14

A main generator is connected to an infinite power grid with the following generator output parameters:

22 KV
60 Hertz
575 MW
100 MVAR (in)

Which one of the following contains a combination of minor adjustments to the main generator voltage regulator and speed control setpoints such that each adjustment will cause the main generator to operate at a power factor closer to 1.0? (Assume the generator power factor remains less than 1.0.)

	Voltage Setpoint	Speed Setpoint
A.	Increase	Increase
B.	Increase	Decrease
C.	Decrease	Increase
D.	Decrease	Decrease

QUESTION: 15

Two identical AC induction motors are connected to identical radial-flow centrifugal pumps in identical but separate cooling water systems. Each motor is rated at 200 hp. The discharge valve for pump A is fully shut and the discharge valve for pump B is fully open. Each pump is currently off.

If the pumps are started under these conditions, the longer time period required to stabilize motor current will be experienced by the motor for pump _____; and the higher stable motor current will be experienced by the motor for pump _____.

A. A; A

B. A; B

C. B; A

D. B; B

QUESTION: 16

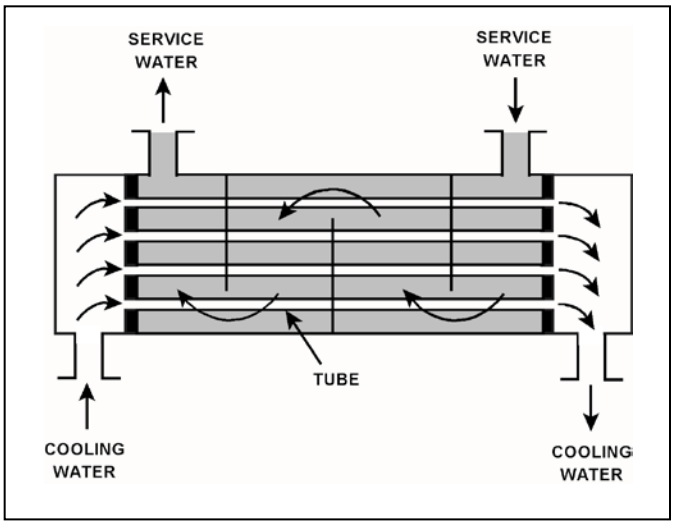
Refer to the drawing of a heat exchanger (see figure below).

The heat exchanger is in service with the following inlet temperatures:

Cooling water inlet temperature = 70°F
Service water inlet temperature = 130°F

Assume that both fluids have the same specific heat, and that cooling water mass flow rate is greater than service water mass flow rate. Which one of the following pairs of heat exchanger outlet temperatures is not possible?

	Cooling Water Outlet Temp.	Service Water Outlet Temp.
A.	78°F	120°F
B.	90°F	110°F
C.	98°F	100°F
D.	100°F	90°F



QUESTION: 17

A nuclear power plant is operating at steady-state 100 percent power. Assuming that condenser cooling water inlet temperature and flow rate do not change, if main condenser vacuum decreases, condensate temperature will...

A. increase, because condensate subcooling has decreased.

B. increase, because condenser saturation pressure has increased.

C. decrease, because condensate subcooling has increased.

D. decrease, because condenser saturation pressure has decreased.

QUESTION: 18

Reactor coolant system (RCS) purification mixed-bed ion exchanger A was removed from service and isolated after several weeks of operation when the RCS boron concentration was 900 ppm. Currently, with ion exchanger B in service, the RCS boron concentration is 450 ppm. If ion exchanger B is isolated and ion exchanger A is immediately returned to service, RCS boron concentration will...

A. remain the same because the resin in ion exchanger A has already become saturated with boron during previous operation.

B. remain the same because the resin in ion exchanger A has no affinity for the boron in the reactor coolant.

C. increase until the volume of water in ion exchanger A mixes completely with the RCS.

D. increase until the resin in ion exchanger A reaches equilibrium with the existing RCS boron concentration.

QUESTION: 19

A nuclear power plant was operating at steady-state 100 percent power when the reactor coolant system experienced a large crud burst. After 20 minutes, the operators began to record parameters for the in-service reactor 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: 20

Given the following indications for an open 4,160 VAC breaker:

All phase overcurrent trip flags are reset.
The control power fuses indicate blown.
The line-side voltmeter indicates 4,160 VAC.
The load-side voltmeter indicates 0 VAC.

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 manually at the breaker cabinet.

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

QUESTION: 21

During a routine inspection of a main generator output breaker, a technician discovers severely damaged main contact surfaces. Which one of the following is the most likely cause of the damaged contact surfaces?

A. The main generator breaker automatically tripped open after it was closed with the generator and power grid voltages 60 degrees out of phase.

B. The main generator breaker automatically tripped open due to a faulty trip relay actuation while the main generator was operating unloaded.

C. The main generator breaker automatically tripped open on a loss of offsite power while the main generator was operating at its maximum rated load.

D. The main generator breaker automatically tripped open after it was closed with the generator and power grid voltages in phase but with generator frequency 0.2 Hz lower than power grid frequency.

QUESTION: 22

While remotely investigating the condition of a typical normally-open motor control center (MCC) feeder breaker, an operator observes the following indications:

Green breaker position indicating light is lit.
Red breaker position indicating light is out.
MCC voltmeter indicates zero volts.
MCC ammeter indicates zero amperes.

Based on these indications, the operator can accurately report that the breaker is open and racked to _____ position.

A. the OUT

B. the IN

C. the TEST

D. an unknown

QUESTION: 23

During a brief time interval in a typical reactor operating steady-state near the beginning of a fuel cycle, 4.25×10^{10} prompt neutrons were produced.

Approximately how many delayed neutrons were produced in the reactor during this same time interval?

A. 2.8×10^{8}

B. 6.5×10^{8}

C. 2.8×10^{9}

D. 6.5×10^{9}

QUESTION: 24

A nuclear power plant is currently operating at steady-state 80 percent power near the end of its fuel cycle. During the next 3 days of steady-state power operation, no operator action is taken.

How will core K_{eff} be affected during the 3-day period?

A. Core K_{eff} will gradually increase during the entire period.

B. Core K_{eff} will gradually decrease during the entire period.

C. Core K_{eff} will tend to increase, but inherent reactivity feedback will maintain K_{eff} at 1.0.

D. Core K_{eff} will tend to decrease, but inherent reactivity feedback will maintain K_{eff} at 1.0.

QUESTION: 25

Reactors A and B are identical except that the reactors are operating at different times in core life. The reactor A effective delayed neutron fraction is 0.007, and the reactor B effective delayed neutron fraction is 0.005. Both reactors are currently subcritical with neutron flux level stable in the source range.

Given:

Reactor A K_{eff} = 0.999
Reactor B K_{eff} = 0.998

If positive 0.003 ΔK/K is added to each reactor, how will the resulting stable startup rates (SUR) compare? (Consider only the reactor response while power is below the point of adding heat.)

A. Reactor A stable SUR will be higher because it will have the higher positive reactivity.

B. Reactor B stable SUR will be higher because it has the smaller effective delayed neutron fraction.

C. Reactors A and B will have the same stable SUR because both reactors will remain subcritical.

D. Reactors A and B will have the same stable SUR because both reactors received the same amount of positive reactivity.

QUESTION: 26

Differential boron worth (ΔK/K/ppm) becomes more negative as...

A. burnable poisons deplete.

B. boron concentration increases.

C. moderator temperature increases.

D. fission product poison concentration increases.

QUESTION: 27

The amount of pure water required to decrease the reactor coolant boron concentration by 20 ppm at 100 ppm is approximately _____ the amount of pure water required to decrease the reactor coolant boron concentration by 20 ppm at 1,000 ppm.

A. one-tenth

B. the same as

C. 10 times

D. 100 times

QUESTION: 28

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, the differential control rod worth will increase by a factor of _____. (Assume the core average thermal neutron flux is constant.)

A. 1/3

B. 3

C. 9

D. 27

QUESTION: 29

Control rod insertion limits ensure that control rods will be more withdrawn as reactor power _____ to compensate for the change in _____.

A. increases; xenon reactivity

B. decreases; xenon reactivity

C. increases; power defect

D. decreases; power defect

QUESTION: 30

A reactor was operating at 50 percent power for one week when power was ramped to 100 percent. Which one of the following describes the equilibrium xenon-135 concentration at 100 percent power?

A. Twice the 50 percent power concentration.

B. Less than twice the 50 percent power concentration.

C. More than twice the 50 percent power concentration.

D. Remains the same, because it is independent of power.

QUESTION: 31

A reactor has been shut down for 7 days to perform maintenance. A reactor startup is performed, and power level is increased to 50 percent over a two-hour period.

Ten hours after reactor power reaches 50 percent, the magnitude of xenon-135 negative reactivity will be...

A. increasing toward a downturn.

B. increasing toward an equilibrium value.

C. decreasing toward an equilibrium value.

D. decreasing toward an upturn.

QUESTION: 32

A nuclear power plant had been shut down for two weeks near the middle of a fuel cycle when a reactor startup was commenced. Twelve hours later, reactor power is 100 percent, where it is being maintained. Which one of the following is the primary reason for periodically reducing the reactor coolant boron concentration during the next 36 hours?

A. To offset the buildup of xenon-135.

B. To offset the depletion of the reactor fuel.

C. To maintain an adequate shutdown margin.

D. To maintain reactor heat flux below the critical heat flux.

QUESTION: 33

A reactor is shutdown with a K_{eff} of 0.8. The source range count rate is stable at 800 cps. What percentage of the core neutron population is being contributed directly by neutron sources other than neutron-induced fission?

A. 10 percent

B. 20 percent

C. 80 percent

D. 100 percent

QUESTION: 34

A reactor is initially critical at 1.0×10^{-5} percent power near the middle of a fuel cycle with manual rod control when a steam generator relief valve fails open. Assume no operator actions are taken and the reactor does not trip.

When the reactor stabilizes, average reactor coolant temperature will be _____ the initial reactor coolant temperature; and reactor power will be _____ the point of adding heat.

A. equal to; greater than

B. equal to; equal to

C. less than; greater than

D. less than; equal to

QUESTION: 35

How do the following parameters change during a normal ramp of reactor power from 15 percent to 75 percent?

	Main Turbine First Stage Pressure	Reactor Coolant System Boron Concentration
A.	Increases	Decreases
B.	Decreases	Decreases
C.	Increases	Increases
D.	Decreases	Increases

QUESTION: 36

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: 37

Which one of the following is arranged from the lowest pressure to the highest pressure?

A. 2 psig, 12 inches Hg absolute, 8 psia

B. 2 psig, 18 inches Hg absolute, 8 psia

C. 12 psia, 20 inches Hg absolute, 2 psig

D. 12 psia, 30 inches Hg absolute, 2 psig

QUESTION: 38

Consider a steam-water mixture with a quality of 79 percent. If pressure remains constant and heat is added to the mixture, the temperature of the mixture will _____; and the quality of the mixture will _____. (Assume the mixture remains saturated.)

A. increase; increase

B. increase; remain the same

C. remain the same; increase

D. remain the same; remain the same

QUESTION: 39

Subcooled water is flowing through a heat exchanger with the following parameters:

Inlet temperature = 75ºF
Outlet temperature = 120ºF
Mass flow rate = 6.0×10^4 lbm/hr

What is the approximate heat transfer rate in the heat exchanger?

A. 1.1×10^6 Btu/hr

B. 2.1×10^6 Btu/hr

C. 2.7×10^6 Btu/hr

D. 3.3×10^6 Btu/hr

QUESTION: 40

Which one of the following explains why condensate subcooling is necessary in a nuclear power plant steam cycle?

A. To provide a better condenser vacuum.

B. To maximize overall steam cycle thermal efficiency.

C. To provide net positive suction head for the condensate pumps.

D. To minimize turbine blade and condenser tube erosion by entrained moisture.

QUESTION: 41

Which one of the following will be caused by a decrease in main condenser vacuum (higher absolute pressure) in a nuclear power plant operating at 100 percent power? (Assume that main steam and main condenser circulating water mass flow rates do not change.)

A. Decrease in the condensate temperature.

B. Decrease in the ideal steam cycle thermal efficiency.

C. Decrease in the condensate pump required net positive suction head.

D. Decrease in the mass of noncondensible gases in the condenser.

QUESTION: 42

Reactor coolant system (RCS) hot leg temperature is constant at 520°F while RCS pressure is decreasing due to a small reactor coolant leak. Which one of the following pressure ranges includes the pressure at which two-phase flow will first occur in the hot leg?

A. 950 to 901 psig

B. 900 to 851 psig

C. 850 to 801 psig

D. 800 to 751 psig

QUESTION: 43

Which one of the following will increase the head loss occurring in an operating cooling water system?

A. Shifting two heat exchangers from parallel to series operation.

B. Increasing the flow rate in the system by throttling open a flow control valve.

C. Replacing a 20 foot section of 10-inch diameter pipe with a 10 foot section of 10-inch diameter pipe.

D. Replacing a 20 foot section of 10-inch diameter pipe with a 20 foot section of 12-inch diameter pipe.

QUESTION: 44

Reactor fuel rods are normally charged with _____ gas; which improves heat transfer by _____.

A. helium; convection

B. helium; conduction

C. nitrogen; convection

D. nitrogen; conduction

QUESTION: 45

Which one of the following is indicated by a rapid increase in the temperature difference between the fuel cladding and the bulk coolant?

A. Bulk boiling is occurring.

B. Nucleate boiling is occurring.

C. Critical heat flux is increasing.

D. Departure from nucleate boiling is occurring.

QUESTION: 46

A reactor is shut down at normal operating temperature and pressure with all control rods inserted. Which one of the following will decrease the departure from nucleate boiling ratio for this reactor? (Assume the reactor remains shutdown.)

A. Fully withdrawing a bank of shutdown rods.

B. Reducing reactor coolant temperature by 5°F.

C. Decreasing reactor coolant pressure by 10 psig.

D. Diluting reactor coolant boron concentration by 50 ppm.

QUESTION: 47

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

A. increases; raises

B. increases; lowers

C. decreases; raises

D. decreases; lowers

QUESTION: 48

Which one of the following must be present to assure adequate core cooling following a small loss-of-coolant accident?

A. Subcooling margin greater than zero.

B. Pressurizer level in the indicating range.

C. Emergency cooling injection flow greater than zero.

D. Pressurizer pressure greater than the safety injection actuation setpoint.

QUESTION: 49

A reactor is operating at 3,400 MW thermal power. The core linear power density limit is 12.2 kW/ft.

Given:

- The reactor core contains 198 fuel assemblies.
- Each fuel assembly contains 262 fuel rods, each with an active length of 12 feet.
- The highest total peaking factors measured in the core are as follows:

  Location A: 2.5
  Location B: 2.4
  Location C: 2.3
  Location D: 2.2

Which one of the following describes the operating conditions in the core relative to the linear power density limit?

A. All locations in the core are operating below the linear power density limit.

B. Location A has exceeded the linear power density limit while locations B, C, and D are operating below the limit.

C. Locations A and B have exceeded the linear power density limit while locations C and D are operating below the limit.

D. Locations A, B, and C have exceeded the linear power density limit while location D is operating below the limit.

QUESTION: 50

The nil-ductility transition temperature is the temperature above which...

A. a metal exhibits more ductile tendencies.

B. the probability of brittle fracture increases.

C. no appreciable deformation occurs prior to failure.

D. a large compressive stress can result in brittle fracture.

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

MARCH 2013 NRC GENERIC FUNDAMENTALS EXAMINATION
PRESSURIZED WATER REACTOR - ANSWER KEY

FORM A	FORM B	ANS.	FORM A	FORM B	ANS.
1	15	B	26	40	A
2	16	D	27	41	C
3	17	B	28	42	C
4	18	D	29	43	C
5	19	C	30	44	B
6	20	A	31	45	B
7	21	B	32	46	A
8	22	B	33	47	B
9	23	C	34	48	C
10	24	D	35	49	A
11	25	B	36	50	C
12	26	D	37	1	D
13	27	A	38	2	C
14	28	A	39	3	C
15	29	D	40	4	C
16	30	B	41	5	B
17	31	B	42	6	D
18	32	D	43	7	A
19	33	B	44	8	B
20	34	C	45	9	D
21	35	A	46	10	C
22	36	D	47	11	D
23	37	A	48	12	A
24	38	D	49	13	D
25	39	A	50	14	A