

科目： 293008

知能類： K1.01 [2.6/2.8]

序號： B88

The highest rate of heat transfer from the fuel-cladding surface to the coolant channel is provided by...

- A. forced convection with subcooled coolant (no boiling).
- B. natural convection with subcooled coolant (no boiling).
- C. natural convection with bulk boiling of coolant.
- D. forced convection with nucleate boiling.

ANSWER: D.

從燃料護套到冷卻水通道的熱傳中，最大部分來自於

- A. 次冷卻水（未沸騰）的強制對流
- B. 次冷卻水（未沸騰）的自然對流
- C. 冷卻水整體沸騰的自然對流
- D. 核沸騰的強制對流

答案： D.

科目： 293008

知能類： K1.01 [2.6/2.8]

序號： B89

The order of heat-transfer mechanisms occurring in the core (inlet-to-outlet) is...

- A. subcooled nucleate boiling, single-phase convection, slug flow, annular flow.
- B. subcooled nucleate boiling, single-phase convection, annular flow, slug flow.
- C. single-phase convection, subcooled nucleate boiling, slug flow, annular flow.
- D. single-phase convection, subcooled nucleate boiling, annular flow, slug flow.

ANSWER: C

發生在爐心中的熱傳機制順序（由進口到出口）為

- A. 次冷核沸騰，單相對流，團狀流(slug flow)，環形流(annular flow)
- B. 次冷核沸騰，單相對流，環形流，團狀流
- C. 單相對流，次冷核沸騰，團狀流，環形流
- D. 單相對流，次冷核沸騰，環形流，團狀流

答案： C.

科目： 293008

知能類： K1.01 [2.6/2.8]

序號： B389 (P286)

As heat is transferred to water adjacent to a heating surface, many factors influence steam bubble formation. Select the characteristic below that will enhance steam bubble formation.

- A. Chemicals dissolved in the water
- B. The absence of ionizing radiation exposure to the water
- C. A highly polished heat transfer surface with minimal scratches or cavities
- D. The presence of gases dissolved in the water

ANSWER: D

當一熱表面之熱傳至周圍之水，許多因素會影響蒸汽泡形成。下列何者會增加蒸汽泡之形成？

- A. 溶解於水中之化學物質
- B. 水缺乏游離輻射曝露
- C. 具有最少刮痕與孔洞之高度光滑熱傳表面
- D. 溶解於水中之氣體

答案： D.

科目： 293008

知能類： K1.01 [2.6/2.8]

序號： B885

The dominant heat transfer mechanism that occurs when nucleate boiling is present is...

- A. convection.
- B. radiation.
- C. conduction.
- D. induction.

ANSWER: A

當核沸騰存在時，主要熱傳機制為

- A. 對流
- B. 輻射
- C. 傳導
- D. 感應

答案： A.

科目： 293008

知能類： K1.01 [2.6/2.8]

序號： B986

Which one of the following describes convection heat transfer?

- A. The flow of heat through a body or between bodies in direct contact
- B. The flow of heat between two different fluids not in direct contact
- C. The flow of heat from a body by electromagnetic waves across an intervening space
- D. The flow of heat between a fluid and surface by circulation of the fluid

ANSWER: D

下列何者為對流熱傳之描述？

- A. 透過一物體或是物體間直接接觸之熱量流動
- B. 於兩未直接接觸之不同流體的熱量流動
- C. 藉由一物體穿過一中介空間之電磁波的熱量流動
- D. 藉由流體循環在流體與表面間的熱量流動

答案： D.

科目： 293008

知能類： K1.01 [2.6/2.8]

序號： B1183

Refer to the drawing of a pool boiling curve (see figure below). In which region(s) of the curve does the reactor normally operate to transfer heat from the fuel cladding to the coolant at 100% power?

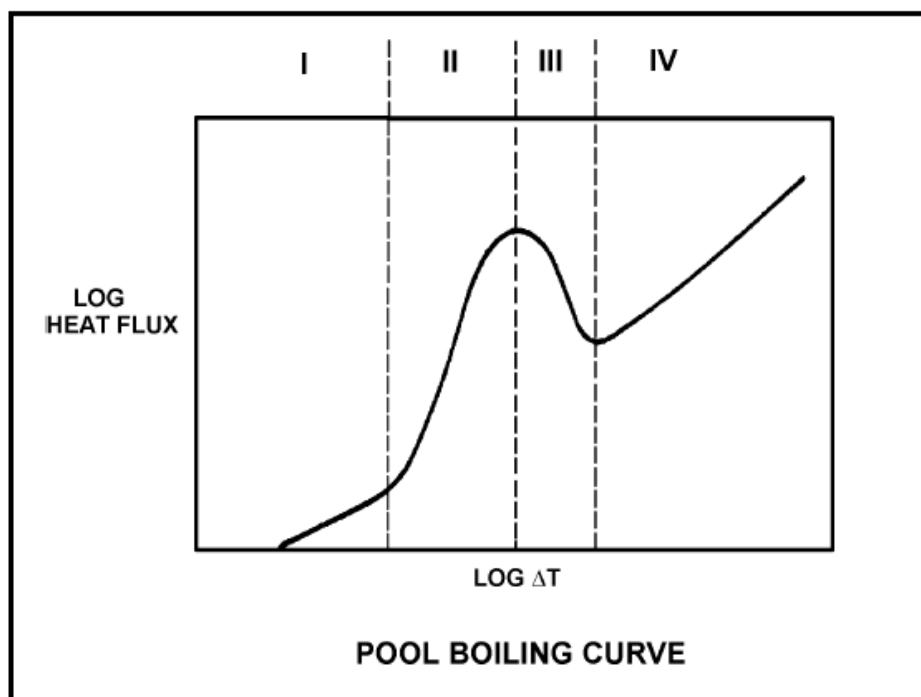
- A. Regions II and III
- B. Region II only
- C. Regions I and II
- D. Region I only

ANSWER: C

參考池式沸騰曲線之圖示（見下圖）。對於100%功率運轉的反應爐，其熱量正常從燃料護套傳送至冷卻水是在曲線上的那些區域？

- A. II 區與 III 區
- B. 只有 II 區
- C. I 區與 II 區
- D. 只有 I 區

答案： C.



科目： 293008

知能類： K1.01 [2.6/2.8]

序號： B1285 (P2787)

For boiling to occur, the coolant adjacent to the fuel rod must have sufficient heat flux for vapor bubble formation. Select the characteristic below that will aid in bubble formation.

- A. Surface scratches or cavities in the fuel clad
- B. Subsurface void defect in the fuel clad
- C. Increased coolant velocity past the fuel rod
- D. Chemically inert material dissolved in the coolant

ANSWER: A

為了使沸騰發生，燃料棒附近的冷卻水需要有足夠的熱通量以利蒸汽泡之形成。下列何者能增進蒸汽泡的形成？

- A. 燃料護套上的表面刮痕或孔洞
- B. 燃料護套上的次表面空泡缺陷(subsurface void defect)
- C. 增加通過燃料棒的冷卻水流速
- D. 溶解於冷卻水中之化學惰性物質

答案： A.

科目： 293008

知能類： K1.01 [2.6/2.8]

序號： B2784 (P1086)

How does the convective heat transfer coefficient vary from the bottom to the top of a fuel rod if subcooled reactor coolant enters the coolant channel and exits as superheated steam?

- A. Increases continuously
- B. Increases, then decreases
- C. Decreases continuously
- D. Decreases, then increases

ANSWER: B

若次冷反應爐冷卻水進入冷卻水通道，並以過熱蒸汽(superheated steam)離開，則燃料棒從底到頂之對流熱傳導係數之變化狀況為何？

- A. 連續增加
- B. 先增加，然後減小
- C. 連續減小
- D. 先減小，然後增加

答案： B.

科目： 293008

知能類： K1.04 [2.6/2.7]

序號： B90

Boiling improves heat transfer because the...

- A. agitation produced reduces the thickness of the fluid film and the bubble formation removes the latent heat of vaporization from the heated surface.
- B. bubbles produced reduce the turbulence in the bulk fluid flow and transfer the latent heat of condensation to the fluid as the steam bubbles collapse in the laminar fluid film.
- C. velocity of the laminar fluid film past the heated surface increases causing the ΔT between the heated surface and the fluid film to increase.
- D. velocity of the laminar fluid film near the heated surface decreases causing the liquid contact time with the heated surface to increase.

ANSWER: A

沸騰能改善熱傳的原因是

- A. 所產生之攪動(agitation)降低了液膜的厚度，同時氣泡的形成會將熱表面的汽化潛熱移除
- B. 所產生之氣泡降低了整體流動的擾動(turbulence)，並且將氣泡凝結消失(collapse)在層流液膜的冷凝潛熱加以傳導
- C. 流經熱表面之層流液膜(laminar fluid film)流速增加，導致熱表面與液膜間的溫差增加
- D. 在熱表面附近之層流液膜流速減小，導致與熱表面的液體接觸時間增加

答案： A.

科目： 293008

知能類： K1.04 [2.6/2.7]

序號： B486

Nucleate boiling occurring at the surface of a fuel rod...

- A. increases the convective heat transfer from the fuel rod to the coolant.
- B. decreases the convective heat transfer from the fuel rod to the coolant.
- C. has no effect on convective heat transfer because it is boiling heat transfer.
- D. causes damage to the fuel rod because it disrupts the laminar flow of coolant next to the fuel rod.

ANSWER: A

發生在燃料棒表面的核沸騰會

- A. 增加從燃料棒至冷卻水之對流熱傳
- B. 降低從燃料棒至冷卻水之對流熱傳
- C. 對於對流熱傳沒有影響，因為這是沸騰熱傳
- D. 導致燃料棒受損，因為其破壞了燃料棒附近之冷卻水層流(laminar flow)

答案： A.

科目： 293008

知能類： K1.04 [2.6/2.7]

序號： B588 (P389)

Core heat transfer is maximized by the presence of...

- A. laminar flow with no nucleate boiling.
- B. turbulent flow with no nucleate boiling.
- C. laminar flow with nucleate boiling.
- D. turbulent flow with nucleate boiling.

ANSWER: D

爐心熱傳增至最大，乃因

- A. 沒有核沸騰的層流(laminar flow)
- B. 沒有核沸騰的擾流(turbulent flow)
- C. 有核沸騰的層流
- D. 有核沸騰的擾流

答案： D.

科目： 293008

知能類： K1.04 [2.6/2.7]

序號： B1086 (P2287)

Which one of the following describes why the core heat transfer rate increases when nucleate boiling begins on the surface of a fuel rod?

- A. Steam bubbles have a greater thermal conductivity than water.
- B. The formation of steam bubbles increases coolant flow along the fuel rod.
- C. Radiative heat transfer begins to supplement convective heat transfer.
- D. The motion of the steam bubbles causes rapid mixing of the coolant.

ANSWER: D

當核沸騰開始在燃料棒表面發生時，下列何者為爐心熱傳速率增加之原因？

- A. 汽泡的熱傳導係數較水為大
- B. 汽泡形成導致沿著燃料棒的冷卻水流量增加
- C. 除了對流熱傳外，開始有輻射熱傳
- D. 汽泡的移動導致冷卻水的快速混合

答案： D.

科目： 293008

知能類： K1.04 [2.6/2.7]

序號： B1890 (P487)

Nucleate boiling enhances the convective heat transfer coefficient by _____ the thermal conductivity of the coolant and _____ the laminar layer thickness.

- A. increasing; decreasing
- B. increasing; increasing
- C. decreasing; decreasing
- D. decreasing; increasing

ANSWER: A

核沸騰藉由_____冷卻水的熱傳導係數與_____層流厚度而增加對流熱傳係數。

- A. 增加；減小
- B. 增加；增加
- C. 減小；減小
- D. 減小；增加

答案： A.

科目： 293008

知能類： K1.04 [2.6/2.7]

序號： B2385 (P2386)

Subcooled water enters the bottom of a fuel assembly in an operating reactor core. As the water flows upward past the fuel assembly, boiling occurs and the coolant exits the fuel assembly at saturation temperature.

If the coolant had remained subcooled, average fuel temperature would have been _____ because boiling is a _____ efficient method of heat transfer.

- A. higher; more
- B. higher; less
- C. lower; more
- D. lower; less

ANSWER: A

次冷水進入一運轉中之反應爐爐心之燃料元件的底部。當水流向上通過燃料元件，發生沸騰，並以飽和溫度離開燃料元件。但若冷卻水一直維持在次冷，則平均燃料溫度將會_____，因為沸騰乃是一_____效率之熱傳方式。

- A. 較高；較有
- B. 較高；較無
- C. 較低；較有
- D. 較低；較無

答案： A.

科目： 293008

知能類： K1.04 [2.6/2.7]

序號： B2486 (P2686)

Subcooled water enters the bottom of a fuel assembly in an operating reactor core. As the water flows upward past the fuel assembly, the water heats up and exits the fuel assembly. If the water begins boiling within the fuel assembly such that a saturated (versus subcooled) fluid exits the fuel assembly, average fuel temperature will be _____ because boiling is a _____ efficient method of heat transfer. (Assume fuel assembly power does not change.)

A. higher; more

B. higher; less

C. lower; more

D. lower; less

ANSWER: C

次冷水進入一運轉中之反應爐爐心之燃料元件的底部。當水流向上通過燃料元件，水被加熱並離開燃料元件。若水開始在燃料元件內沸騰，因而以飽和（相對於次冷）流體離開燃料元件。則平均燃料溫度將會_____，因為沸騰乃是一_____效率之熱傳方式。（假設燃料元件功率不變。）

A. 較高；較有

B. 較高；較無

C. 較低；較有

D. 較低；較無

答案： C.

科目： 293008

知能類： K1.04 [2.6/2.7]

序號： B2886 (P1086)

How does the convective heat transfer coefficient vary from the bottom to the top of a fuel rod if subcooled reactor coolant enters the coolant channel and exits as superheated steam?

- A. Increases continuously
- B. Increases, then decreases
- C. Decreases continuously
- D. Decreases, then increases

ANSWER: B

若次冷反應爐冷卻水進入冷卻水通道，並以過熱蒸汽(superheated steam)離開，則燃料棒從底到頂之對流熱傳係數之變化狀況為何？

- A. 連續增加
- B. 增加，然後減小
- C. 連續減小
- D. 減小，然後增加

答案： B.

科目： 293008

知能類： K1.04 [2.6/2.7]

序號： B2986 (P2986)

Subcooled reactor coolant flows into the bottom of a fuel assembly coolant channel and exits the top of the channel as a saturated steam-water mixture with a 98% moisture content. How does the convective heat transfer coefficient in the coolant channel change as the coolant travels upward along the channel?

- A. Increases only
- B. Increases, then decreases
- C. Decreases only
- D. Decreases, then increases

ANSWER: A

若次冷反應爐冷卻水進入燃料元件冷卻水通道的底部，並在通道頂部以水份含量98%的飽和蒸汽—水混合物方式離開。則當冷卻水在通道中向上流動時，冷卻水通道之對流熱傳係數之變化狀況為何？

- A. 只有增加
- B. 增加，然後減小
- C. 只有減小
- D. 減小，然後增加

答案： A.

科目： 293008

知能類： K1.04 [2.6/2.7]

序號： B3785 (P3786)

Subcooled water is flowing into a fuel assembly in an operating reactor core. As the water flows upward through the fuel assembly, the water begins to boil and exits the fuel assembly as a saturated fluid.

If fuel assembly power is unchanged and system pressure is increased such that all of the water remains subcooled, the average fuel temperature in the fuel assembly would be _____ because boiling is a _____ efficient method of heat transfer.

- A. higher; more
- B. higher; less
- C. lower; more
- D. lower; less

ANSWER: A

次冷水進入一運轉中之反應爐爐心之燃料元件。當水流向上通過燃料元件，水開始沸騰，並且以飽和流體方式離開燃料元件。若燃料元件功率不變，同時系統壓力增加，使得所有的水仍維持次冷，則平均燃料元件溫度將會_____，因為沸騰乃是一_____效率之熱傳方式。

- A. 較高；較有
- B. 較高；較無
- C. 較低；較有
- D. 較低；較無

答案： A.

科目： 293008

知能類： K1.06 [2.5/2.6]

序號： B387

Which one of the following conditions must occur to sustain natural convection in a fluid system?

- A. Subcooling of the fluid
- B. A phase change in the fluid
- C. An enthalpy change in the fluid
- D. Radiative heat transfer to the fluid

ANSWER: C

為了維持一流體系統之自然對流，則下列何者一定發生？

- A. 流體的次冷度
- B. 流體的相變化
- C. 流體的焓變化
- D. 輻射熱傳至流體

答案： C.

科目： 293008

知能類： K1.06 [2.5/2.6]

序號： B2386 (P1989)

Which one of the following conditions must occur to sustain natural convection in a fluid system?

- A. Subcooling of the fluid
- B. A phase change in the fluid
- C. A density change in the fluid
- D. Radiative heat transfer to the fluid

ANSWER: C

為了維持一流體系統之自然對流，則下列何者一定發生？

- A. 流體的次冷度
- B. 流體的相變化
- C. 流體的密度變化
- D. 輻射熱傳至流體

答案： C.

科目： 293008

知能類： K1.07 [2.8/3.0]

序號： B388 (P387)

What type of boiling is described as follows?

The bulk temperature of the liquid is below saturation, but the temperature of the heat transfer surface is above saturation. Vapor bubbles form at the heat transfer surface, but condense in the cold liquid so that no net generation of vapor is obtained.

- A. Bulk boiling
- B. Subcooled nucleate boiling
- C. Transition boiling
- D. Partial film boiling

ANSWER: B

下列所描述的是何種沸騰？

液體的整體溫度在飽和以下，但是熱傳表面的溫度則在飽和之上。汽泡在熱傳表面形成，但是在冷液體中冷凝，因此並無蒸汽的淨生成。

- A. 整體沸騰
- B. 次冷核沸騰
- C. 變態沸騰
- D. 部分薄膜沸騰(Partial film boiling)

答案： B.

科目： 293008

知能類： K1.07 [2.8/3.0]

序號： B887

Refer to the drawing of a pool-boiling curve (see figure below). The region in which nucleate boiling is the primary heat transfer mechanism is region...

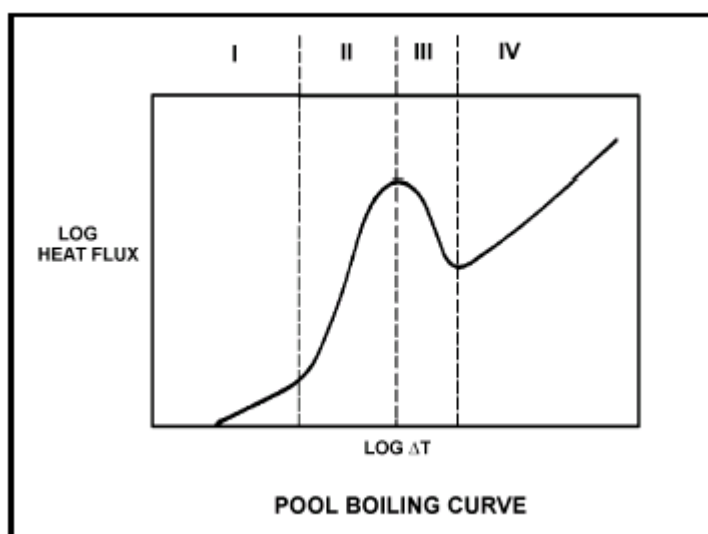
- A. I.
- B. II.
- C. III.
- D. IV.

ANSWER: B

參考池式沸騰曲線圖示（見下圖）。核沸騰為最主要熱傳機制的區域是

- A. I 區
- B. II 區
- C. III 區
- D. IV 區

答案： B.



科目： 293008

知能類： K1.07 [2.8/3.0]

序號： B1087 (P1686)

Which one of the following is a characteristic of subcooled nucleate boiling but not saturated nucleate boiling?

A. T_{Clad} equals T_{Sat}

B. T_{Clad} is greater than T_{Sat}

C. $T_{Bulk\ Coolant}$ equals T_{Sat}

D. $T_{Bulk\ Coolant}$ is less than T_{Sat}

ANSWER: D

下列何者是次冷核沸騰的特徵而非飽和核沸騰之特徵？

A. T_{Clad} 等於 T_{sat}

B. T_{Clad} 大於 T_{sat}

C. $T_{Bulk\ Coolant}$ 等於 T_{sat}

D. $T_{Bulk\ Coolant}$ 小於 T_{Sat}

答案： D.

科目： 293008

知能類： K1.07 [2.8/3.0]

序號： B1287 (P2687)

Which one of the following modes of heat transfer is characterized by steam bubbles moving away from a heated surface and collapsing in the bulk fluid?

- A. Bulk boiling
- B. Subcooled nucleate boiling
- C. Saturated nucleate boiling
- D. Saturated natural convection

ANSWER: B

下列何種熱傳的特徵是汽泡從熱表面離開，而在整體流中凝結消失(collapsing)？

- A. 整體沸騰
- B. 次冷核沸騰
- C. 飽和核沸騰
- D. 飽和自然對流

答案： B.

科目： 293008

知能類： K1.07 [2.8/3.0]

序號： B1786 (P1888)

Which one of the following is a characteristic of saturated nucleate boiling but not subcooled nucleate boiling?

A. T_{Clad} equals T_{Sat}

B. T_{Clad} is greater than T_{Sat}

C. $T_{Bulk\ Coolant}$ equals T_{Sat}

D. $T_{Bulk\ Coolant}$ is less than T_{Sat}

ANSWER: C

下列何者是飽和核沸騰的特徵而非次冷核沸騰之特徵？

A. T_{Clad} 等於 T_{sat}

B. T_{Clad} 大於 T_{sat}

C. $T_{Bulk\ Coolant}$ 等於 T_{sat}

D. $T_{Bulk\ Coolant}$ 小於 T_{Sat}

答案： C.

科目： 293008

知能類： K1.07 [2.8/3.0]

序號： B1986 (P1186)

Refer to the drawing of a pool boiling curve (see figure below). Identify the region of the curve where the most efficient form of heat transfer exists.

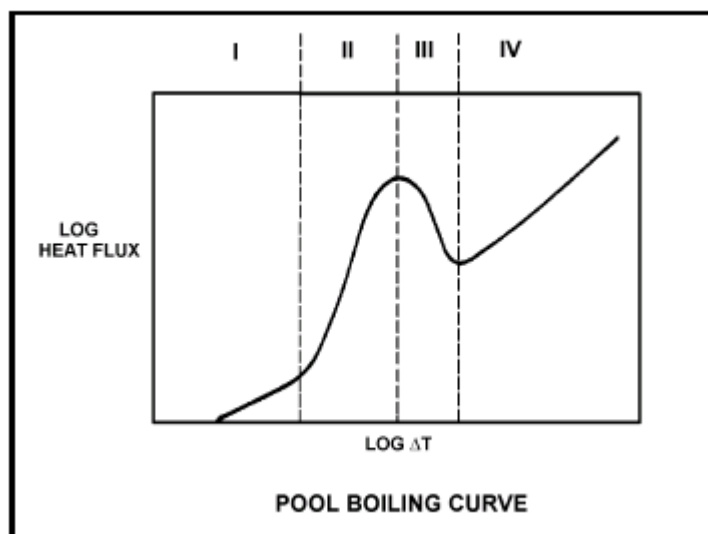
- A. Region I
- B. Region II
- C. Region III
- D. Region IV

ANSWER: B

參考池式沸騰曲線圖示（見下圖）。熱傳最有效率的區域是

- A. I 區
- B. II 區
- C. III 區
- D. IV 區

答案： B.



科目： 293008

知能類： K1.07 [2.8/3.0]

序號： B2088 (P1286)

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

Which region of the curve contains the point at which the hottest locations of the reactor core normally operate to transfer heat from the cladding to the coolant at 100% power?

- A. Region I
- B. Region II
- C. Region III
- D. Region IV

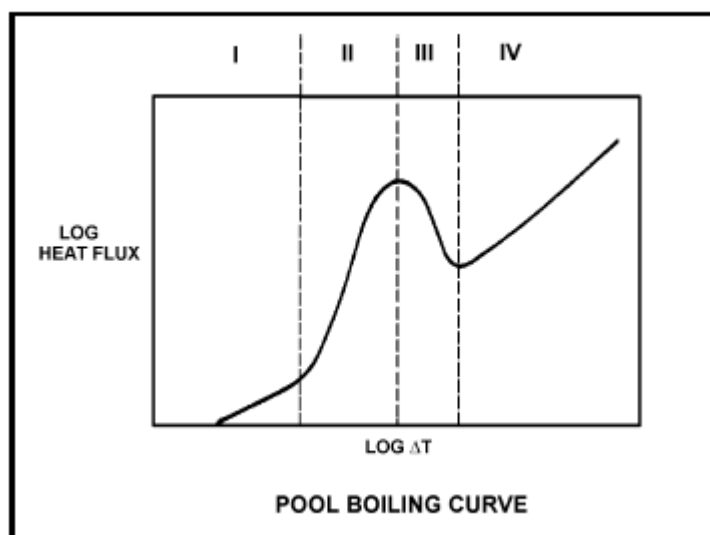
ANSWER: B

參考池式沸騰曲線圖示（見下圖）。

100% 功率下，對反應器爐心最熱位置而言，由護套傳熱到冷卻水的運轉點在那個區域？

- A. I 區
- B. II 區
- C. III 區
- D. IV 區

答案： B.



科目： 293008

知能類： K1.07 [2.8/3.0]

序號： B3685 (P3686)

A reactor is currently shutdown after several months of operation at full power. The shutdown cooling system is in operation, maintaining an average reactor coolant temperature of 280°F. A pressure control malfunction causes RCS pressure to slowly and continuously decrease from 100 psia while reactor coolant temperature remains constant. (Assume a normal reactor coolant flow direction through the core.)

Which one of the following describes where nucleate boiling will first occur?

- A. At a scratch on the surface of a fuel rod near the top of a fuel assembly.
- B. At a scratch on the surface of a fuel rod near the bottom of a fuel assembly.
- C. In the bulk fluid of a coolant channel near the top of a fuel assembly.
- D. In the bulk fluid of a coolant channel near the bottom of a fuel assembly.

ANSWER: A

一反應爐經過數月的全功率運轉後，目前停爐。停機冷卻系統正在運轉中，以維持反應爐冷卻水平均溫度在280°F。因壓力控制故障導致在反應爐冷卻水溫度維持不變下，RCS的壓力從100psia持續緩慢降低。（假設正常反應爐冷卻水流動方向通過爐心。）

下列何者描述了核沸騰最先發生之處？

- A. 在靠近燃料元件頂部之燃料棒的表面刮痕上
- B. 在靠近燃料元件底部之燃料棒的表面刮痕上
- C. 在靠近燃料元件頂部之冷卻水通道的整體流(bulk fluid)中
- D. 在靠近燃料元件底部之冷卻水通道的整體流中

答案： A.

科目： 293008

知能類： K1.08 [2.9/3.1]

序號： B142

Which one of the following describes the onset of transition boiling?

- A. Steam bubbles begin to blanket the fuel rod causing a rapid increase in the ΔT between the fuel rod and the coolant.
- B. Steam bubbles completely blanket the fuel rod causing an increase in the heat flux from the fuel rod.
- C. Steam bubbles begin to blanket the fuel rod causing a rapid decrease in ΔT between the fuel rod and the coolant.
- D. Steam bubbles break up the laminar layer of coolant on the surface of the fuel rod causing an increase in the heat flux from the fuel rod.

ANSWER: A

下列何者為開始變態沸騰的描述？

- A. 汽泡開始覆蓋燃料棒，導致燃料棒與冷卻水間的溫差開始快速增加
- B. 汽泡完全覆蓋燃料棒，導致來自燃料棒的熱通量增加
- C. 汽泡開始覆蓋燃料棒，導致燃料棒與冷卻水間的溫差開始快速減少
- D. 汽泡在燃料棒表面破壞冷卻水的層流層(laminar layer)，導致來自燃料棒的熱通量增加

答案： A.

科目： 293008

知能類： K1.08 [2.9/3.1]

序號： B287

Departure from nucleate boiling (DNB) occurs when steam bubbles begin to blanket the fuel rod, resulting in a rapid _____ in heat transfer rate and a rapid _____ in ΔT (fuel clad minus coolant temperature).

- A. decrease; increase
- B. decrease; decrease
- C. increase; increase
- D. increase; decrease

ANSWER: A

當汽泡開始覆蓋燃料棒時，偏離核沸騰(DNB)發生，導致熱傳速率快速_____，以及（燃料護套減去冷卻水溫度）溫差快速_____。

- A. 減小；增加
- B. 減小；減小
- C. 增加；增加
- D. 增加；減小

答案： A.

科目： 293008

知能類： K1.08 [2.9/3.1]

序號： B1288 (P3388)

Which one of the following is indicated by a rapid increase in the fuel clad-to-coolant ΔT and a decrease in heat flux from the fuel?

- A. Bulk boiling is occurring.
- B. Departure from nucleate boiling has been reached.
- C. Critical heat flux is increasing.
- D. Nucleate boiling is occurring.

ANSWER: B

燃料護套與冷卻水間溫差的快速增加與來自燃料的熱通量減小，代表了下列何者？

- A. 整體沸騰正在發生
- B. 已經達到偏離核沸騰(DNB)
- C. 臨界熱通量正在增加
- D. 核沸騰正在發生

答案： B.

科目： 293008

知能類： K1.08 [2.9/3.1]

序號： B1985 (P1288)

Departure from nucleate boiling should not be allowed to occur in the core because...

- A. as steam bubbles begin to blanket the clad, the radiative heat transfer decreases.
- B. as steam bubbles in the coolant form and then collapse, water hammer occurs.
- C. as steam bubbles begin to blanket the clad, temperature rises sharply.
- D. as steam bubbles form in the coolant, voids-induced reactivity changes cause undesirable power changes.

ANSWER: C

在爐心中不應允許偏離核沸騰(DNB)發生，因為

- A. 當汽泡開始覆蓋護套時，輻射熱傳會減小
- B. 當汽泡在冷卻水中形成而其後凝結消失(collapse)，水錘現象會發生
- C. 當汽泡開始覆蓋護套時，溫度會突然上升
- D. 當汽泡在冷卻水中形成，空泡引發的反應度變化將導致不欲產生之功率變化

答案： C.

科目： 293008

知能類： K1.08 [2.9/3.1]

序號： B2987 (P287)

If ΔT is the temperature difference between the fuel rod clad and the coolant, which one of the following describes the heat transfer from a fuel rod at the departure from nucleate boiling?

- A. Steam bubbles begin to form on the fuel rod clad, causing a rapid decrease in the heat flux from the fuel rod for a given ΔT .
- B. Steam bubbles completely blanket the fuel rod clad, causing a rapid increase in the heat flux from the fuel rod for a given ΔT .
- C. Steam bubbles begin to blanket the fuel rod clad, causing a rapid increase in the ΔT for a given heat flux.
- D. Steam bubbles completely blanket the fuel rod clad, causing a rapid decrease in the ΔT for a given heat flux.

ANSWER: C

若燃料棒與冷卻水間的溫差為 ΔT ，下列何者描述了燃料棒在偏離核沸騰時的熱傳？

- A. 汽泡開始在燃料棒護套上形成，導致燃料棒的熱通量快速減小(當 ΔT 固定時)
- B. 汽泡完全覆蓋燃料棒護套，導致燃料棒的熱通量快速增加(當 ΔT 固定時)
- C. 汽泡開始覆蓋燃料棒護套，導致 ΔT 快速增加(當熱通量固定時)
- D. 汽泡完全覆蓋燃料棒護套，導致 ΔT 快速減小(當熱通量固定時)

答案： C.

科目： 293008

知能類： K1.09 [3.0/3.2]

序號： B288

Refer to the drawing of a hypothetical fuel coolant channel (see figure below). For the hypothetical fuel coolant channel shown below, identify along its length where transition boiling begins.

A. 1

B. 2

C. 3

D. 4

ANSWER: C

參考一假定之燃料冷卻水通道圖示（見下圖）。對於圖中所示之假定的燃料冷卻水通道，何處乃是變態沸騰開始之處？

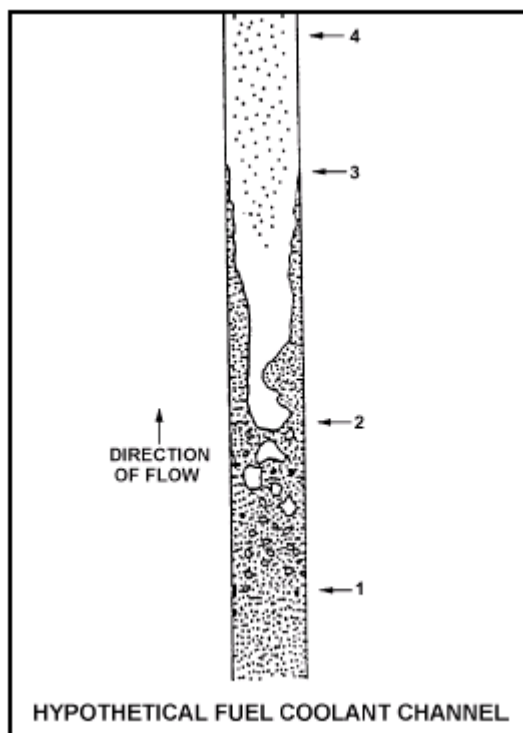
A. 1

B. 2

C. 3

D. 4

答案： C.



科目： 293008

知能類： K1.09 [3.0/3.2]

序號： B987 (P1891)

Which one of the following describes the conditions in a fuel channel that is experiencing transition boiling?

- A. Complete steam blanketing of the fuel rod surface
- B. Alternate wetting and drying of the fuel rod surface
- C. Saturated nucleate boiling
- D. Subcooled nucleate boiling

ANSWER: B

下列何者描述了正處於變態沸騰的燃料通道的狀況？

- A. 蒸汽完全覆蓋燃料棒表面
- B. 燃料棒表面濕、乾交替
- C. 飽和核沸騰
- D. 次冷核沸騰

答案： B.

科目： 293008

知能類： K1.09 [3.0/3.2]

序號： B1386 (P1689)

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

Which one of the points shown represents the onset of transition boiling?

A. A

B. B

C. C

D. D

ANSWER: B

參考一池式沸騰曲線之圖示（見下圖）。哪一個點代表了變態沸騰的開始？

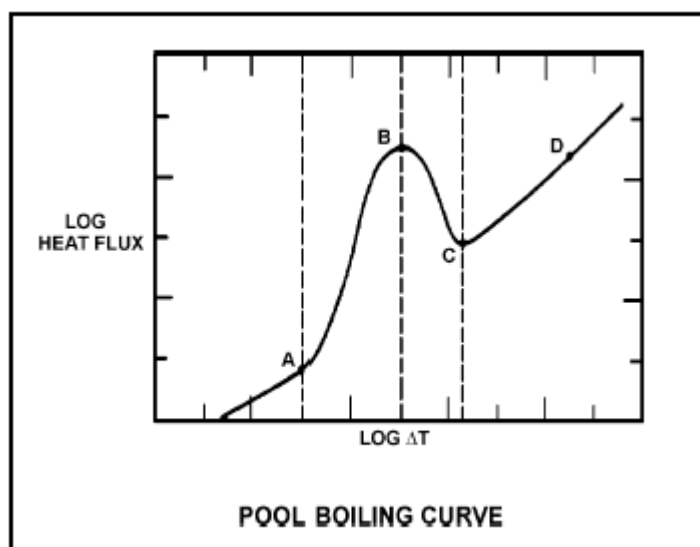
A. A

B. B

C. C

D. D

答案： B.



科目： 293008

知能類： K1.09 [3.0/3.2]

序號： B1486 (P2688)

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

Which one of the following regions represents the most unstable heat transfer?

A. I

B. II

C. III

D. IV

ANSWER: C

參考一池式沸騰曲線之圖示（見下圖）。哪一個區域代表了最不穩定的熱傳？

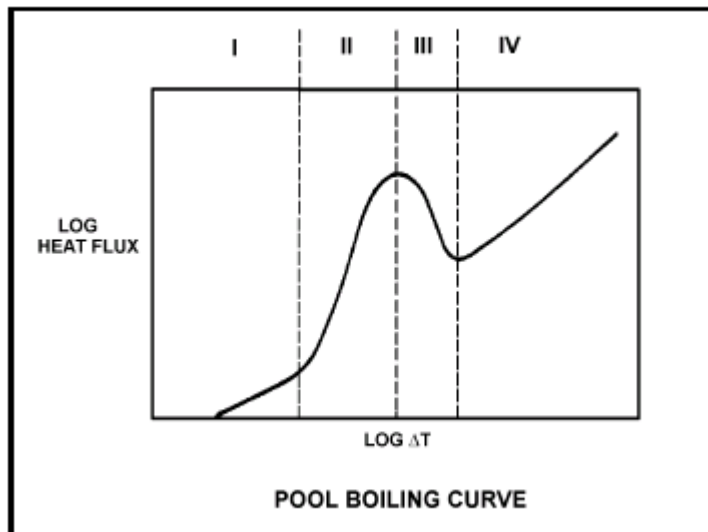
A. I

B. II

C. III

D. IV

答案： C.



科目： 293008

知能類： K1.09 [3.0/3.2]

序號： B1587 (P1587)

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

Which one of the points shown marks the lowest ΔT at which stable film boiling can exist?

A. A

B. B

C. C

D. D

ANSWER: C

參考一池式沸騰曲線之圖示（見下圖）。圖中那一個點代表了穩定薄膜沸騰能夠存在的最低 ΔT ？

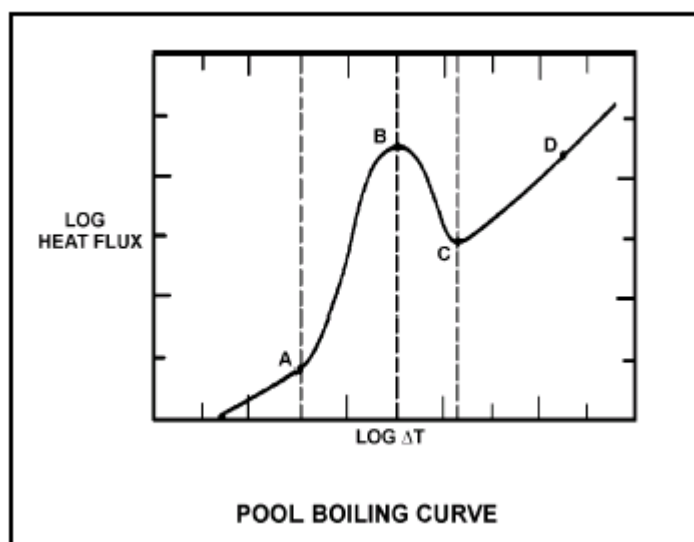
A. A

B. B

C. C

D. D

答案： C.



科目： 293008

知能類： K1.09 [3.0/3.2]

序號： B2288 (P1987)

Which one of the following describes the conditions in a fuel channel that is experiencing transition boiling?

- A. Complete steam blanketing of the fuel rod surface
- B. Alternate wetting and drying of the fuel rod surface
- C. Steam bubbles form and collapse on the fuel rod surface
- D. Steam bubbles form on the fuel rod surface and are swept away by subcooled bulk coolant

ANSWER: B

下列何者描述了燃料匣內正處於變態沸騰的現象？

- A. 蒸汽完全覆蓋燃料棒表面
- B. 燃料棒表面濕、乾交替
- C. 汽泡在燃料棒表面形成與凝結消失(collapse)
- D. 汽泡在燃料棒表面形成，其後被次冷整體冷卻水(subcooled bulk coolant)掃除

答案： B.

科目： 293008

知能類： K1.10 [2.9/3.0]

序號： B289 (P2289)

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

The point at which heat flux is increasing and the critical heat flux has been reached (point B), marks the beginning of...

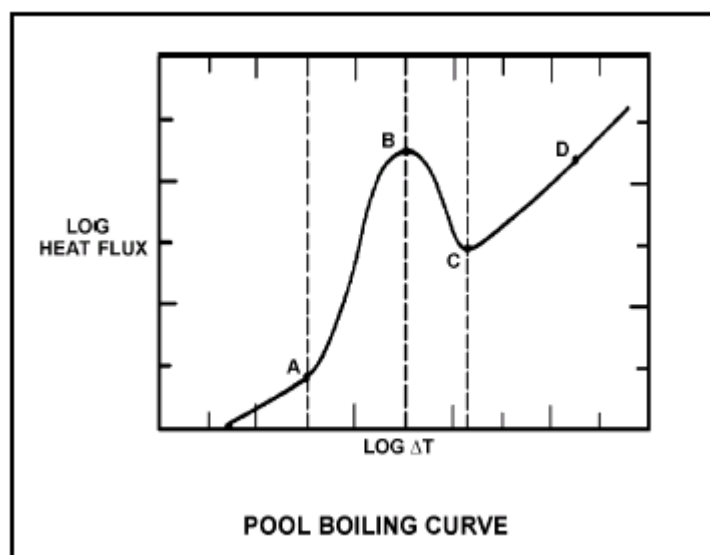
- A. nucleate boiling.
- B. stable film boiling.
- C. partial film boiling.
- D. single-phase convection.

ANSWER: C

參考一池式沸騰曲線之圖示（見下圖）。圖中熱通量增加，同時臨界熱通量已達到之點（點B）代表了何者的開始？

- A. 核沸騰
- B. 穩定薄膜沸騰
- C. 部分薄膜沸騰(partial film boiling)
- D. 單相對流

答案： C.



科目： 293008

知能類： K1.10 [2.9/3.0]

序號： B390

The magnitude of the local fuel pin heat flux that is necessary to cause the onset of transition boiling is...

- A. largest at the top of the core and smallest at the bottom of the core.
- B. largest at the bottom of the core and smallest at the top of the core.
- C. largest at the core midplane and smallest at the top and bottom of the core.
- D. largest at the top and bottom of the core and smallest at the core midplane.

ANSWER: B

開始產生變態沸騰所需之局部燃料棒之熱通量分佈為

- A. 在爐心頂部最大，在爐心底部最小
- B. 在爐心底部最大，在爐心頂部最小
- C. 在爐心中間平面(midplane)最大，在爐心頂部與底部最小
- D. 在爐心頂部與底部最大，在爐心中間平面最小

答案： B.

科目： 293008

知能類： K1.10 [2.9/3.0]

序號： B1687

Which one of the following is the expected mechanism of fuel damage if a fuel rod exceeds the critical heat flux at 100% power?

- A. Loss of clad integrity
- B. Loss of pellet integrity
- C. Pellet-clad interaction
- D. Clad creep

ANSWER: A

若燃料棒在100%功率下超過臨界熱通量，則下列何者乃預期中之燃料損壞機制？

- A. 護套完整性喪失
- B. 燃料丸完整性喪失
- C. 燃料丸—護套交互作用
- D. 護套的潛變(creep)

答案： A.

科目： 293008

知能類： K1.10 [2.9/3.0]

序號： B1888 (P1087)

How does critical heat flux vary from the bottom to the top of a typical fuel bundle during normal full power operation?

- A. Decreases continuously
- B. Decreases, then increases
- C. Increases continuously
- D. Increases, then decreases

ANSWER: A

在正常全功率運轉之下，一典型燃料束之臨界熱通量從底至頂之變化為何？

- A. 持續減小
- B. 先減小，然後增加
- C. 持續增加
- D. 先增加，然後減小

答案： A.

科目： 293008

知能類： K1.10 [2.9/3.0]

序號： B2487 (P2487)

A reactor is shutdown at normal operating temperature and pressure. Which one of the following will decrease the critical heat flux for the reactor fuel? (Assume the reactor remains shutdown.)

- A. Fully withdrawing one control rod
- B. Increasing reactor vessel water level by 12 inches
- C. Increasing reactor recirculation flow rate by 100 gpm
- D. Increasing RCS pressure by 10 psig

ANSWER: D

一反應爐在正常運轉溫度以及壓力下停機。下列何者將會降低反應爐燃料之臨界熱通量？（假設反應爐維持在停機狀況下）。

- A. 將一根控制棒完全抽出
- B. 增加反應爐槽水位12英吋
- C. 增加反應爐再循環流量100gpm
- D. 增加RCS壓力10 psig

答案： D.

科目： 293008

知能類： K1.10 [2.9/3.0]

序號： B2989 (P2187)

Which one of the following will be the initial cause of fuel damage if a fuel rod exceeds the critical heat flux at 100% power?

- A. Excessive fuel clad temperature
- B. Excessive fuel pellet temperature
- C. Excessive fuel rod internal pressure
- D. Excessive fuel rod thermal stress

ANSWER: A

若一燃料棒在100%功率下超越臨界熱通量，則下列何者將會是燃料損害的最初原因？

- A. 燃料護套溫度過高
- B. 燃料丸溫度過高
- C. 燃料棒內部壓力過高
- D. 燃料棒熱應力過高

答案： A.

科目： 293008

知能類： K1.11 [2.7/2.8]

序號： B91

Select the statement that describes transition (partial film) boiling.

- A. A small increase in ΔT (at the heat transfer and coolant interface) causes increased steam blanketing and a reduction in heat flux.
- B. The temperature of the heat transfer surface is so high that thermal radiative heat transfer becomes significant and heat flux increases.
- C. As the ΔT increases, the increasing number of bubbles causes increased agitation and turbulence of the boundary layer consequently increasing heat flux.
- D. As the ΔT increases a few vapor bubbles are formed that may collapse when they enter into the bulk of the fluid.

ANSWER: A

下列何者為變態（部分薄膜）沸騰的描述？

- A. ΔT （在熱傳表面與冷卻水間）的少量增加，導致了蒸汽覆蓋增加，以及熱通量的減少
- B. 熱傳表面的溫度很高，以致於輻射熱傳(thermal radiative heat transfer)重要性增加，同時熱通量增加
- C. 當 ΔT 增加，增加的氣泡數導致邊界層之攪動(agitation)與擾動(turbulence)增加，因而增加熱通量
- D. 當 ΔT 增加，一些蒸汽泡生成，當進入到整體流體時可能會凝結消失(collapse)

答案： A.

科目： 293008

知能類： K1.11 [2.7/2.8]

序號： B787 (P792)

A reactor is operating at full power with a fuel coolant channel that is experiencing each of the following heat transfer mechanisms somewhere along the length of the coolant channel. Which one of the following causes the first reduction in the local cladding heat transfer coefficient as the coolant flows upward through the coolant channel?

- A. Partial film boiling
- B. Nucleate boiling
- C. Single-phase convection
- D. Stable film boiling

ANSWER: A

一反應爐在全功率下運轉，沿著一冷卻水通道可以觀察到下列每一種的熱傳機制正在不同位置發生。當冷卻水向上流過冷卻水通道時，下列何者導致了局部護套熱傳係數的首次下降？

- A. 部分薄膜沸騰(Partial film boiling)
- B. 核沸騰
- C. 單相對流
- D. 穩定薄膜沸騰(Stable film boiling)

答案： A.

科目： 293008

知能類： K1.11

序號： B1289

A reactor is operating at full power with a fuel coolant channel that is experiencing each of the following heat transfer mechanisms somewhere along the length of the coolant channel. Which of the following causes the first reduction in the local fuel clad heat transfer rate as the coolant flows upward through the coolant channel?

- A. Nucleate boiling
- B. Stable film boiling
- C. Partial film boiling
- D. Single-phase convection

ANSWER: C

一反應爐在全功率下運轉，沿著一冷卻水通道可以觀察到下列每一種的熱傳機制正在不同位置發生。當冷卻水向上流過冷卻水通道時，下列何者導致了局部護套熱傳係數的首次下降？

- A. 核沸騰
- B. 穩定薄膜沸騰(Stable film boiling)
- C. 部分薄膜沸騰(Partial film boiling)
- D. 單相對流

答案： C.

科目： 293008

知能類： K1.11 [2.7/2.8]

序號： B1885 (P588)

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

- A. A small increase in heat flux requires a large increase in fuel clad temperature because of increased fuel rod steam blanketing.
- B. The temperature of the fuel clad surface is so high that thermal radiation heat transfer becomes significant, which causes heat flux to rapidly increase.
- C. A small increase in heat flux increases the formation of steam bubbles causing increased turbulence in the liquid boundary layer, consequently decreasing clad temperature.
- D. As the heat flux increases, a few vapor bubbles are formed but collapse when they enter into the bulk of the fluid, which decreases clad temperature.

ANSWER: A

在燃料護套表面與冷卻水介面的變態(部分薄膜)沸騰中，下列何者描述其效應？

- A. 需要燃料護套溫度的大量增加，方能使熱通量的小幅度增加，因為增加了燃料棒蒸汽覆蓋
- B. 燃料護套表面溫度很高，因而輻射熱傳(thermal radiation heat transfer)重要性增加，而導致熱通量的快速增加
- C. 熱通量的小幅度增加，增加了汽泡的形成，導致了液體邊界層(boundary layer)的擾動增加，結果降低護套溫度
- D. 當熱通量增加時，一些汽泡形成，但是當其進入整體流體時會凝結消失(collapse)，因而降低護套溫度

答案： A.

科目： 293008

知能類： K1.11 [2.7/2.8]

序號： B1987 (P889)

If the fission rate in a reactor core steadily increases, the mode of heat transfer that occurs immediately after the critical heat flux is reached is called...

- A. transition boiling.
- B. subcooled nucleate boiling.
- C. saturated nucleate boiling.
- D. stable film boiling.

ANSWER: A

若一反應爐爐心之分裂率穩定增加，則在達到臨界熱通量時緊接發生的熱傳模式稱之為

- A. 變態沸騰
- B. 次冷核沸騰
- C. 飽和核沸騰
- D. 穩定薄膜沸騰(stable film boiling)

答案： A.

科目： 293008

知能類： K1.11 [2.7/2.8]

序號： B2185 (P2188)

Refer to the drawing of a pool boiling curve (see figure below). Which one of the following describes the conditions in a fuel channel that is experiencing region III heat transfer?

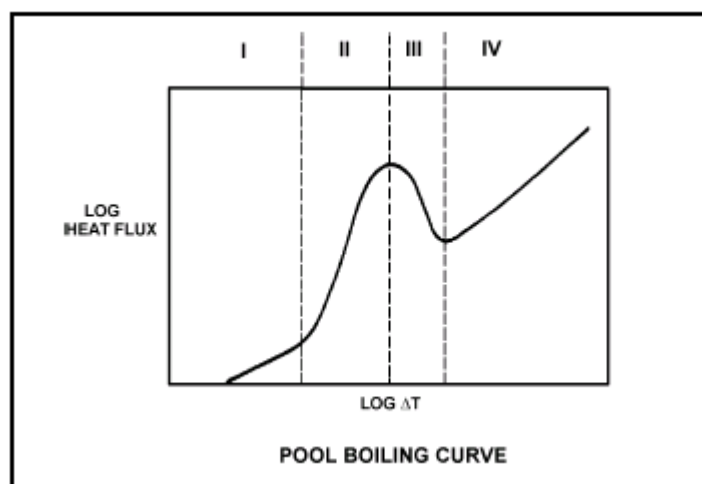
- A. Complete steam blanketing of the fuel rod surface
- B. Alternate wetting and drying of the fuel rod surface
- C. Saturated nucleate boiling
- D. Subcooled nucleate boiling

ANSWER: B

參考池式沸騰曲線圖示（見下圖）。下列何者描述了燃料匣內正處於區域III熱傳之現象？

- A. 蒸汽完全覆蓋燃料棒表面
- B. 燃料棒表面濕、乾交替
- C. 飽和核沸騰
- D. 次冷核沸騰

答案： B.



科目： 293008

知能類： K1.11 [2.7/2.8]

序號： B2688 (P2289)

Refer to the drawing of a pool boiling curve (see figure below). The point at which heat flux stops increasing and the critical heat flux has been reached (point B), marks the beginning of...

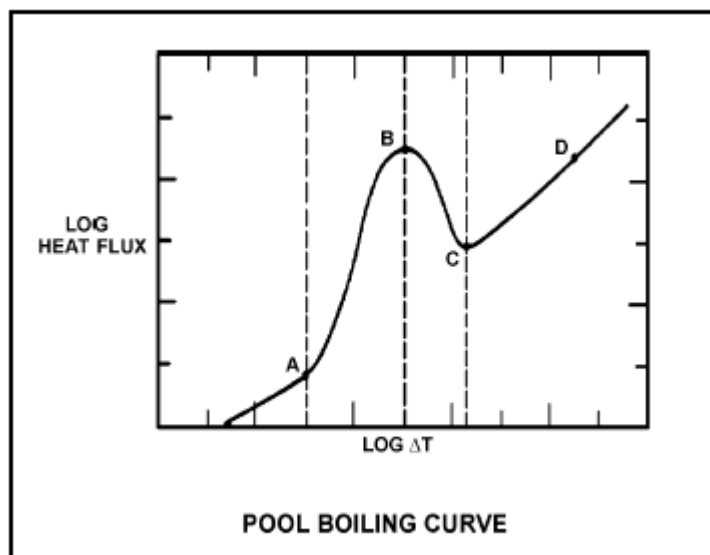
- A. nucleate boiling.
- B. stable film boiling.
- C. partial film boiling.
- D. single-phase convection.

ANSWER: C

參考池式沸騰曲線圖示（見下圖）。熱通量停止增加，同時臨界熱通量已經達到之點（點B），代表了何者的開始？

- A. 核沸騰
- B. 穩定薄膜沸騰(stable film boiling)
- C. 部分薄膜沸騰(partial film boiling)
- D. 單相對流

答案： C.



科目： 293008

知能類： K1.12 [2.7/2.8]

序號： B687 (P2189)

Which one of the following describes the relative contributions of the convective and radiative heat transfer mechanisms, and the relationship of ΔT ($T_{\text{wall}} - T_{\text{bulk}}$) to heat flux, during stable film boiling heat transfer in the core?

- A. Only the radiative heat transfer mechanism is significant and heat flux increases in direct proportion to ΔT squared.
- B. Both heat transfer mechanisms are significant and heat flux increases in direct proportion to ΔT squared.
- C. Only the radiative heat transfer mechanism is significant and a significant increase in heat flux requires a large ΔT increase.
- D. Both heat transfer mechanisms are significant and a significant increase in heat flux requires a large ΔT increase.

ANSWER: C

在爐心穩定薄膜沸騰(stable film boiling)熱傳中，下列何者描述了對流以及輻射熱傳(thermal radiation heat transfer)機制的相對貢獻，以及 $\Delta T(T_{\text{wall}} - T_{\text{bulk}})$ 對熱通量的關係？

- A. 只有輻射熱傳機制顯著，而熱通量正比於 ΔT 的平方而增加
- B. 兩種熱傳機制均顯著，而熱通量正比於 ΔT 的平方而增加
- C. 只有輻射熱傳機制顯著，而熱通量需要 ΔT 的大量增加，方能產生顯著增加
- D. 兩種熱傳機制均顯著，而熱通量需要 ΔT 的大量增加，方能產生顯著增加

答案： C.

科目： 293008

知能類： K1.12 [2.7/2.8]

序號： B2588 (P2588)

Refer to the drawing of a pool boiling curve (see figure below). Which one of the following describes the conditions in a fuel channel that is experiencing region IV heat transfer?

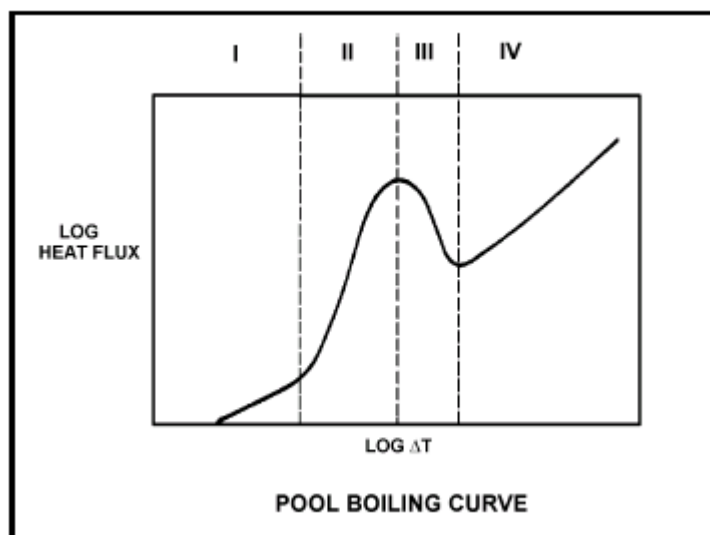
- A. Complete steam blanketing of the fuel rod surface
- B. Alternate wetting and drying of the fuel rod surface
- C. Saturated nucleate boiling
- D. Subcooled nucleate boiling

ANSWER: A

參考池式沸騰曲線圖示（見下圖）。下列何者描述了燃料匣內正處於區域IV熱傳之現象？

- A. 蒸汽完全覆蓋燃料棒表面
- B. 燃料棒表面濕、乾交替
- C. 飽和核沸騰
- D. 次冷核沸騰

答案： A.



科目： 293008

知能類： K1.12 [2.7/2.8]

序號： B3485 (P3488)

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

ANSWER: D

在冷卻水流失事故中，反應爐燃料可能經歷穩定薄膜沸騰(stable film boiling)。當穩定薄膜沸騰開始時，燃料護套之熱傳中，何種形式之熱傳將會顯著增加？

- A. 強制對流
- B. 自然對流
- C. 傳導
- D. 輻射

答案： D.

科目： 293008

知能類： K1.17 [2.5/2.8]

序號： B788 (P789)

Following a reactor accident, transition boiling is occurring near the top of one fuel assembly coolant channel. At the coolant channel elevation where the onset of transition boiling is occurring, coolant flow is changing from _____ flow to _____ flow.

- A. annular; slug
- B. annular; vapor
- C. bubbly; slug
- D. bubbly; vapor

ANSWER: B

在反應爐發生事故後，變態沸騰在一燃料元件冷卻水通道的頂部附近發生。在變態沸騰發生處的冷卻水通道，其冷卻水流動從_____改變為_____。

- A. 環形流(annular), 團狀流(slug)
- B. 環形流, 蒸汽流(vapor)
- C. 氣泡流(bubbly), 團狀流
- D. 氣泡流, 蒸汽流

答案： B.

科目： 293008

知能類： K1.17 [2.5/2.8]

序號： B1588

A reactor is operating at steady state 90% power. Which one of the following will cause the twophase coolant flowing upward in a fuel channel to become closer to the onset of transition boiling? (Assume reactor power does not change unless stated.)

- A. Reactor pressure increases.
- B. Recirculation flow increases.
- C. Feedwater temperature decreases.
- D. Associated bundle power decreases.

ANSWER: A

一反應爐在90%功率下穩態運轉。下列何者將會導致在燃料匣中向上流動的雙相冷卻水更加接近變態沸騰的開始點？

- A. 反應爐壓力增加
- B. 再循環流量增加
- C. 飼水溫度降低
- D. 相關燃料束功率降低

答案： A.

科目： 293008

知能類： K1.17 [2.5/2.8]

序號： B1891

A reactor is operating at steady state 90% power. Which one of the following will cause the twophase coolant flowing upward in a fuel channel to become closer to the onset of transition boiling? (Assume reactor power does not change unless stated.)

- A. Recirculation flow decreases.
- B. Reactor pressure decreases.
- C. Feedwater temperature decreases.
- D. Associated bundle power decreases.

ANSWER: A

一反應爐在90%功率下穩態運轉。下列何者將會導致在燃料匣中向上流動的雙相冷卻水更加接近變態沸騰的開始點？(假設反應爐功率沒有變化。)

- A. 再循環流量降低
- B. 反應爐壓力降低
- C. 飼水溫度降低
- D. 相關燃料束功率降低

答案： A.

科目： 293008

知能類： K1.17 [2.5/2.8]

序號： B2089

A reactor is operating at steady state 70% power. Which one of the following will cause the twophase coolant flowing upward in a fuel channel to become farther from the onset of transition boiling? (Assume reactor power does not change unless stated.)

- A. Recirculation flow rate increases.
- B. Reactor pressure increases.
- C. Feedwater temperature increases.
- D. Associated bundle power increases.

ANSWER: C

一反應爐在70%功率下穩態運轉。下列何者將會導致在燃料匣中向上流動的雙相冷卻水更加遠離變態沸騰的開始點？(假設反應爐功率沒有變化。)

- A. 再循環流量增加
- B. 反應爐壓力增加
- C. 飼水溫度增加
- D. 相關燃料束功率增加

答案： A.

科目： 293008

知能類： K1.17 [2.5/2.8]

序號： B2589

A reactor is operating at steady state 90% power. Which one of the following will cause the twophase coolant flowing upward in a fuel channel to become farther from the onset of transition boiling? (Assume reactor power does not change unless stated.)

- A. Recirculation flow decreases.
- B. Reactor pressure increases.
- C. Feedwater temperature decreases.
- D. Associated bundle power increases.

ANSWER: C

一反應爐在90%功率下穩態運轉。下列何者將會導致在燃料匣中向上流動的雙相冷卻水更加遠離變態沸騰的開始點？(假設反應爐功率沒有變化。)

- A. 再循環流量降低
- B. 反應爐壓力增加
- C. 飼水溫度降低
- D. 相關燃料束功率增加

答案： C.

科目： 293008

知能類： K1.17 [2.5/2.8]

序號： B2789 (N/A)

A reactor is operating at steady-state 90% power. Which one of the following will cause the twophase coolant flowing upward in a fuel bundle to become closer to the onset of transition boiling? (Assume reactor power does not change unless stated.)

- A. Recirculation flow increases.
- B. Reactor pressure decreases.
- C. Feed water temperature increases.
- D. Associated bundle power decreases.

ANSWER: C

一反應爐在90%功率下穩態運轉。下列何者將會導致在燃料束中向上流動的雙相冷卻水更加接近變態沸騰的開始點？(假設反應爐功率沒有變化。)

- A. 再循環流量增加
- B. 反應爐壓力降低
- C. 飼水溫度增加
- D. 相關燃料束功率降低

答案： C.

科目： 293008

知能類： K1.17 [2.5/2.8]

序號： B2888

A reactor is operating at steady state 90% power. Which one of the following will cause the twophase coolant flowing upward in a fuel channel to become closer to the onset of transition boiling? (Assume reactor power does not change unless stated.)

- A. Recirculation flow is slowly increased.
- B. Feed water temperature slowly increases.
- C. Reactor operating pressure is slowly decreased.
- D. Associated bundle power slowly decreases.

ANSWER: B

一反應爐在90%功率下穩態運轉。下列何者將會導致在燃料匣中向上流動的雙相冷卻水更加遠離變態沸騰的開始點？(假設反應爐功率沒有變化。)

- A. 再循環流量緩慢增加
- B. 飼水溫度緩慢增加
- C. 反應爐壓力緩慢降低
- D. 相關燃料束功率緩慢降低

答案： B.

科目： 293008

知能類： K1.19 [2.6/2.8]

序號： B789

Core inlet subcooling is defined as the difference between the temperature of the fluid _____ and the saturation temperature of the fluid in the core inlet plenum.

- A. in the core inlet plenum
- B. at the feedwater pump discharge
- C. in the downcomer area
- D. in the lower fuel channel area

ANSWER: A

爐心進口次冷度定義為：_____液體溫度與在爐心進口區處液體飽和溫度之差值。

- A. 爐心進口區
- B. 飼水泵出口
- C. 降流區之
- D. 燃料匣較低區域之

答案： A.

科目： 293008

知能類： K1.20 [2.4/2.6]

序號： B790

Carry-under is most damaging to which of the following components?

- A. Recirculation pumps
- B. Moisture separator (turbine)
- C. Main turbine
- D. Moisture separator (reactor vessel)

ANSWER: A

蒸汽潛挾(Carry-under)對於下列何種組件損害最大？

- A. 再循環泵
- B. 汽水分離器（汽機）
- C. 主汽機
- D. 汽水分離器（反應爐槽）

答案： A.

科目： 293008

知能類： K1.20 [2.4/2.6]

序號： B989

Which one of the following will directly reduce core inlet subcooling?

- A. Raise reactor vessel downcomer level until carryover occurs
- B. Lower reactor vessel downcomer level until carryunder occurs
- C. Increase core recirculation flow
- D. Isolate steam to one feed-water heater

ANSWER: B

下列何者會直接降低爐心進口次冷度？

- A. 提高反應爐槽降流區水位直到水份騰帶(carryover)發生
- B. 降低反應爐槽降流區水位直到蒸汽潛挾(carryunder)發生
- C. 增加爐心再循環流量
- D. 隔離至一飼水加熱器的蒸汽

答案： B.

科目： 293008

知能類： K1.21 [3.0/3.0]

序號： B290

Void fraction is the ratio of the _____ of steam to the _____ of steam/water mixture at a given elevation in the fuel channel.

- A. volume; mass
- B. mass; mass
- C. volume; volume
- D. mass; volume

ANSWER: C

空泡比(Void fraction)是燃料匣中某個高度下蒸汽的_____對蒸汽/水混合物之_____的比值。

- A. 體積；質量
- B. 質量；質量
- C. 體積；體積
- D. 質量；體積

答案： C.

科目： 293008

知能類： K1.21 [3.0/3.0]

序號： B1487

Given the following conditions:

10 lbm mixture of vapor and liquid

Steam quality = 20%

Pressure = 1,000 psia

Which one of the following approximates the void fraction?

A. 42%

B. 48%

C. 84%

D. 96%

ANSWER: C

根據以下條件：

10 lbm的蒸汽與液體混合物，

蒸汽乾度=20%

壓力=1000psia

則空泡比(Void fraction)約為下列何者？

A. 42%

B. 48%

C. 84%

D. 96%

答案： C.

科目： 293008

知能類： K1.21 [3.0/3.0]

序號： B1689

Given the following conditions:

10 lbm mixture of vapor and liquid

Steam quality = 30%

Pressure = 1,000 psia

Which one of the following approximates the void fraction?

A. 10.1%

B. 11.3%

C. 88.7%

D. 89.9%

ANSWER: D

根據以下條件：

10 lbm的蒸汽與液體混合物，

蒸汽乾度=30%

壓力=1000psia

則空泡比(Void fraction)約為下列何者？

A. 10.1%

B. 11.3%

C. 88.7%

D. 89.9%

答案： D.

科目： 293008

知能類： K1.21 [3.0/3.0]

序號： B2389

Given the following conditions:

10 lbm mixture of vapor and liquid

Steam quality = 40%

Pressure = 1,000 psia

Which one of the following approximates the void fraction?

A. 93.2%

B. 89.9%

C. 10.1%

D. 6.8%

ANSWER: A

根據以下條件：

10 lbm的蒸汽與液體混合物，

蒸汽乾度=40%

壓力=1000psia

則空泡比(Void fraction)約為下列何者？

A. 93.2%

B. 89.9%

C. 10.1%

D. 6.8%

答案： A.

科目： 293008

知能類： K1.21 [3.0/3.0]

序號： B2690

Which one of the following ratios can be used to calculate the core void fraction?

- A. $\frac{\text{Steam Volume}}{\text{Water Volume}}$
- B. $\frac{\text{Steam Volume}}{\text{Steam Volume} + \text{Water Volume}}$
- C. $\frac{\text{Steam Volume} + \text{Water Volume}}{\text{Steam Volume} - \text{Water Volume}}$
- D. $\frac{\text{Steam Volume} + \text{Water Volume}}{\text{Steam Volume} \times \text{Water Volume}}$

ANSWER: B

下列何比值可以用以計算爐心空泡比(Void fraction)？

- A. 蒸汽體積/水體積
- B. 蒸汽體積 / (蒸汽體積 + 水體積)
- C. (蒸汽體積 + 水體積) / (蒸汽體積 - 水體積)
- D. (蒸汽體積 + 水體積) / (蒸汽體積 x 水體積)

答案： B.

科目： 293008

知能類： K1.22 [2.9/3.0]

序號： B587

A reactor is operating at 100% power. Recirculation flow is decreased from 100% to 80%. Which one of the following statements describes the initial response of the boiling boundary within the core?

- A. It physically moves up the fuel rods, because fewer Btus per pound mass of water are now being transferred.
- B. It physically moves up the fuel rods, because more Btus per pound mass of water are now being transferred.
- C. It physically moves down the fuel rods, because more Btus per pound mass of water are now being transferred.
- D. It physically moves down the fuel rods, because fewer Btus per pound mass of water are now being transferred.

ANSWER: C

一反應爐在100%功率下運轉。再循環流量從100%降至80%。下列何者描述了爐心內沸騰邊界最初的反應？

- A. 會沿著燃料棒向上移動，因目前傳遞至每磅質量的水的BTU較少
- B. 會沿著燃料棒向上移動，因目前傳遞至每磅質量的水的BTU較多
- C. 會沿著燃料棒向下移動，因目前傳遞至每磅質量的水的BTU較多
- D. 會沿著燃料棒向下移動，因目前傳遞至每磅質量的水的BTU較少

答案： C.

科目： 293008

知能類： K1.22 [2.9/3.0]

序號： B2091

A reactor is operating at 70% power. Recirculation flow rate is increased by 5%. Which one of the following statements describes the initial response of the boiling boundary within the core?

- A. It physically moves upward, because fewer Btus per pound mass of water are now being transferred.
- B. It physically moves upward, because more Btus per pound mass of water are now being transferred.
- C. It physically moves downward, because more Btus per pound mass of water are now being transferred.
- D. It physically moves downward, because fewer Btus per pound mass of water are now being transferred.

ANSWER: A

一反應爐在70%功率下運轉。再循環流量增加5%。下列何者描述了爐心內沸騰邊界最初的反應？

- A. 會沿著燃料棒向上移動，因目前傳遞至每磅質量的水的BTU量較少
- B. 會沿著燃料棒向上移動，因目前傳遞至每磅質量的水的BTU量較多
- C. 會沿著燃料棒向下移動，因目前傳遞至每磅質量的水的BTU量較多
- D. 會沿著燃料棒向下移動，因目前傳遞至每磅質量的水的BTU量較少

答案： A.

科目： 293008

知能類： K1.23 [2.5/2.7]

序號： B688

Which one of the following is the quality of the steam leaving a cyclone separator at 985 psig and 1171 Btu/lb? (Answer should be rounded to the nearest whole number.)

A. 95%

B. 96%

C. 97%

D. 98%

ANSWER: C

蒸汽於985 psig與1171 Btu/lb下離開旋風(cyclone)分離器，其乾度為何？(答案四捨五入至整數)

A. 95%

B. 96%

C. 97%

D. 98%

答案： C.

科目： 293008

知能類： K1.23 [2.5/2.7]

序號： B1387

Which one of the following values represents the quality of the saturated steam/water mixture leaving a cyclone separator at 985 psig and 1177 Btu/lbm? (Answer should be rounded to the nearest whole number.)

A. 96%

B. 97%

C. 98%

D. 99%

ANSWER: C

蒸汽於985 psig與1177 Btu/lb下離開旋風(cyclone)分離器，其乾度為何？(答案四捨五入至整數)

A. 96%

B. 97%

C. 98%

D. 99%

答案： C.

科目： 293008

知能類： K1.23 [2.5/2.7]

序號： B1788

Which one of the following values approximates the quality of the saturated steam/water mixture leaving the core at 948 psig and 905 Btu/lbm?

A. 27%

B. 44%

C. 56%

D. 73%

ANSWER: C

蒸汽於948 psig與905 Btu/lb下離開爐心的飽和蒸汽/水混合物，其乾度為何？(答案四捨五入至整數)

A. 27%

B. 44%

C. 56%

D. 73%

答案： C.

科目： 293008

知能類： K1.24 [2.4/2.5]

序號： B391

Consider the temperature profile from the centerline of a fuel pellet to the centerline of the flow channel under 100% power conditions and single-phase cooling. Which one of the following portions of the temperature profile will have the greatest temperature difference across it at the beginning of a fuel cycle?

- A. Flow channel boundary layer
- B. Cladding corrosion film
- C. Zircaloy cladding
- D. Pellet-to-clad gap

ANSWER: D

在100%功率與單相冷卻下，考慮從燃料丸中線到冷卻水流道中線之溫度分佈。在燃料週期開始時，此溫度分佈的那一部份將會有最大的溫差？

- A. 流道邊界層
- B. 護套腐蝕膜
- C. 鈹合金護套
- D. 燃料丸至護套間隙

答案： D.

科目： 293008

知能類： K1.24 [2.4/2.5]

序號： B1989 (P391)

Refer to the drawing of a fuel rod and coolant flow channel at the beginning of a fuel cycle (see figure below). At 100% reactor power, the greatest temperature difference in a fuel channel radial temperature profile will occur across the: (Assume the temperature profile begins at the fuel centerline.)

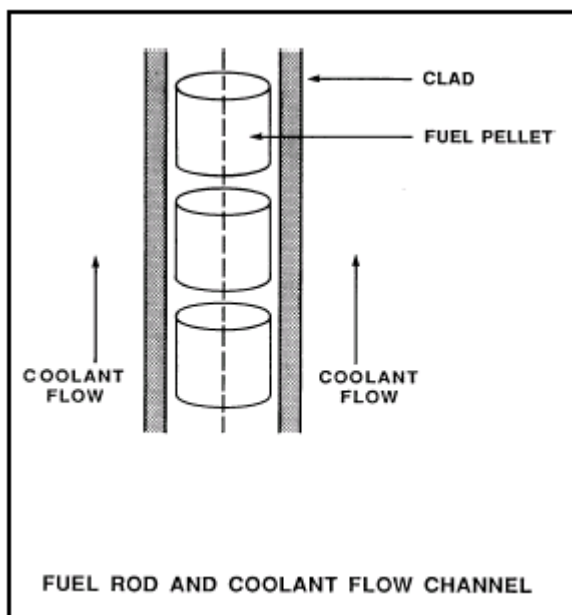
- A. fuel pellet centerline to pellet surface.
- B. fuel-to-clad gap.
- C. zircaloy cladding.
- D. flow channel boundary (laminar) layer.

ANSWER: A

參考於燃料週期開始時，燃料棒與冷卻水流道之圖示（見下圖）。在100%反應爐功率下，燃料通道徑向溫度分佈中最大的溫差將會發生在：（假設溫度分佈始於燃料中線。）

- A. 燃料丸中線至燃料丸表面
- B. 燃料至護套之間隙
- C. 鈹合金護套
- D. 流道邊界（層流, laminar）層

答案： A.



科目： 293008

知能類： K1.25 [3.2/3.2]

序號： B292

A reactor is at 100% power when a trip of the recirculation pumps occurs. Void fraction percentage will...

- A. stay the same due to minimal changes in reactor pressure.
- B. decrease because the reactor power decrease reduces the steam bubbles being generated.
- C. increase because steam bubbles are no longer being swept away.
- D. decrease initially due to reactor pressure increase, then return to initial value.

ANSWER: C

一反應爐在100%功率運轉，此時發生再循環泵跳脫。空泡比(Void fraction)將會

- A. 維持不變，因為反應爐壓力變化最小
- B. 降低，因為反應爐功率降低減少了汽泡的生成
- C. 增加，因為汽泡不再被掃除
- D. 最初減小，因為反應爐壓力增加，其後增加至原值

答案： C.

科目： 293008

知能類： K1.25 [3.2/3.2]

序號： B1189

Forced circulation through a reactor core is required at all times during power operation to prevent...

- A. the core from becoming prompt critical due to high fuel and coolant temperatures.
- B. exceeding reactor vessel and core design steaming rates.
- C. high fuel clad surface temperatures that would result in a crack or leak in the clad.
- D. jet pump cavitation which would reduce the power generated by the core.

ANSWER: C

在功率運轉中，流過反應爐爐心的強制循環一直有其必要性，為的是預防

- A. 爐心因為燃料與冷卻水的高溫而成為瞬發臨界
- B. 超過反應爐槽與爐心的設計蒸汽流量
- C. 燃料護套表面溫度高而導致護套的破裂或洩漏
- D. 噴射泵孔蝕作用，此將降低爐心所產生的功率

答案： C.

科目： 293008

知能類： K1.25 [3.2/3.2]

序號： B3789 (P3780)

Which one of the following describes the relationship between the feedwater mass flow rate entering the reactor vessel and the core mass flow rate at steady-state 100% reactor power?

- A. The mass flow rates are about the same as long as the reactor vessel downcomer level is constant.
- B. The mass flow rates are about the same as long as the reactor recirculation mass flow rate is constant.
- C. The feedwater mass flow rate is much smaller than the core mass flow rate because most of the core mass flow is returned to the reactor vessel downcomer by the steam separators.
- D. The feedwater mass flow rate is much larger than the core mass flow rate because the feedwater pump differential pressure is much larger than the core differential pressure.

ANSWER: C

下列何者描述了進入反應爐槽之飼水流量與在100%功率穩態運轉的爐心流量間的關係？

- A. 只要反應爐槽降流區水位固定，則流量會大約相等
- B. 只要反應爐再循環流量固定，則流量會大約相等
- C. 飼水流量遠小於爐心流量，因為大部分的爐心流量會經汽水分離器而回到反應爐槽降流區
- D. 飼水流量遠大於爐心流量，因為飼水泵差壓遠大於爐心差壓

答案： C.

科目： 293008

知能類： K1.26 [2.9/3.1]

序號： B137

Which one of the following statements describes the principle of jet pump operation?

- A. High-velocity jet flow draws downcomer fluid into the jet pump throat as a result of friction between the driving flow and the driven flow.
- B. Low static pressure created by the increasing area in the diffuser draws downcomer fluid into the jet pump throat.
- C. The high driving-to-driven flow ratio creates a low static pressure in the diffuser, which draws downcomer fluid into the jet pump throat.
- D. Low static pressure created by the high-velocity jet draws downcomer fluid into the jet pump throat.

ANSWER: D

下列何者描述了噴射泵運轉的原理？

- A. 高速噴射水流會將降流區的流體抽入噴射泵喉部，此乃驅動水流與被驅動水流間的摩擦力所致
- B. 因擴散管面積增加所產生的低靜壓(low static pressure)，將降流區的流體帶入噴射泵喉部
- C. 驅動—被驅動流量比例高，在擴散管中產生低靜壓，藉此將降流區流體帶入噴射泵喉部
- D. 由高速噴射所產生的低靜壓將降流區的流體抽入噴射泵喉部

答案： D.

科目： 293008

知能類： K1.26 [2.9/3.1]

序號： B1389

Refer to the drawing of a core recirculation jet pump (see figure below).

The highest pressure will exist at point _____, and the highest velocity will occur at point _____.

A. 1; 4

B. 2; 4

C. 1; 3

D. 2; 3

ANSWER: C

參考一爐心再循環噴射泵圖示（見下圖）。最高壓力將存在於點_____，最高速度將發生在點_____。

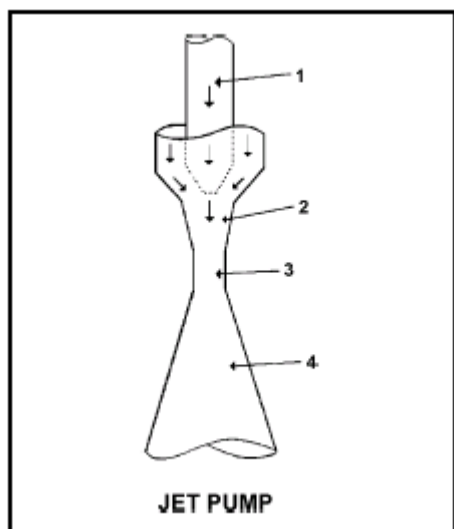
A. 1; 4

B. 2; 4

C. 1; 3

D. 2; 3

答案： C.



科目： 293008

知能類： K1.26 [2.9/3.1]

序號： B2791

Refer to the drawing of a core recirculation jet pump (see figure below).

The lowest pressure will exist at point _____, and the highest velocity will occur at point _____.

A. 3; 3

B. 3; 4

C. 4; 3

D. 4; 4

ANSWER: A

參考一爐心再循環噴射泵圖示（見下圖）。最低壓力將存在於點_____，最高速度將發生在點_____。

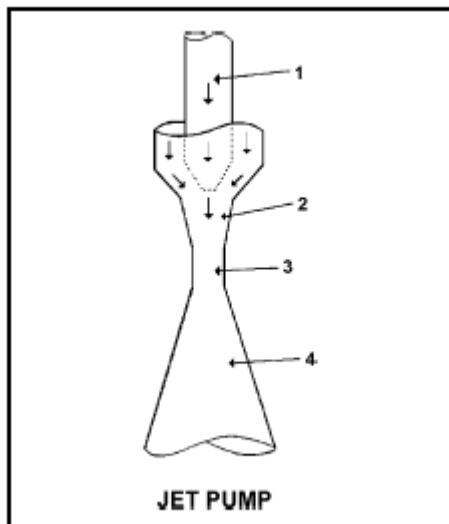
A. 3; 3

B. 3; 4

C. 4; 3

D. 4; 4

答案： A.



科目： 293008

知能類： K1.28 [2.3/2.5]

序號： B490

A reactor is operating at 100% power. Recirculation flow is decreased from 100% to 80%. During the flow reduction, the boiling boundary will move _____ in the core because each pound-mass (lbm) of water flowing through the core is required to remove _____ heat from the fuel rods.

- A. upward; less
- B. upward; more
- C. downward; less
- D. downward; more

ANSWER: D

一反應爐在100%功率下運轉。再循環流量從100%降至80%。在流量減小過程中，沸騰邊界將會在爐心中向____移動，因為每一磅質量(lbm)通過爐心的水流需要從燃料棒移除較____的熱。

- A. 上；少
- B. 上；多
- C. 下；少
- D. 下；多

答案： D.

科目： 293008

知能類： K1.28 [2.3/2.5]

序號： B1789 (P1790)

Single-phase coolant flow resistance (head loss) in a reactor core is directly proportional to the square of coolant _____ and inversely proportional to _____.

- A. velocity; fuel assembly length
- B. temperature; fuel assembly length
- C. velocity; coolant channel cross-sectional area
- D. temperature; coolant channel cross-sectional area

ANSWER: C

反應爐爐心中之單相冷卻水流動阻力（水頭損失）直接正比於冷卻水_____的平方，同時反比於_____。

- A. 速度；燃料元件長度
- B. 溫度；燃料元件長度
- C. 速度；冷卻水通道截面積
- D. 溫度；冷卻水通道截面積

答案： C.

科目： 293008

知能類： K1.29 [2.8/3.0]

序號： B93

Which one of the following statements describes the effect of an increase in bundle power on bundle flow in a centrally located fuel bundle? (Assume total recirculation flow remains constant.)

- A. Bundle flow increases because the increased boiling causes average coolant density to decrease, thereby reducing flow resistance.
- B. Bundle flow decreases because the increased boiling increases backpressure due to increased reactor steam dome pressure, thereby increasing flow resistance.
- C. Bundle flow increases because the increased boiling causes acceleration of coolant due to rapid expansion, thereby reducing flow resistance.
- D. Bundle flow decreases because the increased boiling increases backpressure due to increased turbulence, thereby increasing flow resistance.

ANSWER: D

對於位在中心區之燃料束，下列何者描述燃料束功率增加對於燃料束流量的影響？（假設總再循環率流量維持固定。）

- A. 燃料束流量增加，因為沸騰增加，導致平均冷卻水密度減小，因而降低流體阻力
- B. 燃料束流量減小，因為沸騰增加，導致背壓因反應爐頂蒸汽壓力增加而增加，因而增加流體阻力
- C. 燃料束流量增加，因為沸騰增加，導致冷卻水因為快速擴張而加速，因而降低流體阻力
- D. 燃料束流量減小，因為沸騰增加，導致背壓因擾動(turbulence)增加而增加，因而增加流體阻力

答案： D.

科目： 293008

知能類： K1.29 [2.8/3.0]

序號： B2090

Reactors A and B are identical. Reactor A is operating at 75% power and reactor B is operating at 50% power with neutron flux radially and axially peaked in the center of each core. Recirculation mass flow rate through each core is the same.

Compared to the center fuel bundle in reactor A, the center fuel bundle in reactor B has the _____ critical power and the _____ coolant flow rate.

- A. lower; lower
- B. lower; higher
- C. higher; lower
- D. higher; higher

ANSWER: D

反應爐A與B完全相同。反應爐A在75%功率下運轉，而反應爐B在50%功率下運轉，其中子通量軸向與徑向峰值發生在兩爐心的中心，通過兩爐心之再循環流量相同。與反應爐A之中央燃料束相比，反應爐B之中央燃料束有_____的臨界功率，與_____之冷卻水流量。

- A. 較低；較低
- B. 較低；較高
- C. 較高；較低
- D. 較高；較高

答案： D.

科目： 293008

知能類： K1.29 [2.8/3.0]

序號： B2390

Reactors A and B are identical. Reactor A is operating at 50% power and reactor B is operating at 75% power. Neutron flux is radially and axially peaked in the center of each core. Recirculation mass flow rate through each core is the same.

Compared to the center fuel bundle in reactor A, the center fuel bundle in reactor B has the _____ critical power and the _____ coolant flow rate.

- A. lower; lower
- B. lower; higher
- C. higher; lower
- D. higher; higher

ANSWER: A

反應爐A與B完全相同。反應爐A在50%功率下運轉，而反應爐B在75%功率下運轉，其中子通量軸向與徑向峰值發生在兩爐心的中心，通過兩爐心之再循環水流量相同。與反應爐A之中央燃料束相比，反應爐B之中央燃料束有_____的臨界功率，與_____之冷卻水流量。

- A. 較低；較低
- B. 較低；較高
- C. 較高；較低
- D. 較高；較高

答案： A.

科目： 293008

知能類： K1.30 [2.7/2.7]

序號： B590

Without core orificing, the coolant flow through a high-power bundle will be less than the flow through a low-power bundle because the...

A. two-phase flow-friction multiplier will be greater in the low-power bundle.

B. channel quality will be greater in the high-power bundle.

C. bypass flow will be greater in the high-power bundle.

D. thermal expansion of the fuel rods will be greater in the high-power bundle.

ANSWER: B

在沒有爐心限流孔情況下，通過高功率燃料束的冷卻水流量較通過低功率燃料束的流量為少，因為

A. 在低功率燃料束中，雙相流之摩擦倍增因子(flow-friction multiplier)較大

B. 在高功率燃料束中，流道蒸汽乾度較大

C. 在高功率燃料束中，旁通流量較大

D. 在高功率燃料束中，燃料棒之熱膨脹較大

答案： B.

科目： 293008

知能類： K1.30 [2.7/2.7]

序號： B890

With the reactor operating at rated power, if core orificing was not used, the highest core flow rates would exist in...

- A. low-power bundles because of decreased flow resistance.
- B. low-power bundles because of reduced control rod obstruction.
- C. high-power bundles because of decreased flow resistance.
- D. high-power bundles because of reduced control rod obstruction.

ANSWER: A

反應爐在額定功率下運轉，若爐心限流孔並未使用，則最高的爐心流量將會存在於

- A. 低功率燃料束，因為流動阻力降低
- B. 低功率燃料束，因為控制棒運動障礙(obstruction)減小
- C. 高功率燃料束，因為流動阻力降低
- D. 高功率燃料束，因為控制棒運動障礙減小

答案： A.

科目： 293008

知能類： K1.30 [2.7/2.7]

序號： B990

Reactors A and B are operating at 100% power with neutron flux radially peaked in the center of each core. The reactors are identical except that reactor A has core orificing and reactor B does not. Compared to the center fuel bundle in reactor B, the center fuel bundle in reactor A will have the _____ critical power and the _____ coolant flow rate.

- A. lowest; lowest
- B. lowest; highest
- C. highest; lowest
- D. highest; highest

ANSWER: D

反應爐A與B均運轉在100%功率下，中子通量徑向峰值發生在兩爐心的中央。兩反應爐完全相同，除了反應爐A具有爐心限流孔，反應爐B則無。與反應爐B的中央燃料束相比，反應爐A的中央燃料束有_____的臨界功率與_____的冷卻水流量。

- A. 較低；較低
- B. 較低；較高
- C. 較高；較低
- D. 較高；較高

答案： D.

科目： 293008

知能類： K1.30 [2.7/2.7]

序號： B1190

A reactor is operating at the point of adding heat during a reactor heatup. With only single-phase flow in the reactor, core orificing causes core flow to be...

- A. highest in the periphery bundles.
- B. highest in the central bundles.
- C. the same for all bundles.
- D. unpredictable.

ANSWER: B

一反應爐正運轉於加熱點(point of adding heat)。在反應爐中只有單相流，爐心限流孔會導致爐心流量

- A. 在周邊燃料束最高
- B. 在中央燃料束最高
- C. 在所有燃料束中均相同
- D. 無法預測

答案： B.

科目： 293008

知能類： K1.30 [2.7/2.7]

序號： B1590

Two reactors have the same rated power level and are currently operating at 50% power with the same power distribution in each core. The reactors are identical except that one reactor has core orifices and the other core does not. Each reactor has the same core mass flow rate. The orificed core will have the _____ critical power and the _____ core differential pressure.

- A. higher; higher
- B. higher; lower
- C. lower; higher
- D. lower; lower

ANSWER: A

兩反應爐有相同之額定功率，目前在50%功率下運轉，兩爐心的功率分佈相同。兩反應爐完全相同，除了一反應爐具有爐心限流孔，另一反應爐則無。兩反應爐具有相同之爐心流量。有限流孔的爐心將會有_____的臨界功率與_____的爐心差壓。

- A. 較高；較高
- B. 較高；較低
- C. 較低；較高
- D. 較低；較低

答案： A.

科目： 293008

知能類： K1.30 [2.7/2.7]

序號： B1691

A reactor is operating at rated power at the beginning of core life. If core orificing is not used, the lowest bundle flow rate will exist in...

- A. peripheral bundles that have control rods partially inserted.
- B. central bundles that have control rods partially inserted.
- C. peripheral bundles that have control rods completely withdrawn.
- D. central bundles that have control rods completely withdrawn.

ANSWER: D

一爐心壽命初期的反應爐運轉於額定功率下。若爐心限流孔並未使用，則最低的燃料束流量將存在於

- A. 有控制棒部分插入的周邊燃料束
- B. 有控制棒部分插入的中央燃料束
- C. 有控制棒完全抽出的周邊燃料束
- D. 有控制棒完全抽出的中央燃料束

答案： D.

科目： 293008

知能類： K1.30 [2.7/2.7]

序號： B1790

Two reactors, A and B, are operating at the same rated power with neutron flux radially peaked in the center of each core. Reactors A and B are identical except that reactor A has core orificing and reactor B does not. Both reactors have the same control rod pattern and density. Compared to the center fuel bundle in reactor A, the center fuel bundle in reactor B will have the _____ critical power and the _____ coolant flow rate.

- A. lowest; lowest
- B. lowest; highest
- C. highest; lowest
- D. highest; highest

ANSWER: A

兩反應爐A與B在相同的額定功率下運轉，且中子通量徑向峰值都發生在兩爐心的中心。反應爐A與B完全相同，除了反應爐A具有爐心限流孔，反應爐B則無。兩反應爐具有相同之控制棒佈局與密度。與反應爐A之中央燃料束相比，反應爐B之中央燃料束有_____的臨界功率，與_____之冷卻水流量。

- A. 最低；最低
- B. 最低；最高
- C. 最高；最低
- D. 最高；最高

答案： A.

科目： 293008

知能類： K1.30 [2.7/2.7]

序號： B2187

Reactor A and reactor B are currently operating at 50% power with a normal neutron flux distribution in each core. The reactors are identical except that reactor A has core orifices and reactor B does not. Each reactor has the same core mass flow rate.

Reactor B will have the _____ critical power and the _____ core differential pressure.

- A. higher; higher
- B. higher; lower
- C. lower; higher
- D. lower; lower

ANSWER: D

反應爐A與B目前在50%功率下運轉，兩爐心具有正常中子通量分佈。兩反應爐完全相同，除了反應爐A具有爐心限流孔，反應爐B則無。兩反應爐具有相同之爐心流量。反應爐B將會有_____的臨界功率與_____的爐心差壓。

- A. 較高；較高
- B. 較高；較低
- C. 較低；較高
- D. 較低；較低

答案： D.

科目： 293008

知能類： K1.30 [2.7/2.7]

序號： B2591

Two reactors, A and B, are operating at rated power with neutron flux radially peaked in the center of each core. Reactors A and B are identical except that reactor A has core orificing and reactor B does not. Both reactors have the same control rod pattern and density. Compared to the outer fuel bundles in reactor B, the outer fuel bundles in reactor A will have the _____ critical power and the _____ coolant flow rate.

- A. lowest; lowest
- B. lowest; highest
- C. highest; lowest
- D. highest; highest

ANSWER: A

兩反應爐A與B都在額定功率下運轉，且中子通量徑向峰值都發生在兩爐心的中心。反應爐A與B完全相同，除了反應爐A具有爐心限流孔，反應爐B則無。兩反應爐具有相同之控制棒佈局與密度。與反應爐B之外圍燃料束相比，反應爐A之外圍燃料束有_____的臨界功率，與_____之冷卻水流量。

- A. 最低；最低
- B. 最低；最高
- C. 最高；最低
- D. 最高；最高

答案： A.

科目： 293008

知能類： K1.30 [2.7/2.7]

序號： B2890

Two reactors, A and B, are operating at rated power with neutron flux radially peaked in the center of each core. The reactors are identical except that reactor A has core orificing and reactor B does not. Both reactors have the same control rod pattern and density. Compared to the center fuel bundle in reactor A, the center fuel bundle in reactor B will have the _____ exit steam quality and the _____ critical power.

- A. lower; lower
- B. lower; higher
- C. higher; lower
- D. higher; higher

ANSWER: C

兩反應爐A與B都在額定功率下運轉，且中子通量徑向峰值都發生在兩爐心的中心。反應爐A與B完全相同，除了反應爐A具有爐心限流孔，反應爐B則無。兩反應爐具有相同之控制棒佈局與密度。與反應爐A之中央燃料束相比，反應爐B之中央燃料束有_____出口蒸汽乾度，與_____之臨界功率。

- A. 較低；較低
- B. 較低；較高
- C. 較高；較低
- D. 較高；較高

答案： C.

科目： 293008

知能類： K1.31 [2.9/3.0]

序號： B291

Core orificing is used in the reactor core because the orifices...

- A. counteract the buoyant force of the bubbles accelerating flow in the high-powered bundles.
- B. improve the distribution of core flow to offset the effect of increasing quality on bundle flow.
- C. increase core ΔP so that minor crud buildup on fuel bundles will not adversely affect flow.
- D. decrease flow during periods of natural circulation to increase the void coefficient.

ANSWER: B

在反應爐爐心中使用爐心限流孔乃因為這些限流孔

- A. 會抵銷在高功率燃料束中加速水流之氣泡浮力
- B. 改善爐心流動的分佈，以彌補因為蒸汽乾度增加對燃料束內的流量所產生的影響
- C. 增加爐心 ΔP ，讓燃料束上少量累積的積垢不會對流動產生不利影響
- D. 在自然循環運轉期間減少流量，以增加空泡係數(void coefficient)

答案： B.

科目： 293008

知能類： K1.31 [2.9/3.0]

序號： B1388

Which one of the following occurs as a result of reactor core orifices?

- A. The core differential pressure is minimized at all power levels.
- B. The total core coolant flow rate remains the same at all power levels.
- C. The total core coolant flow rate is divided equally through all bundles at all power levels.
- D. The highest bundle coolant flow rates exist in core interior bundles at all power levels.

ANSWER: D

反應爐爐心限流孔會導致下列何者發生？

- A. 在所有功率下，爐心壓差最小化
- B. 在所有功率下，總爐心冷卻水流量維持相同
- C. 在所有功率下，總爐心冷卻水流量平均分配於所有燃料束
- D. 在所有功率下，冷卻水流量最高的燃料束位於爐心較中心位置

答案： D.

科目： 293008

知能類： K1.31 [2.9/3.0]

序號： B3890

Given:

- Reactors A and B are identical except that reactor A has no core orificing while reactor B is equipped with orifices.
- Both reactors always operate with identical recirculation system flow rates.
- Both reactors are currently operating at 80% of full power with the thermal neutron flux radially peaked in the center of both cores.

Compared to identical locations in the core of reactor A, the critical power ratio (CPR) in the central fuel bundles of reactor B is _____; and the peak power in the peripheral fuel bundles of reactor B is _____.

- A. larger; larger
- B. larger; smaller
- C. smaller; larger
- D. smaller; smaller

ANSWER: B

根據下列條件：

- 反應爐A與B完全相同，除了反應爐A無爐心限流孔，反應爐B則有限流孔。
- 兩反應爐運轉在相同之再循環系統流量。
- 兩反應爐目前在80%功率下運轉，且熱中子通量徑向峰值都發生在兩爐心的中心。

與反應爐A之相同爐心位置相比，反應爐B之中央燃料束的臨界功率比率（CPR）_____；同時反應爐B之周邊燃料束的尖峰功率_____。

- A. 較大；較大
- B. 較大；較小
- C. 較小；較大
- D. 較小；較小

答案： B.

科目： 293008

知能類： K1.32 [2.5/2.6]

序號： B690

Core bypass flow is...

- A. undesirable but cannot be prevented due to machined clearances within the reactor vessel.
- B. desirable because it provides cooling for low-power areas of the core.
- C. undesirable because it makes actual core flow hard to measure.
- D. desirable because it provides cooling for incore instrumentation.

ANSWER: D

爐心旁通水流是

- A. 不期望的，但是因為反應爐槽中的製造間隙(machined clearances)而無法避免
- B. 期望的，因為其提供爐心低功率區的冷卻
- C. 不期望的，因為其使得實際的爐心流量難以測量
- D. 期望的，因為其提供爐心中子偵測儀器的冷卻

答案： D.

科目： 293008

知能類： K1.32 [2.5/2.6]

序號： B2991

Which one of the following is the approximate percentage of total core flow that bypasses the fuel coolant channels in a reactor operating at 100% power with 100% recirculation flow?

A. 0.01%

B. 0.1%

C. 1 %

D. 10 %

ANSWER: D

對一運轉在100%功率且具有100%再循環流量的反應爐，其燃料匣之旁通冷卻水流佔總爐心流量之百分比約為下列何者？

A. 0.01%

B. 0.1%

C. 1 %

D. 10 %

答案： D.

科目： 293008

知能類： K1.32 [2.5/2.6]

序號： B3191

A reactor is operating at 100% rated power with 100% of design core flow rate.

Reactor power is decreased and stabilized at 75% using only control rods for reactivity control. Core flow rate is maintained at 100%.

During the power decrease, core bypass flow rate _____ because core pressure drop _____.

- A. decreased; increased
- B. decreased; decreased
- C. increased; increased
- D. increased; decreased

ANSWER: B

一反應爐在100%額定功率與100%設計爐心流量下運轉。在只使用控制棒進行反應度控制下，降低反應爐功率，並穩定於75%。而爐心流量仍維持在100%。在功率下降期間，爐心旁通流量會_____，因為爐心的壓力降_____。

- A. 降低；增加
- B. 降低；減少
- C. 增加；增加
- D. 增加；減少

答案： B.

科目： 293008

知能類： K1.32 [2.5/2.6]

序號： B3290

A reactor is operating at equilibrium 100% power. Assuming reactor coolant flow rate into the core region does not change, how will core bypass flow rate be affected during a reactor power decrease to 80%?

- A. Increase because greater two-phase flow resistance exists in the core at 80% power.
- B. Decrease because less two-phase flow resistance exists in the core at 80% power.
- C. Remain the same because core bypass flow rate is dependent only on reactor core flow rate.
- D. Remain the same because core bypass flow rate is unaffected by changes in reactor power.

ANSWER: B

一反應爐在平衡100%功率下運轉。假設進入爐心區域的反應爐冷卻水流量不變，當反應爐功率降至80%時，對爐心旁通流量有何影響？

- A. 增加，因為在爐心80%功率時，有較大的雙相流阻力存在
- B. 減小，因為在爐心80%功率時，有較小的雙相流阻力存在
- C. 維持不變，因為爐心旁通流量只與反應爐爐心流量有關
- D. 維持不變，因為爐心旁通流量不受反應爐功率影響

答案： B.

科目： 293008

知能類： K1.33 [2.4/2.6]

序號： B384

What is the purpose of the coolant flow that bypasses the fuel assemblies and enters the core interstitial region?

- A. Removes the heat that is generated in the control rods and the local power range monitors.
- B. Equalizes core differential pressure between the inlet and outlet plenums.
- C. Offsets the decrease in heat removal from the fuel bundle due to decreased flow as two phase flow resistance increases.
- D. Lubricates the interfacing surfaces of control rods and fuel channels to reduce sliding friction and wear.

ANSWER: A

冷卻水流旁通燃料元件，並進入爐心空隙區域的目的為何？

- A. 移除由控制棒以及局部功率中子偵測器所產生的熱量
- B. 使進口與出口區的爐心壓差相等
- C. 彌補因為雙相流動阻力增加而使流量減少所導致的燃料束熱量移除的減少
- D. 潤滑控制棒與燃料匣之接觸面，以降低滑動的摩擦與磨損

答案： A.

科目： 293008

知能類： K1.33 [2.4/2.6]

序號： B1390

Reactor coolant flow that bypasses the core is necessary to...

- A. provide a source of water to the incore thermocouples to ensure they measure a representative coolant temperature.
- B. act as a neutron reflector to minimize fast neutron leakage.
- C. ensure that recirculation pump flow rate is adequate to prevent pump overheating.
- D. provide cooling to prevent excessive boiling in the bypass region.

ANSWER: D

反應爐冷卻水旁通爐心是為了

- A. 提供爐內熱電偶的水源，以確保其能夠量測到具代表性的冷卻水溫度
- B. 做為中子反射體，使快中子的洩漏降至最低
- C. 確保充分之再循環泵流量，以預防泵過熱
- D. 提供冷卻，以預防旁通區域沸騰過度

答案： D.

科目： 293008

知能類： K1.34 [2.9/3.1]

序號： B192

Natural circulation is inherent in a boiling water reactor. Which one of the following statements describes natural circulation after a loss of offsite power?

- A. Liquid density in the downcomer and reduction of density in the core region support the cycle.
- B. Two-phase flow in the separators allows steam to be removed and liquid to return to the downcomer region.
- C. Relief and safety valves provide a heat sink for decay heat; in spite of leakage, control rod drives are adequate to maintain inventory.
- D. Density of liquid in the core region increases, thereby allowing liquid in the downcomer to enter the core.

ANSWER: A

自然循環是沸水式反應爐所固有的。下列何者描述了在喪失外電後之自然循環？

- A. 降流區的液體密度，以及爐心區域密度的降低支持此循環
- B. 在分離器中之雙相流使蒸汽被移除，而液體回到降流區
- C. 釋壓與安全閥提供衰變熱的熱沉，儘管有洩漏，但控制棒驅動機構足夠維持爐水存量
- D. 在爐心區域的液體密度增加，因而使降流區的液體得以進入爐心

答案： A.

科目： 293008

知能類： K1.34 [2.9/3.1]

序號： B691

Which one of the following statements describes natural circulation in a shut down reactor? (Assume no isolation condenser.)

- A. The moisture separators return the liquid portion of the coolant mixture exiting the core to the downcomer where it cools and increases in density.
- B. The jet pump diffusers establish a thermal driving head by increasing the velocity of the coolant as it flows downward through the diffuser.
- C. Coolant flows from the downcomer into a reactor recirculation loop and is returned to the core.
- D. Emergency coolant injection establishes a thermal driving head by providing cold coolant to the downcomer.

ANSWER: A

下列何者描述了在一停爐反應爐中之自然循環？（假設沒有隔離冷凝器。）

- A. 汽水分離器使離開爐心的冷卻水混合物之液體部分返回降流區，使其在此處冷卻並增加密度
- B. 當冷卻水向下流經噴射泵擴散管時，此擴散管藉由增加冷卻水速度而建立一熱驅動水頭
- C. 冷卻水流從降流區進入反應爐再循環迴路，並且回到爐心
- D. 緊急冷卻水的注入藉由提供至降流區的低溫冷卻水而建立起一熱驅動水頭

答案： A.

科目： 293008

知能類： K1.35 [3.1/3.3]

序號： B293

A reactor is shut down with all reactor recirculating pumps stopped. Which one of the following explains why it is important to monitor reactor vessel skin temperatures?

- A. Significant differential temperature between the top and bottom reactor vessel heads will result in excessive thermal stresses in the reactor vessel wall.
- B. Significant differential temperature between the upper and lower elevation reactor vessel skin indicates that thermal stratification is occurring.
- C. These temperatures provide a backup indication of reactor water level because the skin temperatures detected above vessel water level will be lower than those below vessel water level.
- D. These temperatures provide the best indication of the accuracy of the shutdown reactor water level instruments due to the temperature variance from instrument calibration conditions.

ANSWER: B

一反應爐停爐且所有反應爐再循環泵停止運轉。監視反應爐槽表面溫度是重要的，其理由為何？

- A. 反應爐頂蓋的頂部與底部間的顯著差溫，將導致反應爐槽壁的過度熱應力
- B. 反應爐槽高低位置的金屬表面顯著的差溫，代表了熱分層(stratification)正在發生
- C. 這些溫度代表了反應爐水位的替代指示，因為在槽水位之上的表面溫度會低於槽水位之下的溫度
- D. 這些溫度提供了停爐反應爐水位儀器的最精確指示，因為運轉的溫度與儀器校正的狀況不同

答案： B.

科目： 293008

知能類： K1.35 [3.1/3.3]

序號： B3490

Given:

- A reactor was shutdown 1 week ago from long term operation at 100% power.
- All reactor recirculation pumps are off.
- All reactor head vents are open.
- A shutdown core cooling system is currently in use, maintaining reactor coolant temperature stable at 170EF.
- Reactor coolant temperature is monitored by a detector at the inlet to the in-service shutdown core cooling heat exchanger.

The flow rate from the shutdown core cooling system to the core is inadvertently throttled, resulting in thermal stratification of the reactor coolant in the core. Which one of the following combinations will occur if this thermal stratification is permitted to exist for up to 24 hours?

- A. Water in the core will begin to boil, and the in-service shutdown cooling pump will cavitate.
- B. The in-service shutdown cooling pump will cavitate, and the jet pumps will cavitate.
- C. The jet pumps will cavitate, and reactor coolant temperature will indicate lower than actual core water temperature.
- D. Reactor coolant temperature will indicate lower than actual core water temperature, and water in the core will begin to boil.

ANSWER: D

根據下列條件：

- 一反應爐長期在100%功率下運轉後，於一週前停爐
- 所有反應爐再循環泵停止
- 所有反應爐蓋通氣閥開放
- 目前使用一組停機爐心冷卻系統，使反應爐冷卻水溫度維持穩定於170°F
- 反應爐冷卻水溫度由一個位於使用中之停機爐心冷卻熱交換器進口處之偵測器所監視

從停機爐心冷卻系統進入爐心之水流被不當地節流，導致爐心中反應爐冷卻水熱分層(thermal stratification)。若此熱分層存在達24小時，則下列何項組合將會發生？

- A. 爐心的水將開始沸騰，而使用中之停機冷卻泵會發生孔蝕現象

- B. 使用中之停機冷卻泵會發生孔蝕現象，同時噴射泵將發生孔蝕現象
- C. 噴射泵將發生孔蝕現象，而反應爐冷卻水溫度指示將低於實際的爐心水溫
- D. 反應爐冷卻水溫度指示將低於實際的爐心水溫，而爐心的水將開始沸騰

答案： D.

科目： 293008

知能類： K1.36 [3.1/3.3]

序號： B1491

A reactor is operating at full power when a loss of offsite power results in a reactor scram and a loss of forced core coolant flow. Several minutes later, the development of natural circulation flow will be indicated by differential _____ across the core plate and flow through the _____ pumps.

A. temperature; recirculation

B. temperature; jet

C. pressure; recirculation

D. pressure; jet

ANSWER: D

一反應爐在全功率下運轉，此時發生喪失外電，而導致反應爐急停，以及喪失強制爐心冷卻水流。數分鐘後，自然循環之流量，將會由爐心底板兩側與流經_____泵的差_____所指示。

A. 再循環；溫

B. 噴射；溫

C. 再循環；壓

D. 噴射；壓

答案： D.

科目： 293008

知能類： K1.36 [3.1/3.3]

序號： B3891

A reactor was shutdown from steady-state 100% power operation 10 days ago. Five minutes ago, a station blackout occurred that caused the complete loss of forced coolant circulation through the core. The following conditions currently exist:

- Reactor pressure vessel (RPV) pressure indicates 0 psig.
- Main steam isolation valves are closed.
- Reactor head vents are open with no steam issuing.
- Average reactor coolant temperature is 150°F.
- Differential temperature between the upper and lower RPV heads is 20°F and increasing.

Over the next few hours, with no operator action, which one of the following would occur if natural circulation becomes established in the RPV?

- A. RPV pressure will remain near 0 psig, and the differential temperature between the upper and lower RPV heads will stabilize at a value greater than 0°F.
- B. RPV pressure will remain near 0 psig, and the differential temperature between the upper and lower RPV heads will stabilize at 0°F.
- C. RPV pressure will slowly increase to about 10 psig, and the differential temperature between the upper and lower RPV heads will stabilize at a value greater than 0°F.
- D. RPV pressure will slowly increase to about 10 psig, and the differential temperature between the upper and lower RPV heads will stabilize at 0°F.

ANSWER: A

十天前一反應爐從穩態100%功率運轉下停爐。五分鐘前，發生電廠全黑，導致了流過爐心的強制冷卻水循環完全喪失。目前存在下列狀況：

- 反應爐壓力槽（RPV）壓力指示0 psig
- 主蒸汽隔離閥關閉
- 反應爐頂蓋通氣閥開啟，沒有蒸汽排放
- 平均反應爐冷卻水溫度為150°F
- RPV頂蓋的上下部分的溫差為20°F，並繼續增加

在未來數小時內，沒有運轉員作業，若自然循環在RPV中建立，則下列何者將發生？

- A. RPV壓力將會維持接近於0 psig，而RPV頂蓋的上下部分溫差將會穩定於一大於0°F的數值上

- B. RPV壓力將會維持接近於0 psig，而RPV頂蓋的上下部分溫差將會穩定於0°F上
 - C. RPV壓力將緩慢增加至約10 psig，而RPV頂蓋的上下部分溫差將會穩定於一大於0°F的數值上
 - D. RPV壓力將緩慢增加至約10 psig，而RPV頂蓋的上下部分溫差將會穩定於0°F上
- 答案： A.

科目： 293008

知能類： K1.37 [3.2/3.4]

序號： B891

While a reactor is shut down, what effect will decreasing reactor water level to just below the steam separators have on natural circulation flow rate?

- A. Flow rate will significantly decrease due to the loss of communication between the annulus and the core.
- B. Flow rate will decrease initially and then increase to a new thermal equilibrium value slightly less than the original flow rate.
- C. Flow rate will increase to a new stable value as the temperature of the water in the core increases to a new stable value.
- D. Flow rate will not be significantly affected because the thermal driving head is primarily dependent on the differential temperature between the core and the annulus.

ANSWER: A

當反應爐停爐時，反應爐水位下降至剛好低於汽水分離器，則對自然循環流量將有何影響？

- A. 流量將會顯著減少，因為喪失了環帶(annulus)與爐心間的交流
- B. 流量最初會減小，然後增加至一稍微小於原本流量的新熱平衡值
- C. 當爐心的水溫增加至一新的穩定值，流量將增加至一新的穩定值
- D. 流量不會受到顯著影響，因為熱驅動水頭主要視爐心與環帶間的溫差而定。

答案： A.

科目： 293008

知能類： K1.37 [3.2/3.4]

序號： B3086

After operating at high power for several weeks, the reactor was shut down yesterday and cooled down for steam line leak repairs. Shutdown cooling water pumps are being used to maintain reactor temperature and pressure. The pumps will be stopped in 30 minutes to commence a 4- hour test.

What action, if any, should be taken to enhance natural circulation cooling during the test, and why?

- A. No action necessary; the increase of density in the downcomer and the reduction of density in the core region will easily support circulation.
- B. No action necessary; the density of the mixture in the core region increases, thereby allowing liquid in the downcomer to enter the core.
- C. Raise vessel pressure to allow vessel relief valves to lift and create a heat sink for decay heat while control rod drive flow maintains inventory.
- D. Raise vessel water level above the bottom of the steam separators to provide a liquid flow path from the inside to the outside of the core shroud.

ANSWER: D

在以高功率運轉數週之後，昨天反應爐為了維修蒸汽管路洩漏而停機冷卻。停機冷卻水泵正用以維持反應爐的溫度與壓力。此泵將會在30分鐘內停止，並開始一4小時的測試。在此測試期間，應該進行何種行動以加強自然循環？

- A. 不需採取行動；降流區的密度增加，以及爐心區域的密度降低將能輕易地支持循環
- B. 不需採取行動；爐心區域混合物的密度增加，因而使得降流區的液體能進入爐心
- C. 提高爐槽壓力使得爐槽的釋壓閥升起，並在控制棒驅動流維持爐水存量下，對衰變熱產生一熱沈
- D. 提高爐槽水位高過於汽水分離器的底部，以便提供從爐心側板內部到外部液體流動通路

答案： D.

科目/題號：293008/1 (2016新增)

知能類：K1.28 [2.3/2.5]

序號：B5445 (P5446)

Refer to the drawing of a section of pipe that contains flowing subcooled water (see figure below).

Given:

- Pressure at P_1 is 24 psig.
- Pressure at P_2 is 16 psig.
- Pressure change due to change in velocity is 2 psig.
- Pressure change due to change in elevation is 10 psig.

The pressure decrease due to friction head loss between P_1 and P_2 is _____; and the direction of flow is from _____.

- A. 2 psig; left to right
- B. 2 psig; right to left
- C. 4 psig; left to right
- D. 4 psig; right to left

ANSWER: D.

參考一段內含有流動的次冷水管路圖(見下圖)

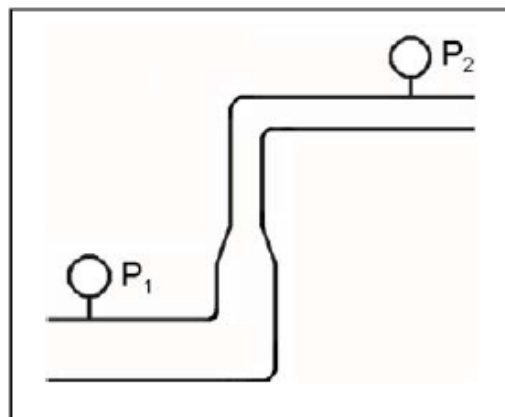
已知：

- 在 P_1 處的壓力為 24 psig
- 在 P_2 處的壓力為 16 psig
- 因速度變化造成的壓力變化為 2 psig
- 因高程變化造成的壓力變化為 10 psig

在 P_1 和 P_2 之間由於摩擦水頭損失造成壓力減少是____；而流動方向是從_____。

- A. 2 psig；左至右
- B. 2 psig；右至左
- C. 4 psig；左至右
- D. 4 psig；右至左

答案： D



科目/題號：293008/2 (2016 新增)

知能類：K1.28 [2.3/2.5]

序號：B5845 (P5847)

Refer to the drawing of a section of pipe that contains flowing subcooled water (see figure below).

Given:

- Pressure at P_1 is 26 psig.
- Pressure at P_2 is 34 psig.
- Pressure change due to change in velocity is 2 psig.
- Pressure change due to change in elevation is 8 psig.

The pressure decrease due to friction head loss between P_1 and P_2 is _____; and the direction of flow is from _____.

- A. 2 psig; left to right
- B. 2 psig; right to left
- C. 4 psig; left to right
- D. 4 psig; right to left

ANSWER: A.

參考一段內含有流動的次冷水管路圖(見下圖)

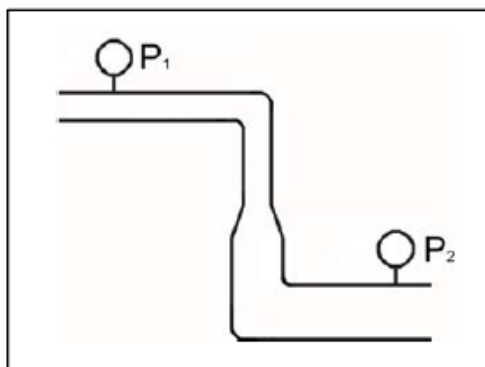
已知：

- 在 P_1 處的壓力為 26 psig
- 在 P_2 處的壓力為 34 psig
- 因速度變化造成的壓力變化為 2 psig
- 因高程變化造成的壓力變化為 8 psig

在 P_1 和 P_2 之間由於摩擦水頭損失造成壓力減少是 _____；而流動方向是從 _____。

- A. 2 psig；左至右
- B. 2 psig；右至左
- C. 4 psig；左至右
- D. 4 psig；右至左

答案： A



科目/題號：293008/3 (2016 新增)

知能類：K1.28 [2.3/2.5]

序號：B6646 (P6648)

Refer to the drawing of a section of pipe that contains flowing subcooled water. (See figure below).

Given:

- Pressure at P_1 is 30 psig.
- Pressure at P_2 is 32 psig.
- Pressure change due to change in velocity is 2 psig.
- Pressure change due to change in elevation is 2 psig.

The pressure decrease due to friction head loss between P_1 and P_2 is _____; and the direction of flow is from _____.

- A. 2 psig; left to right
- B. 2 psig; right to left
- C. 6 psig; left to right
- D. 6 psig; right to left

ANSWER: B.

參考一段內含有流動的次冷水管路圖(見下圖)

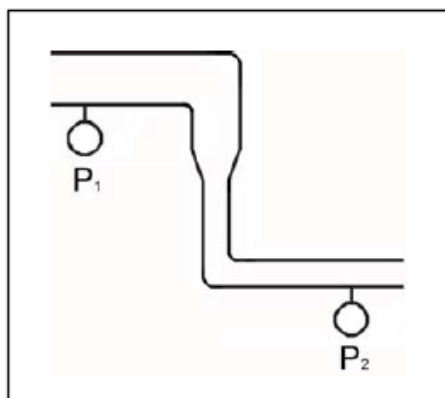
已知：

- 在 P_1 處的壓力為 30 psig
- 在 P_2 處的壓力為 32 psig
- 因速度變化造成的壓力變化為 2 psig
- 因高程變化造成的壓力變化為 2 psig

在 P_1 和 P_2 之間由於摩擦水頭損失造成壓力減少是_____；而流動方向是從_____。

- A. 2 psig；左至右
- B. 2 psig；右至左
- C. 6 psig；左至右
- D. 6 psig；右至左

答案： B



科目/題號：293008/4 (2016 新增)

知能類：K1.28 [2.3/2.5]

序號：B7046 (P7048)

Refer to the drawing of a section of pipe that contains flowing subcooled water (see figure below).

Given:

- Pressure at P_1 is 34 psig.
- Pressure at P_2 is 20 psig.
- Pressure change due to change in velocity is 2 psig.
- Pressure change due to change in elevation is 8 psig.

The pressure decrease due to friction head loss between P_1 and P_2 is _____; and the direction of flow is from _____.

- A. 2 psig; left to right
- B. 2 psig; right to left
- C. 4 psig; left to right
- D. 4 psig; right to left

ANSWER: D

參考一段內含有流動的次冷水管路圖(見下圖)

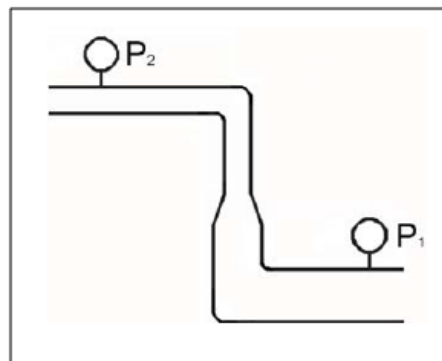
已知：

- 在 P_1 處的壓力為 34 psig
- 在 P_2 處的壓力為 20 psig
- 因速度變化造成的壓力變化為 2 psig
- 因高程變化造成的壓力變化為 8 psig

在 P_1 和 P_2 之間由於摩擦水頭損失造成壓力減少是_____；而流動方向是從_____。

- A. 2 psig；左至右
- B. 2 psig；右至左
- C. 4 psig；左至右
- D. 4 psig；右至左

答案： D



科目/題號：293008/5 (2016 新增)

知能類：K1.28 [2.3/2.5]

序號：B7680 (P7680)

Refer to the drawing of a section of pipe that contains flowing subcooled water (see figure below).

Given:

- The pressure at P_1 is 20 psig.
- The pressure at P_2 is 20 psig.
- The pressure change caused by the change in velocity is 2 psig.
- The pressure change caused by the change in elevation is 8 psig.

The pressure decrease due to friction head loss between P_1 and P_2 is _____; and the direction of flow is from _____.

- A. 6 psig; left to right
- B. 6 psig; right to left
- C. 10 psig; left to right
- D. 10 psig; right to left

ANSWER: B.

參考一段內含有流動的次冷水管路圖(見下圖)

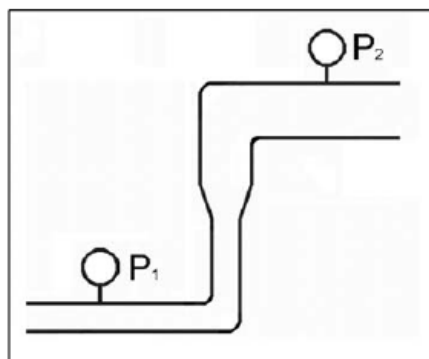
已知：

- 在 P_1 處的壓力為 20 psig
- 在 P_2 處的壓力為 20 psig
- 因速度變化造成的壓力變化是 2 psig
- 因高程變化造成的壓力變化是 8 psig

在 P_1 和 P_2 之間由於摩擦水頭損失造成壓力減少是_____；而流動方向是從_____。

- A. 6 psig；左至右
- B. 6 psig；右至左
- C. 10 psig；左至右
- D. 10 psig；右至左

答案： B



科目/題號：293008/6 (2016 新增)

知能類： K1.29 [2.8/3.0]

序號： B5646

Reactors A and B are operating at steady-state 100 percent power. The reactors are identical except that reactor A has core orifices and reactor B does not. Both reactors have the same power distribution and core mass flow rate.

Compared to the center fuel bundle in reactor B, the center fuel bundle in reactor A will have the _____ exit steam quality and the _____ critical power.

- A. lower; lower
- B. lower; higher
- C. higher; lower
- D. higher; higher

ANSWER: B

反應器 A 和 B 以 100% 的功率穩定運轉。兩反應器相同，只是反應器 A 中有爐心限流孔而反應器 B 沒有。兩反應器的功率分佈和爐心質量流量率均相同。與反應器 B 內的中心燃料棒束比較，反應器 A 內的中心燃料棒束將有_____ 的出口蒸汽乾度和_____ 臨界功率。

- A. 較低；較低
- B. 較低；較高
- C. 較高；較低
- D. 較高；較高

答案： B