TOPIC: 292006
KNOWLEDGE: K1.01 [2.7/2.8]
QID: B558

Fission fragments or daughters that have a substantial neutron absorption cross section and are not fissionable are called...

A. fissile materials.

B. fission product poisons.

C. fissionable nuclides.

D. burnable poisons.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.01 [2.7/2.8]
QID: B1558 (P2858)

A fission product poison can be differentiated from all other fission products because a fission product poison...

A. has a higher microscopic cross section for thermal neutron capture.

B. has a longer half-life.

C. is produced in a greater percentage of thermal fissions.

D. is formed as a gas and is contained in the fuel pellets.

ANSWER: A.

TOPIC: 292006
KNOWLEDGE: K1.01 [2.7/2.8]
QID: B1858 (P858)

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

A. have a longer half-life.

B. are stronger absorbers of thermal neutrons.

C. are produced in a larger percentage of fissions.

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

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.01 [2.7/2.8]
QID: B2061 (P2058)

A fission product poison can be differentiated from all other fission products in that a fission product poison will...

A. be produced in direct proportion to the fission rate in the core.

B. remain radioactive for thousands of years after the final reactor criticality.

C. depress the power production in some core locations and cause peaking in others.

D. migrate out of the fuel pellets and into the reactor coolant via pinhole defects in the clad.

ANSWER: C.

TOPIC: 292006
KNOWLEDGE: K1.02 [3.1/3.1]
QID: B55

Which one of the following lists the proper order of substances from the largest to the smallest microscopic cross section for absorption of thermal neutrons?

A. B-10, U-235, Xe-135

B. B-10, Xe-135, U-235

C. Xe-135, U-235, B-10

D. Xe-135, B-10, U-235

ANSWER: D.

TOPIC: 292006
KNOWLEDGE: K1.02 [3.1/3.1]
QID: B256 (P2658)

Compared to other poisons in the core, the two characteristics that cause xenon-135 to be a major reactor poison are its relatively _____ absorption cross section and its relatively _____ variation in concentration for large reactor power changes.

A. small; large

B. small; small

C. large; small

D. large; large

ANSWER: D.

TOPIC: 292006
KNOWLEDGE: K1.02 [3.1/3.1]
QID: B1058 (P1858)

Which one of the following is a characteristic of xenon-135?

A. Thermal neutron flux level affects both the production and removal of xenon-135.

B. Thermal neutrons interact with xenon-135 primarily through scattering reactions.

C. Xenon-135 is primarily a resonance absorber of epithermal neutrons.

D. Xenon-135 is produced from the radioactive decay of barium-135.

ANSWER: A.

TOPIC: 292006
KNOWLEDGE: K1.02 [3.1/3.1]
QID: B1259

Which one of the following exhibits the greatest microscopic cross section for absorption of a thermal neutron in an operating reactor?

A. Uranium-235

B. Uranium-238

C. Plutonium-239

D. Xenon-135

ANSWER: D.

TOPIC: 292006
KNOWLEDGE: K1.02 [3.1/3.1]
QID: B1658 (P2458)

Which one of the following has the greatest microscopic cross section for absorption of a thermal neutron?

A. Uranium-235

B. Boron-10

C. Samarium-149

D. Xenon-135

ANSWER: D.

TOPIC: 292006
KNOWLEDGE: K1.02 [3.1/3.1]
QID: B3458

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

Which reactor has the smaller <u>concentration</u> of xenon-135?

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

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

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

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

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.03 [2.9/2.9]
QID: B257 (P1859)

What is the major contributor to the production of Xe-135 in a reactor that has been operating at full power for two weeks?

A. Radioactive decay of I-135.

B. Radioactive decay of Cs-135.

C. Direct production from fission of U-235.

D. Direct production from fission of U-238.

ANSWER: A.

TOPIC: 292006
KNOWLEDGE: K1.03 [2.9/2.9]
QID: B362 (P358)

Xenon-135 is produced in a reactor by two primary methods. One is directly from fission; the other is from the decay of...

A. cesium-135.

B. iodine-135.

C. xenon-136.

D. iodine-136.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.03 [2.9/2.9]
QID: B458 (P1359)

A reactor has been operating at full power for several weeks. Xenon-135 is being directly produced as a fission product in approximately _____ percent of all fissions.

A. 100

B. 30

C. 3

D. 0.3

ANSWER: D.

TOPIC: 292006
KNOWLEDGE: K1.03 [2.9/2.9]
QID: B859 (P1559)

Which one of the following describes the production mechanisms of xenon-135 in a reactor that is operating at steady-state 100 percent power?

A. Primarily from fission, secondarily from iodine decay

B. Primarily from fission, secondarily from promethium decay

C. Primarily from iodine decay, secondarily from fission

D. Primarily from promethium decay, secondarily from fission

ANSWER: C.

TOPIC: 292006
KNOWLEDGE: K1.03 [2.9/2.9]
QID: B2558 (P2558)

Reactors A and B are operating at steady-state 100 percent power with equilibrium xenon-135. The reactors are identical except that reactor A is operating near the end of a fuel cycle (EOC) and reactor B is operating near the beginning of a fuel cycle (BOC).

Which reactor has the greater concentration of xenon-135, and why?

A. Reactor A (EOC), due to the smaller 100 percent power thermal neutron flux.

B. Reactor A (EOC), due to the larger 100 percent power thermal neutron flux.

C. Reactor B (BOC), due to the smaller 100 percent power thermal neutron flux.

D. Reactor B (BOC), due to the larger 100 percent power thermal neutron flux.

ANSWER: C.

TOPIC: 292006
KNOWLEDGE: K1.04 [2.9/2.9]
QID: B128

Which one of the following describes the change in xenon-135 concentration immediately following a power increase from equilibrium xenon-135 conditions?

A. Initially decreases, due to the decreased rate of xenon-135 production from fission.

B. Initially decreases, due to the increased rate of thermal neutron absorption by xenon-135.

C. Initially increases, due to the increased rate of xenon-135 production from fission.

D. Initially increases, due to the decreased rate of thermal neutron absorption by xenon-135.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.04 [2.9/2.9]
QID: B258

The two methods of xenon-135 removal from a reactor operating at full power are...

A. gamma decay and beta decay.

B. neutron absorption and fission.

C. fission and gamma decay.

D. beta decay and neutron absorption.

ANSWER: D.

TOPIC: 292006
KNOWLEDGE: K1.04 [2.9/2.9]
QID: B359 (P1059)

Xenon-135 undergoes radioactive decay to...

A. iodine-135.

B. cesium-135.

C. tellurium-135.

D. lanthanum-135.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.04 [2.9/2.9]
QID: B462 (P460)

Reactor power is increased from 50 percent to 60 percent in one hour. What is the most significant contributor to the initial change in xenon-135 reactivity?

A. Production of xenon-135 from fission.

B. Production of xenon-135 from iodine-135 decay.

C. Loss of xenon-135 due to absorption of neutrons.

D. Loss of xenon-135 due to decay to cesium-135.

ANSWER: C.

TOPIC: 292006
KNOWLEDGE: K1.04 [2.9/2.9]
QID: B860

Which one of the following is the approximate half-life of xenon-135?

A. 19 seconds

B. 6.6 hours

C. 9.1 hours

D. 30 hours

ANSWER: C.

TOPIC: 292006
KNOWLEDGE: K1.04 [2.9/2.9]
QID: B959

Which one of the following describes the primary method of xenon-135 removal at steady-state 100 percent power?

A. Decay of xenon-135 to cesium-135.

B. Decay of xenon-135 to iodine-135.

C. Absorption of thermal neutrons.

D. Absorption of fast neutrons.

ANSWER: C.

TOPIC: 292006
KNOWLEDGE: K1.04 [2.9/2.9]
QID: B3358 (P2659)

A nuclear power plant has been operating at 100 percent power for several months. Which one of the following describes the relative contributions of beta decay and neutron capture to xenon-135 removal from the reactor?

A. Primary is neutron capture; secondary is beta decay.

B. Primary is beta decay; secondary is neutron capture.

C. Beta decay and neutron capture contribute equally.

D. Not enough information is given to make a comparison.

ANSWER: A.

TOPIC: 292006
KNOWLEDGE: K1.05 [2.9/2.9]
QID: B58 (P61)

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.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.05 [2.9/2.9]
QID: B259 (P1459)

Following a two-week shutdown, a reactor is taken critical and ramped to 100 percent power in 6 hours. How long will it take to achieve an equilibrium xenon-135 condition after the reactor reaches 100 percent power?

A. 70 to 80 hours

B. 40 to 50 hours

C. 8 to 10 hours

D. 1 to 2 hours

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.05 [2.9/2.9]
QID: B658 (P660)

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

A. The same as the 100 percent concentration.

B. More than one-half the 100 percent concentration.

C. One-half the 100 percent concentration.

D. Less than one-half the 100 percent concentration.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.05 [2.9/2.9]
QID: B1160 (P1158)

A reactor has been operating at 25 percent power for 24 hours following a two-hour power reduction from steady-state 100 percent power. Which one of the following describes the current status of the xenon-135 concentration?

A. At equilibrium.

B. Decreasing toward an upturn.

C. Decreasing toward equilibrium.

D. Increasing toward a peak.

ANSWER: C.

TOPIC: 292006
KNOWLEDGE: K1.05 [2.9/2.9]
QID: B1363

Which one of the following indicates that core Xe-135 is in equilibrium?

A. Xe-135 is being removed equally by neutron capture and decay.

B. The reactor has been operated at a steady-state power level for five days.

C. Xe-135 is being produced equally by fission and I-135 decay.

D. The reactor is currently operating at 100 percent power.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.05 [2.9/2.9]
QID: B1859

A reactor was operating for 42 weeks at a steady-state 30 percent power when a reactor scram occurred. The reactor was returned to critical after 12 hours and then ramped to 60 percent power over the next 6 hours.

How much time at steady-state 60 percent power will be required to reach an equilibrium xenon-135 concentration?

A. 20 to 30 hours

B. 40 to 50 hours

C. 70 to 80 hours

D. 90 to 100 hours

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.05 [2.9/2.9]
QID: B1960 (P1360)

A reactor has been operating at a constant 50 percent power level for 15 hours following a one-hour power reduction from steady-state 100 percent power. Which one of the following describes the current xenon-135 concentration?

A. Increasing toward a peak.

B. Decreasing toward an upturn.

C. Increasing toward equilibrium.

D. Decreasing toward equilibrium.

ANSWER: D.

TOPIC: 292006
KNOWLEDGE: K1.05 [2.9/2.9]
QID: B2659 (P2159)

Which one of the following indicates that core Xe-135 concentration is in equilibrium?

A. Xe-135 production and removal rates are momentarily equal five hours after a power increase.

B. A reactor has been operated at 80 percent power for five days.

C. Xe-135 is being produced equally by fission and I-135 decay.

D. A reactor is currently operating at 100 percent power.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.05 [2.9/2.9]
QID: B2760 (P2859)

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

Which reactor is experiencing the most negative reactivity from equilibrium xenon-135?

A. Reactor A (EOL), due to a greater equilibrium concentration of xenon-135.

B. Reactor A (EOL), due to lower competition from the fuel for thermal neutrons.

C. Reactor B (BOL), due to a greater thermal neutron flux in the core.

D. Reactor B (BOL), due to a smaller accumulation of fission product poisons.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.06 [2.7/2.7]
QID: B59

A reactor was operating at 50 percent power for one week when a power increase to 100 percent is initiated. How will the xenon-135 concentration respond?

A. Initially decrease, and then build up to a higher equilibrium concentration.

B. Initially increase, and then build up to a higher equilibrium concentration.

C. Initially decrease, and then return to the same equilibrium concentration.

D. Initially increase, and then return to the same equilibrium concentration.

ANSWER: A.

TOPIC: 292006
KNOWLEDGE: K1.06 [2.7/2.7]
QID: B660

A reactor was operating at 75 percent power for one week when a power decrease to 50 percent is initiated. How will the xenon-135 concentration initially respond?

A. Decreases, because the xenon-135 production rate from fission has decreased.

B. Increases, because the rate of xenon-135 burnout has increased.

C. Decreases, because the rate of xenon-135 decay exceeds the rate of production from fission.

D. Increases, because the concentration of iodine-135 has increased.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.06 [2.7/2.7]
QID: B961

A reactor was operating at 100 percent power for two weeks when power was reduced to 50 percent in one hour. How will the xenon-135 concentration change during the next 24 hours?

A. Increase and stabilize at a higher concentration.

B. Increase initially, and then decrease and stabilize at a lower concentration.

C. Decrease and stabilize at a lower concentration.

D. Decrease initially, and then increase and stabilize at a higher concentration.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.06 [2.7/2.7]
QID: B1262 (P1960)

A reactor was operating at 100 percent power for two weeks when power was decreased to 10 percent in one hour. Immediately following the power decrease, xenon-135 concentration will _____ for a period of _____.

A. decrease; 4 to 6 hours

B. increase; 4 to 6 hours

C. decrease; 8 to 11 hours

D. increase; 8 to 11 hours

ANSWER: D.

TOPIC: 292006
KNOWLEDGE: K1.06 [2.7/2.7]
QID: B1860

A reactor has been operating at 50 percent power for 15 hours following a rapid power reduction from steady-state 100 percent power. Which one of the following describes the current xenon-135 concentration?

A. Increasing toward a peak.

B. Decreasing toward an upturn.

C. Increasing toward equilibrium.

D. Decreasing toward equilibrium.

ANSWER: D.

TOPIC: 292006
KNOWLEDGE: K1.06 [2.7/2.7]
QID: B2559 (P3362)

A reactor has been operating at 70 percent power for 20 hours following a one-hour power reduction from steady-state 100 percent power. Which one of the following describes the current xenon-135 concentration?

A. Increasing toward a peak.

B. Decreasing toward an upturn.

C. Decreasing toward equilibrium.

D. At equilibrium.

ANSWER: C.

TOPIC: 292006
KNOWLEDGE: K1.06 [2.7/2.7]
QID: B2761 (P2261)

A reactor has been operating at 50 percent power for 12 hours following a one-hour power reduction from steady-state 100 percent power. Which one of the following describes the current xenon-135 concentration?

A. Increasing toward a peak.

B. Decreasing toward an upturn.

C. Increasing toward equilibrium.

D. Decreasing toward equilibrium.

ANSWER: D.

TOPIC: 292006
KNOWLEDGE: K1.06 [2.7/2.7]
QID: B2960 (P2961)

A reactor has been operating at 30 percent power for three hours following a one-hour power reduction from steady-state 100 percent power. Which one of the following describes the current xenon-135 concentration?

A. Increasing toward a peak.

B. Increasing toward equilibrium.

C. Decreasing toward an upturn.

D. Decreasing toward equilibrium.

ANSWER: A.

TOPIC: 292006
KNOWLEDGE: K1.07 [3.2/3.2]
QID: B132

What is the difference in peak xenon-135 concentration following a reactor scram after one week at 100 percent power as compared to a scram after one week at 50 percent power?

A. The time to reach the peak is shorter after a scram from 100 percent power, due to the higher iodine-135 decay rate.

B. The peak concentration after a scram from 50 percent power is smaller in magnitude, due to the lower xenon-135 burnout rate.

C. The peaks are equal, because the decay rate of iodine-135 remains constant.

D. The peak from 100 percent power has a larger magnitude, due to the larger initial iodine-135 concentration.

ANSWER: D.

TOPIC: 292006
KNOWLEDGE: K1.07 [3.2/3.2]
QID: B260

A reactor has been operating at 25 percent power for five days when a scram occurs. Xenon-135 will peak in approximately...

A. 2 hours.

B. 5 hours.

C. 10 hours.

D. 20 hours.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.07 [3.2/3.2]
QID: B861

Which one of the following equilibrium reactor pre-scram conditions produces the greater amount of negative reactivity from peak xenon-135 conditions after a reactor scram? (BOC -- beginning of a fuel cycle; EOC -- end of a fuel cycle.)

A. BOC and 100 percent power

B. EOC and 100 percent power

C. BOC and 20 percent power

D. EOC and 20 percent power

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.07 [3.2/3.2]
QID: B1361 (P1358)

A reactor has been operating at 75 percent power for two months. A manual reactor scram is required for a test. The scram will be followed immediately by a reactor startup with criticality scheduled to occur 12 hours after the scram.

The greatest assurance that fission product poison reactivity will permit criticality during the startup will exist if the reactor is operated at _____ power for 48 hours prior to the scram; and if criticality is rescheduled for _____ hours after the scram.

A. 100 percent; 8

B. 100 percent; 16

C. 50 percent; 8

D. 50 percent; 16

ANSWER: D.

TOPIC: 292006
KNOWLEDGE: K1.07 [3.2/3.2]
QID: B1561

The amount of negative reactivity associated with peak xenon-135 is smaller after a reactor scram from equilibrium _____ reactor power at the _____ of a fuel cycle.

A. 20 percent; beginning

B. 20 percent; end

C. 100 percent; beginning

D. 100 percent; end

ANSWER: A.

TOPIC: 292006
KNOWLEDGE: K1.07 [3.2/3.2]
QID: B3861 (P3860)

A reactor has been operating at 80 percent power for two months. A manual reactor scram is required for a test. The scram will be followed by a reactor startup with criticality scheduled to occur 24 hours after the scram.

The greatest assurance that xenon-135 reactivity will permit criticality during the reactor startup will exist if the reactor is operated at _____ power for 48 hours prior to the scram; and if criticality is rescheduled for _____ hours after the scram.

A. 60 percent; 18

B. 60 percent; 30

C. 100 percent; 18

D. 100 percent; 30

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.07 [3.2/3.2]
QID: B6031

A reactor scram occurred <u>one</u> <u>hour</u> ago following several months of operation at 100 percent power. Reactor vessel pressure is being maintained at 800 psia and the source range count rate is currently 400 cps. If <u>no</u> operator action is taken, how will the source range count rate respond during the next 24 hours? (Assume a constant source neutron flux.)

A. The count rate will remain about the same.

B. The count rate will decrease for the entire period.

C. The count rate will initially decrease and then increase.

D. The count rate will initially increase and then decrease.

ANSWER: C.

TOPIC 292006
KNOWLEDGE: K1.08 [2.8/3.2]
QID: B135

When comparing control rod worth (CRW) during a reactor startup from 100 percent peak xenon-135 concentration and a reactor startup from xenon-free conditions...

A. center CRW will be higher during the peak xenon startup than during the xenon-free startup.

B. peripheral CRW will be higher during the peak xenon startup than during the xenon-free startup.

C. center and peripheral CRWs will be the same regardless of xenon-135 concentration.

D. it is impossible to determine how xenon-135 will affect the worth of center and peripheral control rods.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.08 [2.8/3.2]
QID: B261

A reactor has been operating at full power for several weeks when a scram occurs. When the reactor is brought critical 5 hours later, xenon-135 concentration will be highest in the _____ of the core, which causes thermal neutron flux to shift toward the _____ of the core.

A. center; periphery

B. periphery; periphery

C. center; center

D. periphery; center

ANSWER: A.

TOPIC: 292006
KNOWLEDGE: K1.08 [2.8/3.2]
QID: B1062

A reactor is operating at 100 percent power with equilibrium xenon-135 near the beginning of a fuel cycle when a scram occurs. When the reactor is taken critical 5 hours later, xenon-135 distribution will be maximum at the _____ of the core.

A. bottom and center

B. bottom and outer circumference

C. top and center

D. top and outer circumference

ANSWER: A.

TOPIC: 292006
KNOWLEDGE: K1.08 [2.8/3.2]
QID: B2454

Sustained operation at 100 percent power requires periodic withdrawal of control rods to compensate for...

A. buildup of fission product poisons and decreasing control rod worth.

B. fuel depletion and buildup of fission product poisons.

C. decreasing control rod worth and burnable poison burnout.

D. burnable poison burnout and fuel depletion.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.08 [2.8/3.2]
QID: B2660 (P2359)

Which one of the following explains why xenon-135 oscillations are a concern in a reactor?

A. They can adversely affect core power distribution, and they can require operation below full rated power.

B. They can adversely affect core power distribution, and they can prevent reactor criticality during a reactor startup.

C. They can cause excessively short reactor periods during power operation, and they can require operation below full rated power.

D. They can cause excessively short reactor periods during power operation, and they can prevent reactor criticality during a reactor startup.

ANSWER: A.

TOPIC: 292006
KNOWLEDGE: K1.08 [2.8/3.2]
QID: B2860

A reactor has been operating at 50 percent power for several weeks near the middle of core life with core axial power distribution evenly divided above and below the core midplane. Reactor power is to be increased to 65 percent over a two-hour period using shallow control rods only.

During the power increase, core axial power distribution will...

A. shift toward the top of the core.

B. shift toward the bottom of the core.

C. remain evenly divided above and below the core midplane.

D. have peaks near the top and the bottom of the core.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.08 [2.8/3.2]
QID: B3061 (P3060)

A reactor has been operating at 100 percent power for one month following a refueling outage with axial neutron flux distribution peaked in the bottom half of the core. An inadvertent reactor scram occurs. The reactor is restarted, with criticality occurring 6 hours after the scram. Reactor power is increased to 60 percent over the next 4 hours and then stabilized.

During the one-hour period immediately after power level is stabilized at 60 percent, the core axial neutron flux peak will be located _____ in the core than the pre-scram peak location; and the core axial neutron flux peak will be moving _____.

A. higher; upward

B. higher; downward

C. lower; upward

D. lower; downward

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.09 [2.5/2.5]
QID: B262

Following a one-month outage, a reactor is being started up and taken to 100 percent power using a constant ramp rate. To compensate for the effect of xenon-135 while <u>increasing</u> reactor power, it will be necessary to _____ rods and _____ recirculation flow.

A. insert; decrease

B. insert; increase

C. withdraw; increase

D. withdraw; decrease

ANSWER: C.

TOPIC: 292006
KNOWLEDGE: K1.09 [2.5/2.5]
QID: B355 (P353)

A nuclear power plant is being returned to operation following a refueling outage. Fuel preconditioning procedures require reactor power to be increased from 10 percent to 100 percent 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. uranium-235 burnup.

B. xenon-135 buildup.

C. fuel temperature increase.

D. moderator temperature increase.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.09 [2.5/2.5]
QID: B562 (P561)

Following a 7 day shutdown, a reactor startup is performed and the reactor is taken to 100 percent power over a 16-hour period. After reaching 100 percent power, what type of reactivity addition will be needed to compensate for xenon-135 changes over the next 24 hours?

A. Negative only

B. Negative, then positive

C. Positive only

D. Positive, then negative

ANSWER: C.

TOPIC: 292006
KNOWLEDGE: K1.09 [2.5/2.5]
QID: B2861 (P2260)

A reactor is initially shut down with no xenon-135 in the core. Over the next 4 hours, the reactor is made critical and power level is increased to10 percent. The shift supervisor has directed that power be maintained constant at this level for 12 hours.

To accomplish this objective, control rods will have to be...

A. inserted periodically for the duration of the 12 hours.

B. withdrawn periodically for the duration of the 12 hours.

C. inserted periodically for 4 to 6 hours, and then withdrawn periodically.

D. withdrawn periodically for 4 to 6 hours, and then inserted periodically.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.09 [2.5/2.5]
QID: B6930

A nuclear power plant was operating at 100 percent power for 3 months near the end of a fuel cycle when a reactor scram occurred. Eighteen hours later, the reactor is critical at the point of adding heat with normal operating reactor vessel temperature and pressure. Power level will be raised to 100 percent over the next 3 hours.

During this power level increase, most of the positive reactivity added by the operator will be required to overcome the negative reactivity from...

A. fuel burnup.

B. xenon-135 buildup.

C. fuel temperature increase.

D. moderator temperature increase.

ANSWER: C.

TOPIC: 292006
KNOWLEDGE: K1.10 [2.9/2.9]
QID: B57

Following a reactor scram from a long steady-state 100 percent power run, a reactor is to be taken critical. The calculated estimated critical conditions (position) are based on having a xenon-free core.

Which one of the following is the shortest time after the initial scram that a xenon-free core will exist?

A. 8 to 10 hours

B. 15 to 25 hours

C. 40 to 50 hours

D. 70 to 80 hours

ANSWER: D.

TOPIC: 292006
KNOWLEDGE: K1.09 [2.5/2.5]
QID: B5631 (P5631)

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.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.10 [2.9/2.9]
QID: B1162

A reactor scram recently occurred from steady-state 100 percent power and a reactor startup is currently in progress. Which one of the following sets of initial startup conditions will require the most control rod withdrawal to achieve criticality? (BOC -- beginning of fuel cycle; EOC -- end of fuel cycle.)

	Core Age	Time Since Reactor Scram
A.	BOC	12 hours
B.	BOC	40 hours
C.	EOC	12 hours
D.	EOC	40 hours

ANSWER: C.

TOPIC: 292006
KNOWLEDGE: K1.10 [2.9/2.9]
QID: B1461

A reactor had been operating at 100 percent power for 2 months when a reactor scram occurred. Four hours later with a startup in progress, reactor power is currently stable at 10 percent. Which one of the following operator actions is required to maintain reactor power at 10 percent over the next 18 hours?

A. Incremental control rod withdrawals throughout the entire period.

B. Incremental control rod insertions throughout the entire period.

C. Incremental control rod withdrawals for several hours, then incremental insertions for the rest of the period.

D. Incremental control rod insertions for several hours, then incremental withdrawals for the rest of the period.

ANSWER: C.

TOPIC: 292006
KNOWLEDGE: K1.10 [2.9/2.9]
QID: B1763 (P1762)

A reactor had been operating for two months at 100 percent power when a scram occurred. Fifteen hours later, during a reactor startup, the reactor has achieved criticality and reactor power is currently 1.0×10^{-4} percent.

Which one of the following describes the response of reactor power over the next 2 hours without any further operator actions?

A. Power increases toward the point of adding heat, due to the decay of Xe-135.

B. Power increases toward the point of adding heat, due to the decay of Sm-149.

C. Power decreases toward a stable shutdown neutron level, due to the buildup of Xe-135.

D. Power decreases toward a stable shutdown neutron level, due to the buildup of Sm-149.

ANSWER: A.

TOPIC: 292006
KNOWLEDGE: K1.10 [2.9/2.9]
QID: B4430

A reactor scram occurred from steady-state 100 percent power and a reactor startup is currently in progress. Which one of the following sets of initial startup conditions will require the smallest amount of control rod withdrawal to achieve criticality? (BOC-- beginning of fuel cycle; EOC -- end of fuel cycle.)

	Core Age	Time Since Reactor Scram
A.	BOC	12 hours
B.	BOC	40 hours
C.	EOC	12 hours
D.	EOC	40 hours

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.11 [2.6/2.7]
QID: B173

A reactor has been operating at 50 percent power for 4 days. Power level is then increased to 100 percent over a one-hour period. After power level reaches 100 percent, how much time will be required for xenon-135 concentration to reach a minimum value?

A. 4 to 8 hours

B. 10 to 15 hours

C. 40 to 50 hours

D. 70 to 80 hours

ANSWER: A.

TOPIC: 292006
KNOWLEDGE: K1.11 [2.6/2.7]
QID: B459 (P260)

Two identical reactors have been operating at a constant power level for one week. Reactor A is at 50 percent power and reactor B is at 100 percent power. If both reactors scram at the same time, xenon-135 negative reactivity will peak first in reactor _____; and the highest xenon-135 reactivity peak will occur in reactor _____.

A. B; B

B. B; A

C. A; B

D. A; A

ANSWER: C.

TOPIC: 292006
KNOWLEDGE: K1.11 [2.6/2.7]
QID: B1362

A reactor has been operating at 100 percent power for two weeks when power is reduced to 50 percent over 2 hours. To maintain power level stable at 50 percent during the next 2 hours, the operator must add _____ reactivity because xenon-135 concentration is _____.

A. positive; decreasing

B. negative; decreasing

C. positive; increasing

D. negative; increasing

ANSWER: C.

TOPIC: 292006
KNOWLEDGE: K1.11 [2.6/2.7]
QID: B1759

Which one of the following describes the change in xenon-135 concentration immediately following a 10 percent power increase from equilibrium 70 percent power over a two-hour period?

A. Xe-135 concentration will initially decrease, due to the increased rate of decay of Xe-135 to Cs-135.

B. Xe-135 concentration will initially decrease, due to the increased absorption of thermal neutrons by Xe-135.

C. Xe-135 concentration will initially increase, due to the increased I-135 production rate from fission.

D. Xe-135 concentration will initially increase, due to the increased Xe-135 production rate from fission.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.11 [2.6/2.7]
QID: B1761 (P1159)

Two identical reactors have been operating at a constant power level for one week. Reactor A is at 100 percent power and reactor B is at 50 percent power. If both reactors scram at the same time, xenon-135 concentration will peak first in reactor _____; and the highest peak xenon-135 concentration will occur in reactor _____.

A. B; B

B. B; A

C. A; B

D. A; A

ANSWER: B.

TOPIC: 292006
KNOWLEDGE K1.11 [2.6/2.7]
QID: B2063

A reactor had been operating at 50 percent power for two weeks when power was increased to 100 percent over a three-hour period. To maintain reactor power stable during the next 24 hours, which one of the following incremental control rod manipulations will be required?

A. Insert rods slowly during the entire period.

B. Insert rods slowly at first, and then withdraw rods slowly.

C. Withdraw rods slowly during the entire period.

D. Withdraw rods slowly at first, and then insert rods slowly.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.11 [2.6/2.7]
QID: B2158 (P2061)

A reactor had been operating at 100 percent power for two weeks when power was reduced to 50 percent over a one-hour period. To maintain reactor power stable during the next 24 hours, which one of the following incremental control rod manipulations will be required?

A. Withdraw rods slowly during the entire period.

B. Withdraw rods slowly at first, and then insert rods slowly.

C. Insert rods slowly during the entire period.

D. Insert rods slowly at first, and then withdraw rods slowly.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.11 [2.6/2.7]
QID: B2259 (P1860)

Which one of the following describes the <u>initial</u> change in xenon-135 concentration immediately following a power increase from steady-state power operation?

A. Decreases, due to the increased rate of xenon-135 radioactive decay.

B. Decreases, due to the increased rate of neutron absorption by xenon-135.

C. Increases, due to the increased xenon-135 production rate from fission.

D. Initially increases, due to the increased iodine-135 production rate from fission.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.11 [2.6/2.7]
QID: B2361 (P2360)

A reactor had been operating at 70 percent power for two weeks when power was increased to 100 percent over a two-hour period. To offset xenon-135 reactivity changes during the next 12 hours, which one of the following incremental control rod manipulations will be required?

A. Withdraw rods slowly during the entire period.

B. Withdraw rods slowly at first, and then insert rods slowly.

C. Insert rods slowly during the entire period.

D. Insert rods slowly at first, and then withdraw rods slowly.

ANSWER: D.

TOPIC: 292006
KNOWLEDGE: K1.11 [2.6/2.7]
QID: B2561

A reactor is initially operating at 100 percent power with equilibrium xenon-135. Power is decreased to 50 percent over a one-hour period. No subsequent operator actions are taken.

Considering only the reactivity effects of xenon-135 changes, which one of the following describes reactor power 10 hours after the power change is completed?

A. Less than 50 percent and decreasing slowly.

B. Less than 50 percent and increasing slowly.

C. Greater than 50 percent and decreasing slowly.

D. Greater than 50 percent and increasing slowly.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.11 [2.6/2.7]
QID: B2762

A reactor is initially operating at 60 percent power with equilibrium xenon-135. Power is increased to 80 percent over a two-hour period. No subsequent operator actions are taken.

Considering only the reactivity effects of xenon-135 changes, which one of the following describes reactor power 24 hours after the power change is completed?

A. Greater than 80 percent and decreasing slowly.

B. Greater than 80 percent and increasing slowly.

C. Less than 80 percent and decreasing slowly.

D. Less than 80 percent and increasing slowly.

ANSWER: C.

TOPIC: 292006
KNOWLEDGE: K1.11 [2.6/2.7]
QID: B2862

A reactor has been operating at 50 percent power for 3 hours following a one-hour power reduction from steady-state 100 percent power. Which one of the following describes the current xenon-135 concentration?

A. Increasing toward a peak.

B. Decreasing toward an upturn.

C. Increasing toward equilibrium.

D. Decreasing toward equilibrium.

ANSWER: A.

TOPIC: 292006
KNOWLEDGE: K1.11 [2.6/2.7]
QID: B3259

A reactor is initially operating at equilibrium 100 percent power. An operator inserts control rods intermittently over a period of 30 minutes. At the end of this time period, reactor power is 70 percent.

Assuming no additional operator actions are taken, what will power level be after an additional 60 minutes?

A. 70 percent and stable.

B. Less than 70 percent and slowly increasing.

C. Less than 70 percent and slowly decreasing.

D. Less than 70 percent and stable.

ANSWER: C.

TOPIC: 292006
KNOWLEDGE: K1.12 [2.8/2.3]
QID: B463

A reactor has been operating at 100 percent power for several weeks. Following a reactor scram, the reactor will first be considered xenon-free after...

A. 40 to 50 hours.

B. 70 to 80 hours.

C. 100 to 110 hours.

D. 130 to 140 hours.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.12 [2.8/2.3]
QID: B1462

A reactor scram has occurred following two months of operation at steady-state 100 percent power. How soon after the scram will the reactor first be considered xenon-free?

A. 8 to 10 hours

B. 24 to 30 hours

C. 40 to 50 hours

D. 70 to 80 hours

ANSWER: D.

TOPIC: 292006
KNOWLEDGE: K1.12 [2.8/2.3]
QID: B2159 (P1063)

A reactor had operated at 100 percent power for three weeks when a reactor scram occurred. Which one of the following describes the concentration of xenon-135 in the core 24 hours after the scram?

A. At least twice the concentration at the time of the scram and decreasing.

B. Less than one-half the concentration at the time of the scram and decreasing.

C. At or approaching a peak concentration.

D. Approximately the same as the concentration at the time of the scram.

ANSWER: D.

TOPIC: 292006
KNOWLEDGE: K1.12 [2.8/2.3]
QID: B2262 (P863)

Twenty-four hours after a reactor scram from 100 percent power with equilibrium xenon-135, the xenon-135 concentration will be approximately...

A. the same as the concentration at the time of the scram and decreasing.

B. the same as the concentration at the time of the scram and increasing.

C. 50 percent lower than the concentration at the time of the scram and decreasing.

D. 50 percent higher than the concentration at the time of the scram and increasing.

ANSWER: A.

TOPIC: 292006
KNOWLEDGE: K1.12 [2.8/2.3]
QID: B2461 (P2262)

Fourteen hours after a reactor scram from 100 percent power with equilibrium xenon-135, the concentration of xenon-135 will be _____ than the 100 percent power equilibrium xenon-135 concentration; and xenon-135 will have added a net _____ reactivity since the scram.

A. less; positive

B. less; negative

C. greater; positive

D. greater; negative

ANSWER: D.

TOPIC: 292006
KNOWLEDGE: K1.12 [2.8/2.3]
QID: B2662

Given:

- A reactor was operating at 100 percent power for 6 weeks when a scram occurred.
- A reactor startup was performed and criticality was reached 16 hours after the scram.
- Two hours later, the reactor is currently at 30 percent power.

If no operator actions occur during the next hour, reactor power will _____ because the xenon-135 concentration is _____.

A. increase; decreasing

B. increase; increasing

C. decrease; decreasing

D. decrease; increasing

ANSWER: A.

TOPIC: 292006
KNOWLEDGE: K1.12 [2.8/2.3]
QID: B2763 (P2762)

A reactor that had been operating at 100 percent power for about two months was shut down over a two-hour period. Following the shutdown, xenon-135 will reach a steady-state concentration in _____ hours.

A. 8 to 10

B. 20 to 25

C. 40 to 50

D. 70 to 80

ANSWER: D.

TOPIC: 292006
KNOWLEDGE: K1.13 [2.6/2.6]
QID: B63

If a reactor that has operated at 100 percent power for 10 days is shut down rapidly, the xenon-135 concentration will...

A. slowly decrease to almost zero in 3 days.

B. increase to a new equilibrium concentration in 3 days.

C. peak in about a half day, and then decrease to almost zero in 3 days.

D. decrease directly with reactor power.

ANSWER: C.

TOPIC: 292006
KNOWLEDGE: K1.13 [2.6/2.6]
QID: B1463

Which one of the following describes a reason for the direction of change in xenon-135 reactivity immediately after a reactor shutdown from long-term power operation?

A. The production rate of Xe-135 from I-135 decay significantly decreases.

B. The production rate of Xe-135 directly from fission significantly decreases.

C. The removal rate of Xe-135 by decay to I-135 significantly decreases.

D. The removal rate of Xe-135 by neutron absorption significantly decreases.

ANSWER: D.

TOPIC: 292006
KNOWLEDGE: K1.14 [3.1/3.2]
QID: B56

A reactor has been shut down for two weeks after six months of 100 percent power operation. A reactor startup is performed and reactor power is stabilized at 10 percent. What control rod movements are required to maintain power level stable at 10 percent over the next two hours?

A. Rod insertions to compensate for samarium-149 burnout.

B. Rod withdrawals to compensate for samarium-149 buildup.

C. Rod insertions to compensate for xenon-135 burnout.

D. Rod withdrawals to compensate for xenon-135 buildup.

ANSWER: D.

TOPIC: 292006
KNOWLEDGE: K1.14 [3.1/3.2]
QID: B62

A reactor had been operating at 100 percent power for about two weeks when power level was reduced to 50 percent in one hour. To compensate for changing xenon-135 concentration during the next 4 hours, the operator must add...

A. positive reactivity, because the xenon-135 concentration is decreasing.

B. negative reactivity, because the xenon-135 concentration is decreasing.

C. positive reactivity, because the xenon-135 concentration is increasing.

D. negative reactivity, because the xenon-135 concentration is increasing.

ANSWER: C.

TOPIC: 292006
KNOWLEDGE: K1.14 [3.1/3.2]
QID: B263

A reactor had been operating at 100 percent power for 10 weeks when a scram occurred. The reactor was made critical 24 hours later, and power level is currently being maintained low in the intermediate range.

To maintain a constant power level for the next several hours, control rods must be...

A. inserted, because xenon-135 burnout will cause increased neutron flux peaking near the periphery of the core.

B. maintained at the present position as xenon-135 establishes equilibrium for the current power level.

C. inserted, because xenon-135 will essentially follow its normal decay curve.

D. withdrawn, because xenon-135 concentration is increasing toward equilibrium.

ANSWER: C.

TOPIC: 292006
KNOWLEDGE: K1.14 [3.1/3.2]
QID: B363

A reactor is initially shut down with no xenon-135 in the core. The reactor is taken critical, and 4 hours later power level is low in the intermediate range. The maintenance department has asked that power be maintained constant at this level for approximately 12 hours.

To maintain a constant power level, the control rods will have to be periodically...

A. withdrawn for the duration of the 12 hours.

B. inserted for the duration of the 12 hours.

C. withdrawn for 4 to 6 hours, and then inserted.

D. inserted for 4 to 6 hours, and then withdrawn.

ANSWER: A.

TOPIC: 292006
KNOWLEDGE: K1.14 [3.1/3.2]
QID: B461

Four hours after a reactor scram from 100 percent power with equilibrium xenon-135, the reactor has been taken critical and is currently at 10 percent power. To maintain power level at 5 percent during the next two hours, the operator must add _____ reactivity because the xenon-135 concentration is _____.

A. positive; increasing

B. positive; decreasing

C. negative; increasing

D. negative; decreasing

ANSWER: A.

TOPIC: 292006
KNOWLEDGE: K1.14 [3.1/3.2]
QID: B964

Sixteen hours after a reactor scram from 100 percent power with equilibrium xenon-135, the concentration of xenon-135 will be...

A. less than 100 percent equilibrium xenon-135, and will have added a net positive reactivity since the scram.

B. greater than 100 percent equilibrium xenon-135, and will have added a net positive reactivity since the scram.

C. less than 100 percent equilibrium xenon-135, and will have added a net negative reactivity since the scram.

D. greater than 100 percent equilibrium xenon-135, and will have added a net negative reactivity since the scram.

ANSWER: D.

TOPIC: 292006
KNOWLEDGE: K1.14 [3.1/3.2]
QID: B1164

A reactor was operating at 100 percent power with equilibrium xenon-135 at the beginning of a fuel cycle when a reactor scram occurred. If the reactor is taken critical 4 hours later, which one of the following describes the effect of xenon-135 on control rod worth when the reactor becomes critical?

A. Increasing xenon-135 concentration at the periphery of the core is causing periphery control rods to exhibit increasing worth.

B. Increasing thermal neutron flux at the periphery of the core is causing periphery control rods to exhibit increasing worth.

C. Increasing thermal neutron flux at the center of the core is causing center control rods to exhibit increasing worth.

D. Decreasing xenon-135 concentration at the center of the core is causing center control rods to exhibit increasing worth.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.14 [3.1/3.2]
QID: B1663

A reactor is initially operating at 50 percent power with equilibrium xenon-135. Power is level increased to 75 percent over a one-hour period, and no subsequent operator actions are taken. Considering only the reactivity effects of xenon-135 changes, which one of the following describes reactor power 6 hours after the power change?

A. Greater than 75 percent and decreasing slowly.

B. Greater than 75 percent and increasing slowly.

C. Lower than 75 percent and decreasing slowly.

D. Lower than 75 percent and increasing slowly.

ANSWER: A.

TOPIC: 292006
KNOWLEDGE: K1.14 [3.1/3.2]
QID: B1762

A reactor is operating at 100 percent power with equilibrium xenon-135 at the beginning of a fuel cycle when a reactor scram occurs. The reactor is taken critical 4 hours later.

Which one of the following describes the effect of xenon-135 on control rod worth when the reactor becomes critical?

A. High xenon-135 concentration at the periphery of the core will cause peripheral rods to exhibit higher worth.

B. High xenon-135 concentration at the periphery of the core will cause central rods to exhibit higher worth.

C. High xenon-135 concentration at the center of the core will cause peripheral rods to exhibit higher worth.

D. High xenon-135 concentration at the center of the core will cause central rods to exhibit higher worth.

ANSWER: C.

TOPIC: 292006
KNOWLEDGE: K1.14 [3.1/3.2]
QID: B1862 (P361)

A nuclear power plant has been operating at 100 percent power for two months when a reactor scram occurs. Shortly after the reactor scram, a reactor startup is commenced. Four hours after the scram, reactor power is at 5 percent. To maintain reactor power at 5 percent over the next hour, the operator must add...

A. positive reactivity, because the xenon-135 concentration is increasing.

B. negative reactivity, because the xenon-135 concentration is increasing.

C. positive reactivity, because the xenon-135 concentration is decreasing.

D. negative reactivity, because the xenon-135 concentration is decreasing.

ANSWER: A.

TOPIC: 292006
KNOWLEDGE: K1.14 [3.1/3.2]
QID: B2062

A reactor is initially operating at 100 percent power with equilibrium xenon-135. Power level is decreased to 75 percent over a one-hour period and stabilized. No subsequent operator actions are taken.

Considering only the reactivity effects of xenon-135 changes, which one of the following describes reactor power 10 hours after the power change?

A. Greater than 75 percent and decreasing slowly.

B. Greater than 75 percent and increasing slowly.

C. Less than 75 percent and decreasing slowly.

D. Less than 75 percent and increasing slowly.

ANSWER: D.

TOPIC: 292006
KNOWLEDGE: K1.14 [3.1/3.2]
QID: B2263

A reactor is currently operating at 80 percent power immediately after a one-hour power reduction from steady-state 100 percent power. To maintain reactor power at 80 percent over the next 3 hours, the operator must _____ control rods or _____ reactor recirculation flow rate.

A. insert; increase

B. insert; decrease

C. withdraw; increase

D. withdraw; decrease

ANSWER: C.

TOPIC: 292006
KNOWLEDGE: K1.14 [3.1/3.2]
QID: B2964

A reactor is currently operating at 60 percent power immediately after a one-hour power increase from steady-state 40 percent power. To maintain reactor power at 60 percent over the next 2 hours, the operator must _____ control rods or _____ reactor recirculation flow rate.

A. insert; increase

B. insert; decrease

C. withdraw; increase

D. withdraw; decrease

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.14 [3.1/3.2]
QID: B3063

A reactor is initially operating at 100 percent power with equilibrium xenon-135. Power level is decreased to 75 percent over a one-hour period and stabilized. No subsequent operator actions are taken.

Considering only the reactivity effects of xenon-135 changes, which one of the following describes reactor power 30 hours after the power change?

A. Less than 75 percent and increasing slowly.

B. Less than 75 percent and decreasing slowly.

C. Greater than 75 percent and increasing slowly.

D. Greater than 75 percent and decreasing slowly.

ANSWER: C.

TOPIC: 292006
KNOWLEDGE: K1.14 [3.1/3.2]
QID: B3563 (P3563)

A nuclear power plant had been operating at 100 percent power for two months when a reactor scram occurred. Soon afterward, a reactor startup was performed. Twelve hours after the scram, the startup has been paused with reactor power at 5 percent.

To maintain reactor power at 5 percent over the next hour, the operator must add _____ reactivity because the xenon-135 concentration will be _____.

A. positive; increasing

B. negative; increasing

C. positive; decreasing

D. negative; decreasing

ANSWER: D.

TOPIC: 292006
KNOWLEDGE: K1.14 [3.1/3.2]
QID: B3863

A reactor has been operating at steady-state 100 percent power for three weeks. The operator slowly adds negative reactivity over a period of 20 minutes to reduce reactor power to 90 percent.

Which one of the following describes reactor power 60 minutes after power level reaches 90 percent if no additional operator action is taken?

A. Greater than 90 percent and increasing slowly.

B. Greater than 90 percent and decreasing slowly.

C. Less than 90 percent and increasing slowly.

D. Less than 90 percent and decreasing slowly.

ANSWER: D.

TOPIC: 292006
KNOWLEDGE: K1.14 [3.1/3.2]
QID: B4631

Six hours after a reactor scram from steady-state 100 percent power operation, a reactor is taken critical and power is immediately stabilized low in the intermediate range. To maintain the reactor critical at a constant power level for the next hour, the operator must add _____ reactivity because the xenon-135 concentration is _____.

A. negative; increasing

B. negative; decreasing

C. positive; increasing

D. positive; decreasing

ANSWER: C.

TOPIC: 292006
KNOWLEDGE: K1.14 [3.1/3.2]
QID: B6831 (P6831)

A reactor has been shut down for 7 days following 2 months of steady-state 100 percent power operation. A reactor startup is then performed and the reactor is taken to 100 percent power over a 12-hour period. After 100 percent power is reached, what incremental control rod positioning will be needed to compensate for xenon-135 changes over the next 24 hours?

A. Withdraw rods slowly during the entire period.

B. Withdraw rods slowly at first, and then insert rods slowly.

C. Insert rods slowly during the entire period.

D. Insert rods slowly at first, and then withdraw rods slowly.

ANSWER: A.

TOPIC: 292006
KNOWLEDGE: K1.14 [3.1/3.2]
QID: B7431 (P7431)

A nuclear power plant was initially operating at steady-state 100 percent power at the end of a fuel cycle (EOC) when the plant was shut down for refueling. After refueling, the reactor was restarted and the plant is currently operating at steady-state 100 percent power at the beginning of a fuel cycle (BOC). Assume the average energy released by each fission did not change.

Compared to the equilibrium xenon-135 concentration at 100 percent power just prior to the refueling, the current equilibrium xenon-135 concentration is…

A. greater, because the higher fission rate at BOC produces xenon-135 at a faster rate.

B. greater, because the lower thermal neutron flux at BOC removes xenon-135 at a slower rate.

C. smaller, because the lower fission rate at BOC produces xenon-135 at a slower rate.

D. smaller, because the higher thermal neutron flux at BOC removes xenon-135 at a faster rate.

ANSWER: B.

TOPIC: 292006
KNOWLEDGE: K1.14 [3.1/3.2]
QID: B7531

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 withdrawing control rods 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.

ANSWER: A.

TOPIC: 292006
KNOWLEDGE: K1.14 [3.1/3.2]
QID: B7657 (P7657)

With Xe-135 initially at equilibrium, which one of the following power changes produces the greatest change in equilibrium Xe-135 negative reactivity?

A. 0 percent to 10 percent

B. 30 percent to 40 percent

C. 60 percent to 70 percent

D. 90 percent to 100 percent

ANSWER: A.