科目： 191002
知能類：K1.02 [2.7/2.9]
序號： P6 (B1806)

Density input is normally used in steam flow instruments to convert _____ into _____.

A. mass flow rate; volumetric flow rate

B. volumetric flow rate; mass flow rate

C. mass flow rate; differential pressure

D. differential pressure; volumetric flow rate

ANSWER: B.

在蒸汽流量計中的密度輸入值，一般用來將_____轉換成_____。

A. 質量流量；體積流量

B. 體積流量；質量流量

C. 質量流量；差壓

D. 差壓；體積流量

答案：B.

科目： 191002
知能類：K1.02 [2.7/2.9]
序號： P305 (B2906)

If the steam pressure input to a density-compensated steam flow instrument fails high, the associated flow rate indication will...

A. decrease, because the density input has decreased.

B. increase, because the density input has decreased.

C. decrease, because the density input has increased.

D. increase, because the density input has increased.

ANSWER: D.

如果對於一輸入密度補償蒸汽流量計的蒸汽壓力高值失效(fail high)，則流量指示值將會……

A. 減小，因為其密度輸入減小。

B. 增加，因為其密度輸入減小。

C. 減小，因為其密度輸入增加。

D. 增加，因為其密度輸入增加。

答案：D.

科目： 191002
知能類：K1.02 [2.7/2.9]
序號： P406 (B1606)

The density compensating input to a steam flow instrument is used to convert volumetric flow rate to...

A. velocity flow rate.

B. gallons per minute.

C. mass flow rate.

D. differential flow rate.

ANSWER: C.

輸入蒸汽流量計的密度補償值，旨在將體積流量轉換成……

A. 速度流量。

B. 每分鐘加侖數。

C. 質量流量。

D. 差壓。

答案：C.

科目： 191002
知能類：K1.02 [2.7/2.9]
序號： P705 (B708)

A steam flow measuring instrument uses density compensation and square root compensation to convert the differential pressure across the flow element to flow rate in lbm/hr.

The purpose of square root compensation in this flow measuring instrument is to convert _____ to _____.

A. volumetric flow rate; mass flow rate

B. volumetric flow rate; differential pressure

C. differential pressure; mass flow rate

D. differential pressure; volumetric flow rate

ANSWER: D.

一蒸汽流量計使用密度補償與平方根補償，將通過流量元件的差壓，轉換成以lbm/hr為單位的流量。

在此流量計中，平方根補償的目的，是將_____ 轉換成 _____。

A. 體積流量；質量流量

B. 體積流量；差壓

C. 差壓；質量流量

D. 差壓；體積流量

答案：D.

科目： 191002
知能類：K1.02 [2.7/2.9]
序號： P1212

If the steam pressure input to a density-compensated steam flow instrument fails low, the indicated flow rate will...

A. increase, because the density input has increased.

B. decrease, because the density input has increased.

C. increase, because the density input has decreased.

D. decrease, because the density input has decreased.

ANSWER: D.

假設密度補償蒸汽流量計，出現蒸汽壓力輸入低值失效(fail low)，指示流量值將會……

A. 增加，因為其密度輸入增加。

B. 減少，因為其密度輸入增加。

C. 增加，因為其密度輸入減少。

D. 減少，因為其密度輸入減少。

答案：D.

科目： 191002
知能類：K1.02 [2.7/2.9]
序號： P2505 (B2506)

A main steam flow rate measuring instrument uses a steam pressure input to produce main steam flow rate indication in lbm/hr. Assuming volumetric steam flow rate does not change, a steam pressure decrease will cause indicated steam flow rate to...

A. decrease because the density of the main steam has decreased.

B. increase because the specific volume of the main steam has increased.

C. remain the same because steam pressure does not affect the mass flow rate of main steam.

D. remain the same because the steam pressure input compensates for changes in steam pressure.

ANSWER: A.

主蒸汽流量計使用蒸汽壓力輸入，以產生以lbm/hr為單位之主蒸汽流量指示。假設體積蒸汽流量沒有改變，則蒸汽壓力減小將會導致蒸汽流量……

A. 減小，因為主蒸汽的密度減小。

B. 增加，因為主蒸汽的比容增加。

C. 維持不變，因為蒸汽壓力不影響主蒸汽的質量流量。

D. 維持不變，因為輸入的蒸汽壓力，彌補了蒸汽壓力的異動。

答案：A.

科目： 191002
知能類：K1.02 [2.7/2.9]
序號： P3605 (B3608)

A steam flow measuring instrument uses density compensation and square root extraction to convert the differential pressure across the flow element to flow rate in lbm/hr.

The purpose of density compensation in this flow measuring instrument is to convert _____ to _____.

A. volumetric flow rate; mass flow rate

B. volumetric flow rate; differential pressure

C. differential pressure; mass flow rate

D. differential pressure; volumetric flow rate

ANSWER: A.

一蒸汽流量計使用密度補償與開平方根，將流經流量元件的差壓，轉換成以lbm/hr為單位之流量。

在此流量計中，密度補償的目的乃將_____轉換成_____。

A. 體積流量；質量流量

B. 體積流量；差壓

C. 差壓；質量流量

D. 差壓；體積流量

答案：A.

科目： 191002
知能類：K1.02 [2.7/2.9]
序號： P4603 (B4604)

A main steam flow rate differential pressure detector was properly calibrated to produce a main steam flow rate indication of 500,000 lbm/hr with the following initial input conditions:

Detector high pressure input: 1,000 psia
Detector low pressure input: 950 psia

The current detector input conditions are as follows:

Detector high pressure input: 985 psia
Detector low pressure input: 935 psia

Assume that the detector and associated circuitry do not have steam density compensation. Also assume that the main steam quality and volumetric flow rate do not change.

The current main steam flow rate indication is _____ 500,000 lbm/hr; and the current main steam flow rate is _____ 500,000 lbm/hr.

A. equal to; greater than

B. less than; greater than

C. equal to; less than

D. greater than; less than

ANSWER: C.

主蒸汽差壓流量計經過妥善校正後，在下列的初始輸入條件下，顯示為 500,000 lbm/hr 的主蒸汽流量：

流量計高壓側輸入： 1,000 psia
流量計低壓側輸入： 950 psia

流量計目前的輸入條件如下：

流量計高壓側輸入： 985 psia
流量計低壓側輸入： 935 psia

假設流量計和相關電路沒有蒸汽密度補償，而且主蒸汽的品質和體積流量不變。

目前顯示的主蒸汽流量數據_____500,000 lbm/hr，目前實際的主蒸汽流量_____500,000 lbm/hr。

A. 等於；大於

B. 小於；大於

C. 等於；小於

D. 大於；小於

答案：C.

科目： 191002
知能類：K1.03 [2.7/2.9]
序號： P206

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

A. gas or steam being trapped in the liquid.

B. unequal temperature gradients in the liquid.

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

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

ANSWER: A.

下列何者為液體差壓流量計指示值產生波動的最可能原因……

A. 液體中含有氣體或蒸汽。

B. 液體中溫度梯度不平均。

C. 通過流量裝置的液體產生渦流(vortexing)。

D. 高壓感測管的閥門半關。

答案：A.

科目： 191002
知能類：K1.03 [2.7/2.9]
序號： P905

A properly calibrated water flow detector is located several feet below a horizontal pipe containing the detector's sensing element. The detector is removed for inspection and then reconnected to the sensing element with its low-pressure sensing line filled with air and its highpressure sensing line filled with water.

If the water system is operating, indicated flow rate will be...

A. zero.

B. equal to actual flow rate but greater than zero.

C. lower than actual flow rate.

D. higher than actual flow rate.

ANSWER: D.

一妥善校正過的流量計位於內含感測元件的水平管下方數呎處。基於檢查之需而取下流量計，之後將感測元件重新接上，卻使得低壓感測管注滿空氣，高壓感測管注滿水。

倘若水系統正在運作，此時指示的流量將是……

A. 零。

B. 等於實際流量，但是大於零。

C. 小於實際流量。

D. 大於實際流量。

答案：D.

科目： 191002
知能類：K1.04 [2.7/2.7]
序號： P8 (B607)

If the equalizing valve for a differential pressure flow detector is opened in an operating system, the associated flow indication will...

A. increase by 50%.

B. decrease by 50%.

C. increase to maximum.

D. decrease to minimum.

ANSWER: D.

如果運轉中系統的差壓流量計平衡閥全開，流量指示值將會……

A. 增加50%。

B. 減少50%。

C. 增加到最大值。

D. 減小到最小值。

答案：D.

科目： 191002
知能類：K1.04 [2.7/2.7]
序號： P307 (B307)

Which one of the following will cause indicated volumetric flow rate to be lower than actual volumetric flow rate using a differential pressure flow detector that is connected to a calibrated orifice?

A. System pressure decreases.

B. The orifice erodes over time.

C. Debris becomes lodged in the orifice.

D. A leak develops in the low pressure sensing line.

ANSWER: B.

使用一接在經校正過之限流孔的差壓流量計，下列何者將會導致指示體積流量，小於實際之體積流量？

A. 系統壓力降低。

B. 限流孔因長時間而沖蝕。

C. 碎片堆積於限流孔。

D. 低壓感測管發生洩漏。

答案：B.

科目： 191002
知能類：K1.04 [2.7/2.7]
序號： P706 (B707)

Flow rate is being measured using a differential pressure flow detector and a calibrated orifice. If actual flow rate remains constant, which one of the following will cause indicated flow rate to be higher than actual flow rate?

A. The flow detector equalizing valve is inadvertently opened.

B. A leak develops in the high pressure sensing line.

C. Debris becomes lodged in the orifice.

D. The orifice erodes over time.

ANSWER: C.

利用一差壓流量計與一經校正限流孔量測流量。如果實際流量維持不變，下列何者將會使流量指示值高於實際流量？

A. 流量計平衡閥不小心開啟。

B. 高壓感測管發生洩漏。

C. 碎片堆積於限流孔。

D. 限流孔因長時間而沖蝕。

答案：C.

科目： 191002
知能類：K1.04 [2.7/2.7]
序號： P1007 (B1907)

Refer to the drawing of a pipe elbow used for flow measurement in a cooling water system (see figure below).

A differential pressure (D/P) flow detector is connected to instrument lines A and B.

If instrument line A develops a leak, indicated flow rate will _____ due to a _____ measured D/P.

A. increase; larger

B. increase; smaller

C. decrease; larger

D. decrease; smaller

ANSWER: D.

請參照下圖的冷卻水系統中，用來量測流量的肘形彎管。

差壓(D/P)流量計連接至儀器管 A 及 B。

假設儀器管 A 發生洩漏，顯示流量將_____，這是因量測差壓_____所致。

A. 增加；較大

B. 增加；較小

C. 降低；較大

D. 降低；較小

答案：D.

科目： 191002
知能類：K1.04 [2.7/2.7]
序號： P1205 (B1506)

If the orifice in a differential pressure (D/P) flow sensor erodes such that the orifice opening becomes larger, indicated flow rate will _____ due to a _____ D/P across the orifice.

A. increase; larger

B. increase; smaller

C. decrease; larger

D. decrease; smaller

ANSWER: D.

如果一差壓流量計的限流孔沖蝕，以致於限流孔的孔徑變大，則流量指示值將會_____，這是因為限流孔的差壓_____。

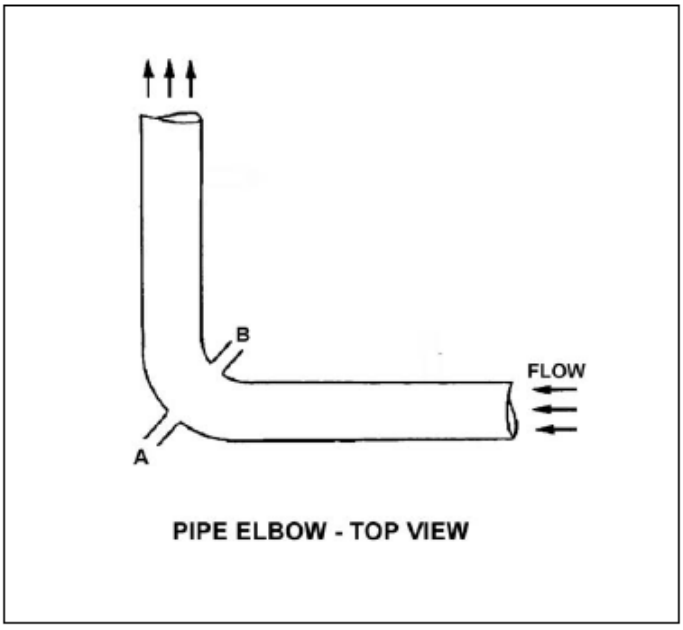
A. 增加；較大

B. 增加；較小

C. 降低；較大

D. 降低；較小

答案：D.



科目： 191002
知能類：K1.04 [2.7/2.7]
序號： P1608 (B1608)

Refer to the drawing of a horizontal pipe elbow (top view) in an operating water system (see figure below).

Three separate bellows differential pressure flow detectors are connected to taps A, B, C, and D as follows:

DETECTOR	TAPS
AD	A and D
BD	B and D
CD	C and D

Assuming zero head loss in this section of pipe, how will the detectors be affected if tap D ruptures?

A. All detectors will fail low.

B. All detectors will fail high.

C. Two detectors will fail low and one will fail high.

D. Two detectors will fail high and one will fail low.

ANSWER: A.

請參照下面用於運轉中水系統的水平肘形彎管頂視圖。

三個分開的伸縮囊(Bellow)差壓流量計，安裝在接頭A、B、C與D處，如下：

流量計	接頭
AD	A與D
BD	B與D
CD	C與D

假設此段管的水頭損失為零，則如果接頭D破裂，則對流量計有何影響？

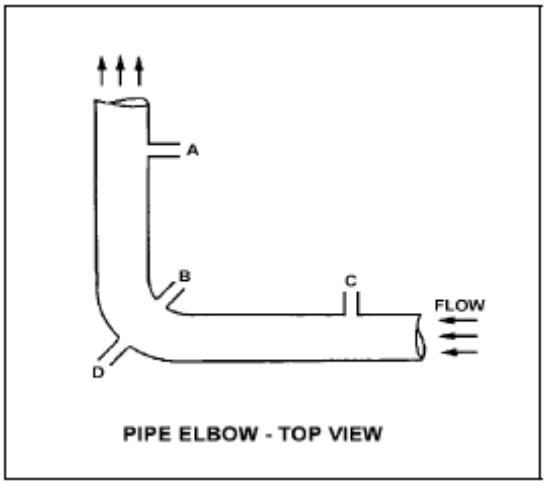
A. 所有流量計將低值失效。

B. 所有流量計將高值失效。

C. 兩個流量計低值失效，一個高值失效。

D. 兩個流量計高值失效，一個低值失效。

答案：A.



科目： 191002
知能類：K1.04 [2.7/2.7]
序號： P2107 (B2209)

Refer to the drawing of a pipe elbow used for flow measurement in a cooling water system (see figure below).

A differential pressure (D/P) flow detector is connected to instrument lines A and B.

If instrument line B develops a leak, indicated flow rate will _____ due to a _____ measured D/P.

A. increase; larger

B. increase; smaller

C. decrease; larger

D. decrease; smaller

ANSWER: A.

請參照下圖中，用於一冷卻水系統中流量量測之肘形彎管。

一差壓流量計連接於儀器管A與B。如果儀器管B發生洩漏，則流量指示值將會_____，因為_____的量測差壓。

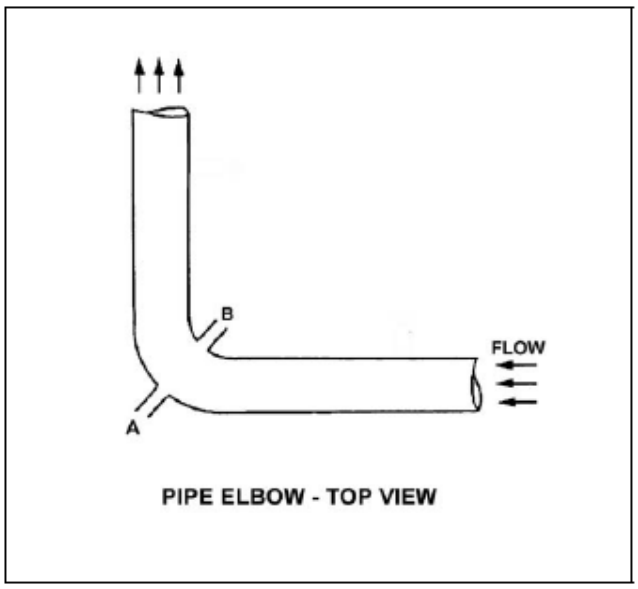
A. 增加；較大

B. 增加；較小

C. 減小；較大

D. 減小；較小

答案：A.



科目： 191002
知能類：K1.04 [2.7/2.7]
序號： P2305 (B2310)

An orifice is being used in an operating cooling water system to measure flow rate. Which one of the following will cause the differential pressure sensed across the orifice to decrease?

A. System pressure decreases.

B. System flow rate decreases.

C. Debris becomes lodged in the orifice.

D. A leak develops in the low pressure sensing line.

ANSWER: B.

在運轉中的冷卻水系統中，使用一限流孔量測流量。下列何者將會導致限流孔處感測的差壓下降？

A. 系統壓力減小。

B. 系統流量減小。

C. 碎片堆積於限流孔。

D. 低壓感測管發生洩漏。

答案：B.

科目： 191002
知能類：K1.04 [2.7/2.7]
序號： P2307 (B2307)

Refer to the drawing of a horizontal pipe elbow (top view) in an operating water system (see figure below).

Three separate bellows differential pressure flow detectors are connected to taps A, B, C, and D as follows:

DETECTOR	TAPS
AD	A and D
BD	B and D
CD	C and D

Assume that water is incompressible and there is no head loss in this section of pipe. How will the detectors be affected if system flow rate remains the same while system pressure increases from 1000 psig to 1200 psig?

A. All detectors will indicate higher flow.

B. Only two detectors will indicate higher flow.

C. Only one detector will indicate higher flow.

D. Detector indication will not change.

ANSWER: D.

請參照下面用於運轉中水系統的水平肘形彎管頂視圖。

三個分開的伸縮囊差壓流量計，安裝在接頭A、B、C與D處，如下：

流量計	接頭
AD	A 與 D
BD	B 與 D
CD	C 與 D

假設水為不可壓縮，同時在此段管線中水頭損失為零，則當系統流量維持不變，但系統壓力從1000psig 增加到1200 psig時，對流量計會有何影響？

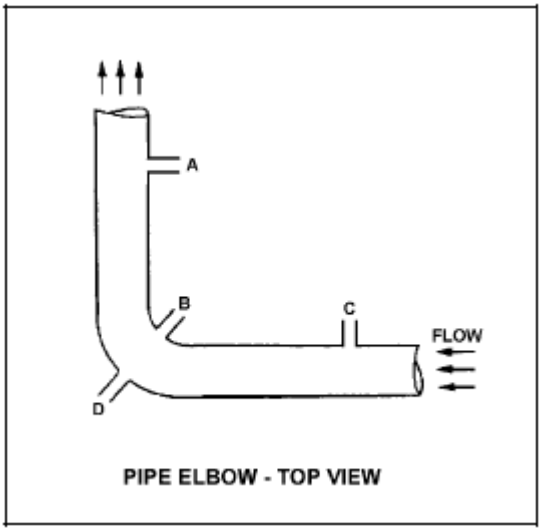
A. 所有流量計將指示較高流量。

B. 只有兩個流量計將指示較高流量。

C. 只有一個流量計將指示較高流量。

D. 流量計指示數值不會改變。

答案：D.



科目： 191002
知能類：K1.04 [2.7/2.7]
序號： P2807 (B1007)

Refer to the drawing of a pipe elbow used for flow measurement (see figure below).

At which one of the following locations is the highest pressure sensed? (Assume a constant pipe diameter and zero head loss in this section of pipe.)

A. Point A

B. Point B

C. Point C

D. Point D

ANSWER: C.

請參照下圖用於流體量測的肘形彎管。

在下列哪一位置感測到的壓力最高？(假設管徑維持固定，同時在此段管線中，水頭損失為零)。

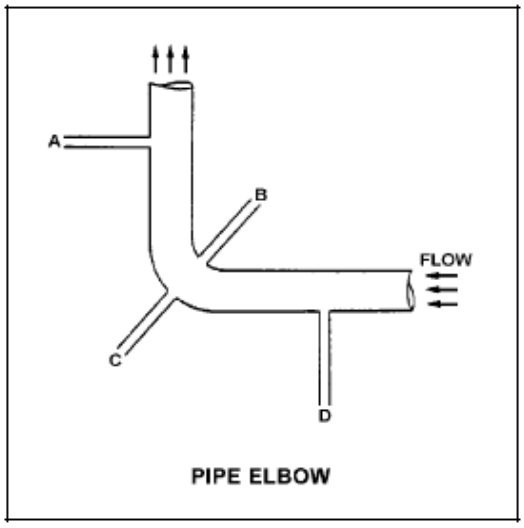
A. 位置 A

B. 位置 B

C. 位置 C

D. 位置 D

答案：C.



科目： 191002
知能類：K1.04 [2.7/2.7]
序號： P2905 (B3108)

Refer to the drawing of a horizontal pipe elbow (top view) in an operating water system (see figure below).

Three separate bellows-type differential pressure flow detectors are connected to taps A, B, C, and D as follows:

DETECTOR	TAPS
AD	A and D
BD	B and D
CD	C and D

Assuming zero head loss in this section of pipe, how will the detectors be affected if tap B experiences a significant leak? (Assume water system pressure does not change.)

A. All detectors will fail low.

B. All detectors will fail high.

C. Only one detector will fail, and it will fail low.

D. Only one detector will fail, and it will fail high.

ANSWER: D.

請參照下面用於運轉中水系統的水平肘形彎管頂視圖。

三個分開的伸縮囊型差壓流量計，連接於接頭A、B、C與D處，如下：

流量計	接頭
AD	A 與 D
BD	B 與 D
CD	C 與 D

假設在此段管線中水頭損失為零，則當接頭B發生嚴重洩漏時，對流量計會有何影響(假設水系統壓力不變)？

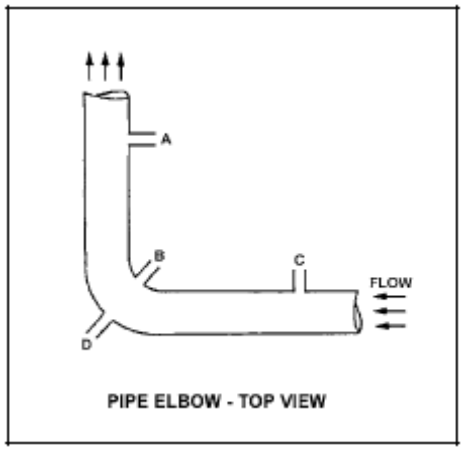
A. 所有流量計將會低值失效。

B. 所有流量計將會高值失效。

C. 只有一個流量計會失效，同時會低值失效。

D. 只有一個流量計會失效，同時會高值失效。

答案：D.



科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P9

Flow detectors (such as an orifice, flow nozzle, and venturi tube) measure flow rate using the principle that flow rate is...

A. directly proportional to the differential pressure (D/P) squared.

B. inversely proportional to the D/P squared.

C. directly proportional to the square root of the D/P.

D. inversely proportional to the square root of the D/P.

ANSWER: C.

流量計(如限流孔、流體噴嘴和文氏管)在量測流量時採用的原理是：流量……

A. 與差壓平方值成正比。

B. 與差壓平方值成反比。

C. 與差壓平方根成正比。

D. 與差壓平方根成反比。

答案：C.

科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P308 (B305)

A cooling water system is operating at steady-state conditions indicating 900 gpm with 60 psid across the flow transmitter venturi. If cooling water flow rate is increased to 1800 gpm, flow transmitter venturi delta-P will be approximately...

A. 85 psid.

B. 120 psid.

C. 175 psid.

D. 240 psid.

ANSWER: D.

一冷卻水系統運轉於流量指示為900 gpm的穩態下，文氏管流量計的差壓為60 psid。如果冷卻水流量增加到1800 gpm，則流量計的差壓大約是……

A. 85 psid

B. 120 psid

C. 175 psid

D. 240 psid

答案：D.

科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P607 (B608)

The flow rate of a fluid passing through a venturi can be determined by measuring the:

A. change in the pressure of the fluid as it passes through the venturi.

B. change in the density of the fluid as it passes through the venturi.

C. linear displacement of a metering plug installed in the throat of the venturi.

D. rotation of a paddle wheel type device installed in the throat of the venturi.

ANSWER: A.

通過一文氏管流量計的流體流量，可以靠量測何者加以決定：

A. 此流體通過文氏管流量計的壓力變化。

B. 此流體通過文氏管流量計的密度變化。

C. 安裝於文氏管流量計頸部的計量栓線性位移。

D. 安裝於文氏管流量計頸部的蹼輪式(paddle wheel type)裝置的旋轉。

答案：A.

科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P707 (B706)

A cooling water system is operating at a steady-state flow rate of 700 gpm with 60 psid across the flow transmitter venturi. If cooling water flow rate is increased to 1000 gpm, differential pressure across the flow transmitter venturi will be approximately...

A. 85.7 psid.

B. 122.4 psid.

C. 171.4 psid.

D. 244.8 psid.

ANSWER: B.

一冷卻水系統運轉於流量指示為700 gpm的穩態下，文氏管流量計的差壓為60 psid。如果冷卻水流量增加到1000 gpm，則流量計的差壓將大約是……

A. 85.7 psid

B. 122.4 psid

C. 171.4 psid

D. 244.8 psid

答案：B.

科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P807 (B807)

Refer to the drawing of a venturi flow element (see figure below) with direction of fluid flow indicated by the arrow.

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

A. Point A

B. Point B

C. Point C

D. Point D

ANSWER: A.

請參照下圖的文氏管流量計，箭號表示水流方向。

差壓流量計的高壓管接頭，應該連接於何處？

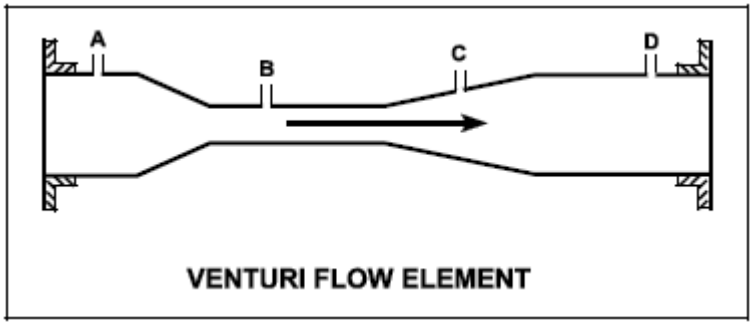
A. 位置 A

B. 位置 B

C. 位置 C

D. 位置 D

答案：A.



科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P907 (B1905)

A differential (D/P) detector is being used to measure main steam flow rate. At a steam flow rate of 5 x 10^6 lbm/hr measured D/P is 40 psid.

If steam flow changes such that current D/P is 30 psid, what is the approximate current steam flow rate?

A. 2.1 x 10^6 lbm/hr

B. 3.5 x 10^6 lbm/hr

C. 3.7 x 10^6 lbm/hr

D. 4.3 x 10^6 lbm/hr

ANSWER: D.

使用差壓流量計來量測主蒸汽流量。在蒸汽流量5 x 10^6 lbm/hr時，量測之差壓為 40 psid。

如果蒸汽流量改變，使得目前差壓成為 30 psid，則目前的蒸汽流量約為？

A. 2.1 x 10^6 lbm/hr

B. 3.5 x 10^6 lbm/hr

C. 3.7 x 10^6 lbm/hr

D. 4.3 x 10^6 lbm/hr

答案：D.

科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P908 (B2106)

Which one of the following flow devices produces the largest unrecoverable head loss when used in an operating fluid system?

A. Venturi

B. Flow nozzle

C. Pipe elbow

D. Orifice

ANSWER: D.

將下列流量裝置用在運轉中的流體系統時，何者會產生最大不可回復的水頭損失？

A. 文氏管

B. 噴嘴

C. 肘形彎管

D. 限流孔

答案：D.

科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P1106 (B3306)

Refer to the drawing of a venturi flow element in an operating cooling water system (see figure below).

At what point does the lowest pressure exist?

A. Point A

B. Point B

C. Point C

D. Point D

ANSWER: B.

請參照下圖中，一運轉中冷卻水系統的文氏管流量計。

請問在何點的壓力最低？

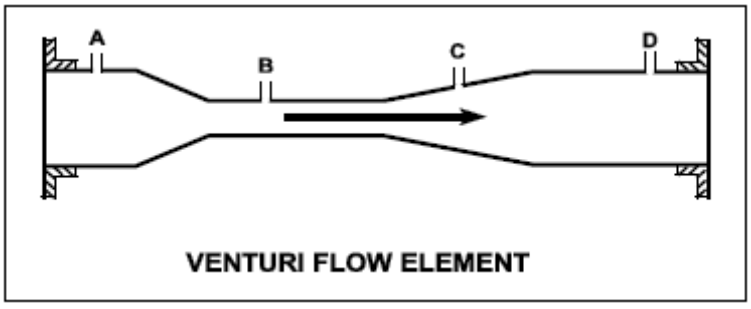
A. 位置 A

B. 位置 B

C. 位置 C

D. 位置 D

答案：B.



科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P1308 (B907)

Refer to the drawing of a venturi flow element for an operating cooling water system (see figure below).

The greatest differential pressure (D/P) will be sensed by a D/P flow detector if the low pressure sensing line is connected at _____ and the high pressure sensing line is connected at _____.

A. B; A

B. B; C

C. D; A

D. D; C

ANSWER: A.

請參照下圖中，一運轉中冷卻水系統的文氏管流量計。

一量測流經文氏管水流的差壓流量計，如果其低壓感測管連接於_____點，而其高壓感測管連接於_____點，將會測得最高的差壓。

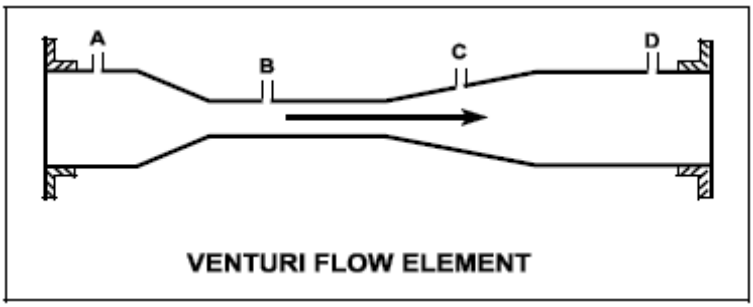
A. B；A

B. B；C

C. D；A

D. D；C

答案：A.



科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P1407

A cooling water system is operating at a steady-state flow rate of 500 gpm with 60 psid across the flow transmitter venturi. If cooling water flow rate is increased to 1000 gpm, differential pressure across the flow transmitter venturi will be approximately...

A. 85 psid.

B. 120 psid.

C. 240 psid.

D. 480 psid.

ANSWER: C.

一冷卻水系統以流量500 gpm穩態運轉，文氏管流量計差壓為60 psid。如果冷卻水流量增至1000 gpm，則文氏管的差壓約是……

A. 85 psid

B. 120 psid

C. 240 psid

D. 480 psid

答案：C.

科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P1606 (B407)

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

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

A. remained the same; remained the same

B. remained the same; decreased slightly

C. decreased slightly; remained the same

D. decreased slightly; decreased slightly

ANSWER: C.

附圖中，次冷水流經一漸縮-漸擴文氏管流量計(參閱下圖)。入口端(P1)與出口端(P2)管徑相等。

與文氏管入口端(P1)相比，文氏管出口端(P2)處壓力_____，而文氏管出口端的水流速_____(假設為「實際」狀況)。

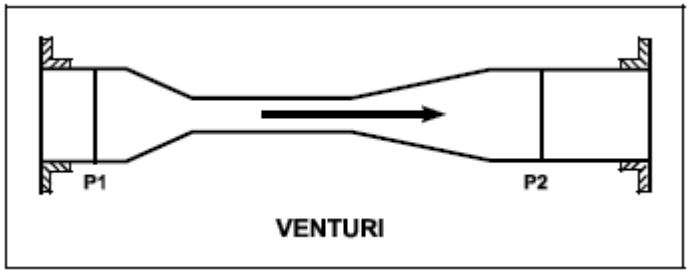
A. 維持相等；維持相等

B. 維持相等；稍微下降

C. 稍微下降；維持相等

D. 稍微下降；稍微下降

答案：C.



科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P1808

Subcooled water is flowing through a venturi flow element. When the water reaches the throat of the venturi, the _____ water pressure and the _____ water velocity occurs.

A. highest; highest

B. lowest; lowest

C. lowest; highest

D. highest; lowest

ANSWER: C.

次冷水流經文氏管流量計。水流至文氏管頸部時，將產生_____水壓及_____流速。

A. 最高；最高

B. 最低；最低

C. 最低；最高

D. 最高；最低

答案：C.

科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P1873 (B1773)

Subcooled water is flowing through each of the following devices. Which one of the devices will produce an outlet pressure that is greater than the inlet pressure?

A. Convergent nozzle

B. Divergent nozzle

C. Orifice

D. Flow restrictor

ANSWER: B.

次冷水流經下列各裝置。請問何者將產生高於入口壓的出口壓？

A. 漸縮噴嘴

B. 漸擴噴嘴

C. 限流孔

D. 限流器

答案：B.

科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P1906 (B1408)

Refer to the drawing of a pipe elbow used for flow measurement (see figure below).

At which one of the following pairs of connection points will the greatest differential pressure be sensed? (Assume ideal fluid flow conditions.)

A. Points A and B

B. Points B and C

C. Points C and D

D. Points D and A

ANSWER: B.

請參照下圖中用於流體量測的肘形彎管。

於下列哪一組連接點會量測到最大差壓(假設處於理想的流量狀況)？

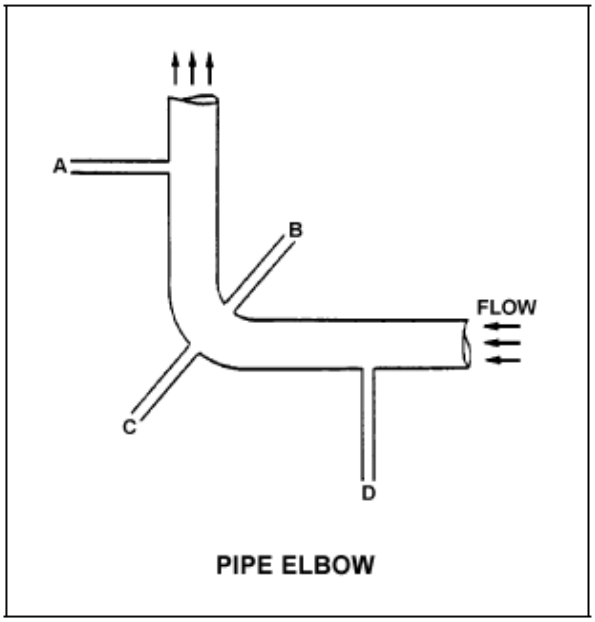
A. 位置 A 與 B

B. 位置 B 與 C

C. 位置 C 與 D

D. 位置 D 與 A

答案：B.



科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P2306 (B2306)

A venturi is used to measure flow rate in a cooling water system. As the water flows from the throat to the discharge of the venturi, water pressure will _____ and volumetric flow rate will _____. (Assume water is incompressible.)

A. increase; remain the same

B. increase; increase

C. decrease; remain the same

D. decrease; decrease

ANSWER: A.

一文氏管用來量測一冷卻水系統之流量。當水從文氏管頸部流至出口時，水壓將會_____而體積流量將會_____(假設水是不可壓縮)。

A. 增加；維持不變

B. 增加；增加

C. 減小；維持不變

D. 減小；減小

答案：A.

科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P2406 (B2206)

A cooling water system is operating at a steady-state flow rate of 700 gpm with 60 psid across a flow transmitter venturi. If cooling water flow rate is increased to 900 gpm, differential pressure across the flow transmitter venturi will be approximately...

A. 68 psid.

B. 77 psid.

C. 99 psid.

D. 127 psid.

ANSWER: C.

一冷卻水系統以700 gpm穩態運轉，文氏管流量計的差壓為60 psid。如果冷卻水流量增加到 900 gpm，則文氏管的差壓將大約是……

A. 68 psid

B. 77 psid

C. 99 psid

D. 127 psid

答案：C.

科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P2506 (B2606)

A venturi is being used to measure flow rate in a cooling water system. As the cooling water flows from the inlet to the throat of the venturi, water pressure will _____ and volumetric flow rate will _____. (Assume water is incompressible.)

A. increase; remain the same

B. increase; increase

C. decrease; remain the same

D. decrease; increase

ANSWER: C.

一文氏管用來量測一冷卻水系統之流量。當水從文氏管的入口流至頸部，水壓將會_____而體積流量將會_____(假設水是不可壓縮)。

A. 增加；維持不變

B. 增加；增加

C. 減小；維持不變

D. 減小；增加

答案：C.

科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P2507 (B2508)

A differential pressure detector is being used with an orifice plate to measure water flow rate through a pipe. When the flow detector was last calibrated, the following parameters were observed:

Upstream Pressure: 125 psig	Actual Flow Rate:100 gpm
Downstream Pressure: 116 psig	Indicated Flow Rate: 100 gpm

Significant erosion of the orifice has occurred since the calibration such that actual flow rate through the orifice has increased to 120 gpm while the upstream and downstream pressures have changed to 110 psig and 106 psig respectively.

What is the approximate flow rate that is currently indicated?

A. 44 gpm

B. 67 gpm

C. 81 gpm

D. 120 gpm

ANSWER: B.

一差壓流量計使用一限流孔板，量測流過一管路之水流量。當此流量計於上次校正時，觀察到以下參數：

上游壓力：125 psig	實際流量：100 gpm
下游壓力：116 psig	指示流量：100 gpm

自從上次校正後，限流孔板發生嚴重沖蝕，以致於流過限流孔的實際流量達到 120 gpm，而上游與下游壓力分別變為 110 psig 與 106 psig。

則目前所指示的流量，約是下列何者？

A. 44 gpm

B. 67 gpm

C. 81 gpm

D. 120 gpm

答案： B.

科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P2606

A cooling water system is operating at steady-state conditions at 900 gpm with 64 psid across the flow transmitter venturi. Cooling water flow rate changes such that venturi differential pressure decreases to 36 psid.

Which one of the following is the new system flow rate?

A. 506 gpm

B. 576 gpm

C. 675 gpm

D. 745 gpm

ANSWER: C.

一冷卻水系統以900 gpm的流量穩態運轉，文氏管流量計差壓為64 psid。冷卻水流量改變後，文氏管差壓則降至36 psid。

下列何者為新的系統流量？

A. 506 gpm

B. 576 gpm

C. 675 gpm

D. 745 gpm

答案：C.

科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P2808 (B2806)

A differential pressure detector is being used with an orifice plate to measure water flow rate through a pipe. When the flow detector was last calibrated, the following parameters were observed:

Upstream Pressure: 135 psig
Downstream Pressure: 120 psig

Actual Flow Rate: 100 gpm
Indicated Flow Rate: 100 gpm

Significant erosion of the orifice plate opening has occurred since the last calibration such that actual flow rate through the orifice has increased to 120 gpm while the upstream and downstream pressures have changed to 124 psig and 109 psig respectively.

What is the approximate currently indicated flow rate?

A. 44 gpm

B. 67 gpm

C. 100 gpm

D. 120 gpm

ANSWER: C.

一差壓流量計使用一限流孔板，量測流經管路的水流量。當流量計在前次校正時，觀察到以下參數：

上游壓力：135 psig
下游壓力：120psig

實際流量：100gpm
指示流量：100gpm

於前次校正之後，限流孔產生嚴重沖蝕，以至於實際流經限流孔的流量，增加到120gpm，而上游與下游壓力分別變為 124 psig 與109psig。

則目前所指示的流量約為下列何者？

A. 44 gpm

B. 67 gpm

C. 100 gpm

D. 120 gpm

答案：C.

科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P3207 (B3206)

A cooling water system uses a horizontal venturi with a differential pressure flow detector to provide cooling water flow rate indication. Water enters and leaves the venturi at 70EF, 120 psig and 20 ft/sec. Water velocity at the throat of the venturi is 45 ft/sec. Assume water is incompressible and the venturi experiences no unrecoverable head loss.

What is the approximate pressure of the water at the throat of the venturi?

A. 109 psig

B. 98 psig

C. 86 psig

D. 71 psig

ANSWER: A.

一冷卻水系統使用具差壓流量計的水平文氏管，提供水流的流量指示。水以70°F、120 psig 及20 ft/sec 進出文氏管。文氏管頸部流速為45 ft/sec。假設水為不可壓縮，且文氏管無不可回復之水頭損失。

水在文氏管頸部的大約壓力為何？

A. 109 psig

B. 98 psig

C. 86 psig

D. 71 psig

答案：A.

科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P3306 (B2010)

A cooling water system is operating at steady-state conditions. A calibrated system flow meter indicates 600 gpm with 50 psid across the flow transmitter venturi.

If cooling water flow rate is increased to 900 gpm, differential pressure across the flow transmitter venturi will be approximately...

A. 63 psid.

B. 75 psid.

C. 97 psid.

D. 112 psid.

ANSWER: D.

一冷卻水系統在穩態情況下運轉。一經校正的系統流量計讀數為600 gpm，而文氏管流量計的差壓為50 psid。

如果冷卻水流量增加至900 gpm，則文氏管流量計的差壓將約是……

A. 63 psid

B. 75 psid

C. 97 psid

D. 112 psid

答案：D.

科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P3706 (B3706)

The following is the current calibration data for an orifice plate that is being used for water flow rate measurement:

Upstream Pressure: 135 psig
Downstream Pressure: 120 psig
Flow Rate: 100 gpm

During a surveillance the following pressures are observed across the orifice plate:

Upstream Pressure: 124 psig
Downstream Pressure: 117 psig

What is the approximate water flow rate through the orifice plate?

A. 47 gpm

B. 57 gpm

C. 68 gpm

D. 78 gpm

ANSWER: C.

下面是目前用來量測水流量的限流孔板校正數據：

上游壓力：135 psig
下游壓力：120 psig
流量： 100 gpm

監測時，觀察到流經限流孔板的壓力如下:

上游壓力：124 psig
下游壓力：117 psig

流經限流孔板的水流量約為？

A. 47 gpm

B. 57 gpm

C. 68 gpm

D. 78 gpm

答案：C.

科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P3807 (B3807)

Refer to the drawing of a differential pressure manometer (see figure below).

The manometer is filled with water and installed across an orifice in a ventilation duct to determine the rate of air flow. The manometer is currently indicating a water level difference of 16 inches at an air flow rate of 300 ft^3/min.

Which one of the following will be the approximate rate of air flow when the manometer indicates a water level difference of 4 inches?

A. 75 ft^3/min.

B. 125 ft^3/min.

C. 150 ft^3/min.

D. 175 ft^3/min.

ANSWER: C.

請參照下圖的差壓壓力計。

壓力計注滿水後，裝至通風管中的限流孔以量測氣體流量。該壓力計目前顯示的水位差為 16 英吋，氣體流量為 300 ft^3/min。

假如壓力計顯示的水位差為 4 英吋，此時氣體流量約為下列何者？

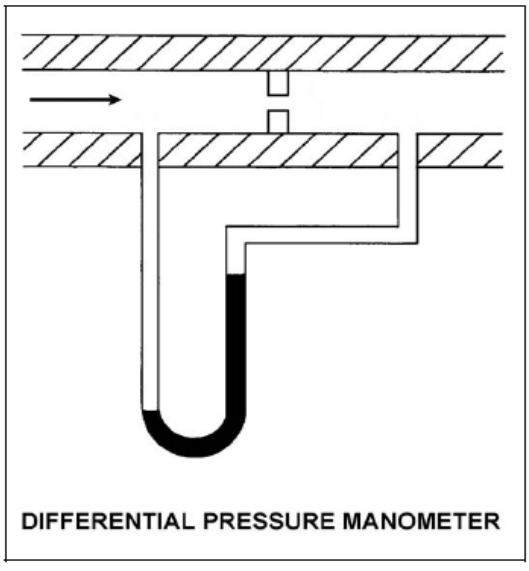
A. 75 ft^3/min

B. 125 ft^3/min

C. 150 ft^3/min

D. 175 ft^3/min

答案：C.



科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P4003 (B4005)

A differential pressure detector is being used with an orifice plate to measure water flow rate through a pipe. When the flow instrument was last calibrated, the following parameters were observed:

Upstream Pressure: 125 psig Actual Flow Rate:100 gpm
Downstream Pressure: 116 psig Indicated Flow Rate: 100 gpm

Since the calibration, debris has collected in the orifice such that the actual flow rate through the orifice has decreased to 80 gpm while the upstream and downstream pressures have changed to 135 psig and 110 psig, respectively.

What is the approximate flow rate that is currently indicated by the flow instrument?

A. 125 gpm

B. 133 gpm

C. 156 gpm

D. 167 gpm

ANSWER: D.

一差壓流量計使用限流孔板，量測流過管線的水流量。前次校正流量計時，觀察到以下參數：

上游壓力：125 psig 實際流量：100 gpm
下游壓力：116 psig 顯示流量：100 gpm

限流孔自前次校正起堆積碎片，以致流過限流孔的實際流量，減少到 80 gpm，上游與下游壓力分別變成135 psig 與110 psig。

請問下列何者為流量計目前顯示的約略流量？

A. 125 gpm

B. 133 gpm

C. 156 gpm

D. 167 gpm

答案：D.

科目： 191002
知能類：K1.05 [2.6/2.8]
序號： P4604 (B4605)

Refer to the drawing of a differential pressure manometer (see figure below).

The manometer is filled with water and installed across an orifice in a ventilation duct to determine the rate of air flow. The manometer is currently indicating a water level difference of 8 inches at an air flow rate of 300 cubic feet per minute (ft3/min).

Which one of the following will be the approximate air flow rate when the manometer indicates a water level difference of 4 inches?

A. 75 ft^3/min

B. 150 ft^3/min

C. 188 ft^3/min

D. 212 ft^3/min

ANSWER: D.

請參照下圖的差壓壓力計。

壓力計注滿水後，裝至通風管中的限流孔以量測氣體流量。該壓力計目前顯示的水位差為 8 英吋，氣體流量為 300 ft^3/min。

假如壓力計顯示的水位差為 4 英吋，下列何者為約略的氣體流量？

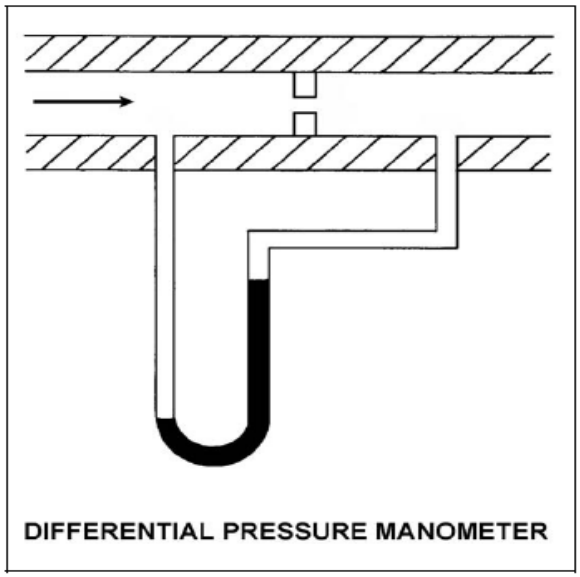
A. 75 ft^3/min

B. 150 ft^3/min

C. 188 ft^3/min

D. 212 ft^3/min

答案：D.



科目： 191002
知能類：K1.06 [2.5/2.6]
序號： P3208

A nuclear reactor is currently shut down at 140°F and 150 psig. Pressurizer level is being monitored using a normal at-power pressurizer level instrument that was calibrated at normal plant operating conditions.

The pressurizer level instrument indicates _____ than actual pressurizer level because, compared to the calibration conditions, there has been a significant change in the density of the fluid in the _____.

A. lower; reference leg

B. lower; pressurizer

C. higher; reference leg

D. higher; pressurizer

ANSWER: D.

一核能機組現於 140°F 與 150 psig 的停機狀態下，使用正常功率運轉的調壓槽(pressurizer)水位計來監控調壓槽水位，該水位計以機組正常運轉條件作校正。

調壓槽水位計顯示的水位_____調壓槽實際水位，這是因相較於校正條件_____的流體密度出現明顯改變所致。

A. 低於；參考水柱(reference leg)

B. 低於；調壓槽

C. 高於；參考水柱

D. 高於；調壓槽

答案：D.

科目： 191002
知能類：K1.06 [2.5/2.6]
序號： P208 (B909)

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

The associated level instrument was calibrated with the water in the storage tank at 100°F. If mass in the tank remains constant and the water temperature increases to 120°F, the indicated level will...

A. increase in direct proportion to the temperature rise.

B. increase but remain less than actual level.

C. decrease in direct proportion to the temperature rise.

D. remain the same although actual level increases.

ANSWER: D.

請參照下圖的水槽差壓(D/P)水位計。

該水位計於100°F的儲水槽溫度下校正。如果此槽的質量維持不變，而水溫增加至120°F，顯示水位將會……

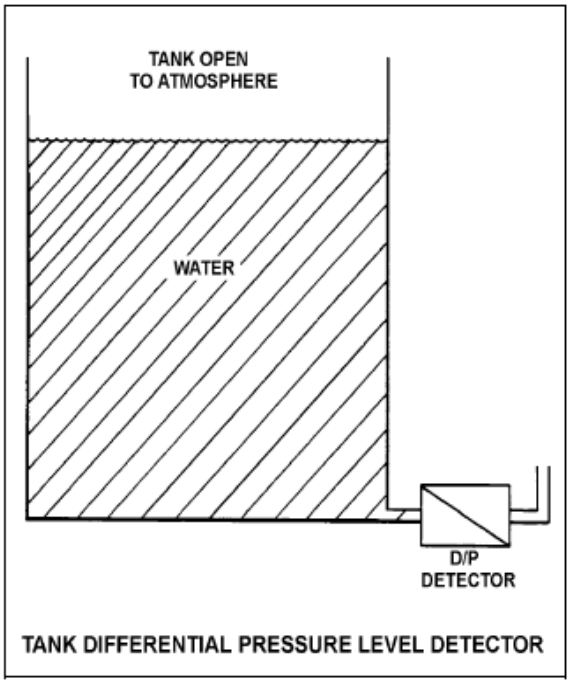
A. 隨溫度上升而成正比升高。

B. 升高，但維持小於實際水位的數值。

C. 隨溫度上升而成正比降低。

D. 儘管實際水位增加，仍然維持不變。

答案：D.



TANK DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 191002
知能類：K1.06 [2.5/2.6]
序號： P411

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

With the nuclear power plant at normal operating conditions, a pressurizer level D/P instrument, that had been calibrated while the plant was in a cold condition, would indicate _____ than actual level because of a _____ D/P sensed by the D/P detector at normal operating conditions.

A. higher; smaller

B. higher; larger

C. lower; smaller

D. lower; larger

ANSWER: D.

請參照下圖的調壓槽差壓(D/P)水位計。

假如核能電廠正常運轉，一調壓槽的差壓水位計，已於電廠處於冷停機條件下校正，該水位計的顯示水位_____實際水位，這是差壓水位計在正常運轉狀況下偵測到的差壓_____所致。

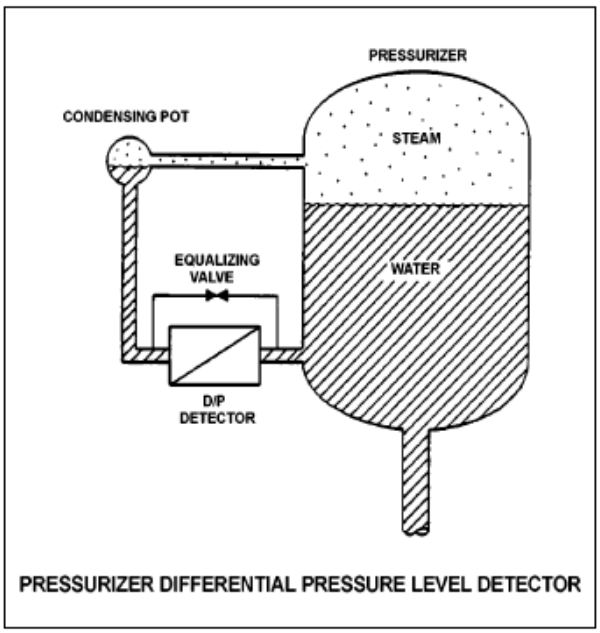
A. 高於；較小

B. 高於；較大

C. 低於；較小

D. 低於；較小

答案：D.



PRESSURIZER DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 191002
知能類：K1.06 [2.5/2.6]
序號： P507

Refer to the drawing of a tank differential pressure level detector that was recently calibrated at a tank water temperature of 80°F (see figure below).

If the mass of the water in the tank remains the same while the tank water temperature is raised from 80°F to 150°F, the indicated level will...

A. remain equal to actual level.

B. increase due to the expansion of the water.

C. remain the same.

D. decrease due to the expansion of the water.

ANSWER: C.

請參照下圖的水槽差壓(D/P)水位計，該水位計最近於80°F的水槽溫度下校正。

倘若槽內水的質量維持不變，而水溫從80°F增加至150°F，顯示水位將會……

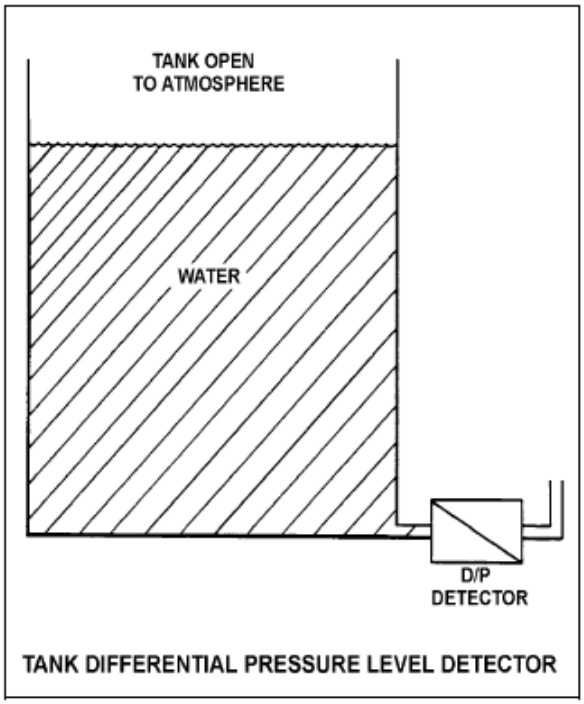
A. 同於實際水位。

B. 水膨脹而導致升高。

C. 維持不變。

D. 水膨脹而導致降低。

答案：C.



TANK DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 191002
知能類：K1.06 [2.5/2.6]
序號： P608

Refer to the drawing of two tank differential pressure (D/P) level indicators (see figure below).

Two D/P level indicators are installed on a large water storage tank. Indicator 1 was calibrated at 100°F water temperature and indicator 2 was calibrated at 200°F water temperature.

Assuming both indicators are on scale, which one will indicate the higher level?

A. Indicator 1 at all water temperatures

B. Indicator 2 at all water temperatures

C. Indicator 1 below 150°F, indicator 2 above 150°F

D. Indicator 2 below 150°F, indicator 1 above 150°F

ANSWER: B.

請參照下圖的兩個槽差壓(D/P)水位計，

兩個差壓水位計裝於大型儲水槽。第 1 水位計於 100°F 的水溫校正，第 2 水位計於 200°F 的水溫校正。

假設兩個水位計的顯示數據都在刻度範圍內(on scale)，何者顯示的水位較高？

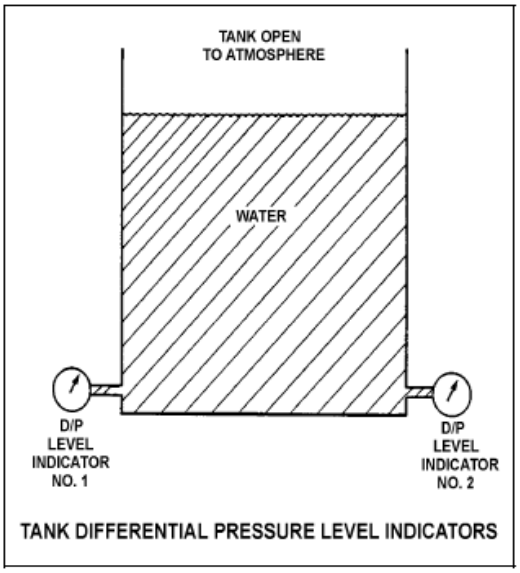
A. 無論水溫為何，都是第 1 水位計。

B. 無論水溫為何，都是第 2 水位計。

C. 150°F 以下為第 1 水位計，150°F 以上為第 2 水位計。

D. 150°F 以下為第 2 水位計，150°F 以上為第 1 水位計。

答案：B.



TANK DIFFERENTIAL PRESSURE LEVEL INDICATORS

科目： 191002
知能類：K1.06 [2.5/2.6]
序號： P808 (B809)

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

The D/P level detector is being used in a level control system that is calibrated to maintain tank level at 80% at the current tank temperature of 100°F. If tank temperature gradually increases and stabilizes at 150°F, actual tank level will...

A. remain at 80%.

B. increase and stabilize above 80%.

C. oscillate around 80%.

D. decrease and stabilize below 80%.

ANSWER: B.

請參照下圖的水槽差壓水位計。

該水位計用於水位控制系統，經過校正後，能在100°F的現有槽溫下，維持80%的水位。如果槽溫漸增並穩定在150°F，水槽的實際水位將……

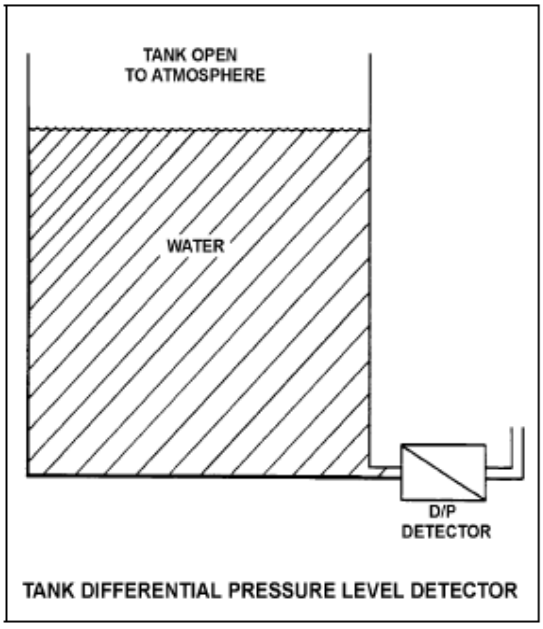
A. 維持在 80%。

B. 升高，並穩定於80%以上。

C. 在80%來回振盪。

D. 降低，並穩定在80%以下。

答案：B.



TANK DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 191002
知能類：K1.06 [2.5/2.6]
序號： P1107 (B1507)

Refer to the drawing of two tank differential pressure (D/P) level indicators (see figure below).

Two D/P level indicators are installed on a large water storage tank. Indicator 1 was calibrated at 100°F water temperature and indicator 2 was calibrated at 200°F water temperature.

Assuming both indicators are on scale, which indicator will indicate the lower level?

A. Indicator 1 at all water temperatures

B. Indicator 2 at all water temperatures

C. Indicator 1 below 150°F, indicator 2 above 150°F

D. Indicator 2 below 150°F, indicator 1 above 150°F

ANSWER: A.

請參照下圖的兩個水槽差壓水位計。

兩個差壓水位計裝在一大型儲水槽。第1水位計於100°F的水溫校正，第2水位計於200°F的水溫校正。

假設兩個水位計的指示數據均在刻度範圍內，哪個水位計顯示的水位較低？

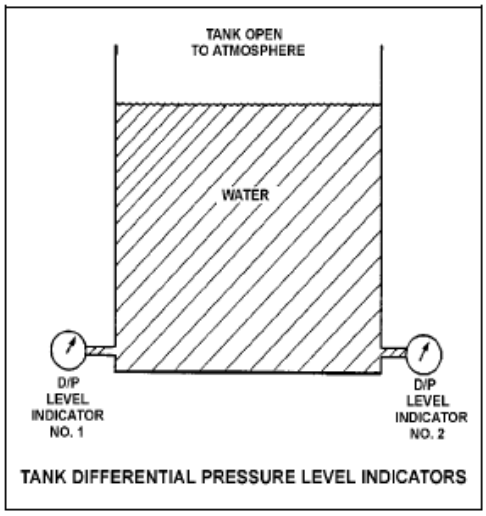
A. 無論水溫為何，都是第1水位計。

B. 無論水溫為何，都是第2水位計。

C. 150°F以下為第1水位計，150°F以上為第2水位計。

D. 150°F以下為第2水位計，150°F以上為第1水位計。

答案：A.



TANK DIFFERENTIAL PRESSURE LEVEL INDICATORS

科目： 191002
知能類：K1.06 [2.5/2.6]
序號： P4104

Refer to the drawing of a pressurizer and differential pressure (D/P) level detector that was recently calibrated at normal operating conditions (see figure below). Assume that the associated pressurizer level instrument does not use density compensation.

With the nuclear power plant shut down at reduced reactor coolant system temperature and pressure, the pressurizer level instrument will indicate _____ than actual water level because the D/P currently sensed by the D/P detector is_____ than the D/P for the same pressurizer water level at normal operating conditions.

A. lower; smaller

B. lower; larger

C. higher; smaller

D. higher; larger

ANSWER: C.

請參照下圖的調壓槽與差壓水位計，水位計最近於正常運轉條件下校正。假設相關調壓槽的水位計未使用密度補償。

當核能機組停機降溫降壓後，調壓槽水位計的顯示數據將_____實際水位，因為差壓水位計目前偵測到的差壓，_____同一調壓槽水位在正常運轉狀況下測得的差壓。

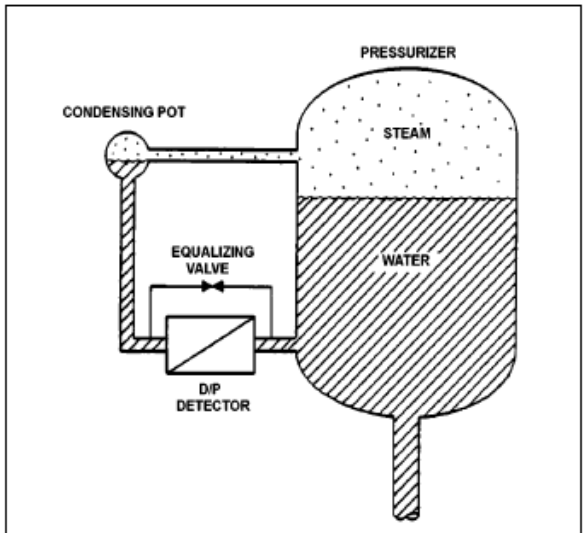
A. 低於；小於

B. 低於；大於

C. 高於；小於

D. 高於；大於

答案：C.



PRESSURIZER DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 191002
知能類：K1.06 [2.5/2.6]
序號： P1706 (B1706)

Refer to the drawing of two tank differential pressure (D/P) level indicators (see figure below).

Two D/P level indicators are installed on a large water storage tank. Indicator No. 1 was calibrated at 200°F water temperature and indicator No. 2 was calibrated at 100°F water temperature.

Assuming both indicators are on scale, which indicator will indicate the lower level?

A. Indicator 1 at all water temperatures

B. Indicator 2 at all water temperatures

C. Indicator 1 below 150°F, indicator 2 above 150°F

D. Indicator 2 below 150°F, indicator 1 above 150°F

ANSWER: B.

請參照下圖的兩個水槽差壓水位計。

兩個差壓水位計裝在一大型儲水槽。第1水位計於200°F的水溫校正，第2水位計於100°F的水溫校正。

假設兩個水位計的指示數據均在刻度範圍內(on scale)，哪個水位計顯示的水位較低？

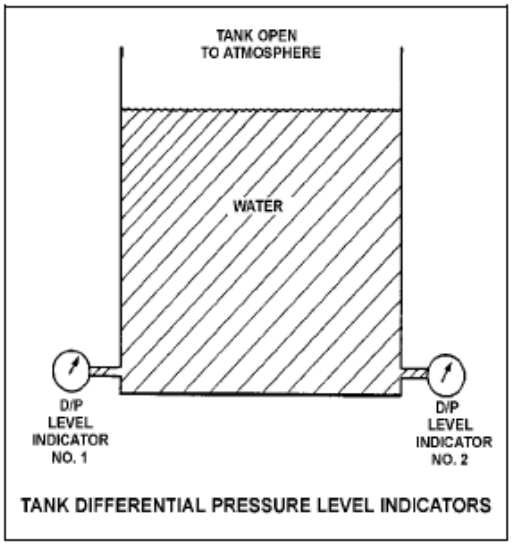
A. 無論水溫為何，都是第1水位計。

B. 無論水溫為何，都是第2水位計。

C. 150°F以下為第1水位計，150°F以上為第2水位計。

D. 150°F以下為第2水位計，150°F以上為第1水位計。

答案：B.



TANK DIFFERENTIAL PRESSURE LEVEL INDICATORS

科目： 191002
知能類：K1.06 [2.5/2.6]
序號： P1907

Refer to the drawing of a water storage tank with two differential pressure (D/P) level indicators (see figure below).

Indicator 1 was calibrated at 120°F and indicator 2 was calibrated at 180°F. If tank water temperature is 150°F, then indicator...

A. 1 will read greater than indicator 2 and greater than actual level.

B. 1 will read greater than indicator 2 and less than actual level.

C. 2 will read greater than indicator 1 and greater than actual level.

D. 2 will read greater than indicator 1 and less than actual level.

ANSWER: C.

請參照下圖的兩個水槽差壓水位計。

第1水位計於120°F的水溫校正，第2水位計於180°F的水溫校正。如果槽內水溫為150°F，此時的水位計……

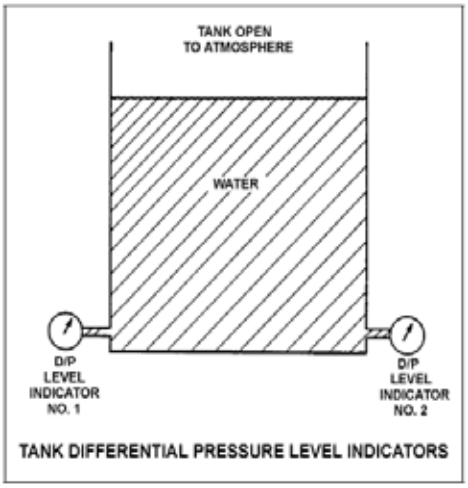
A. 第1水位計的讀取數據將大於第2水位計，亦大於實際水位。

B. 第1水位計的讀取數據將大於第2水位計，並小於實際水位。

C. 第2水位計的讀取數據將大於第1水位計，亦大於實際水位。

D. 第2水位計的讀取數據將大於第1水位計，並小於實際水位。

答案：C.



TANK DIFFERENTIAL PRESSURE LEVEL INDICATORS

科目： 191002
知能類：K1.06 [2.5/2.6]
序號： P2108 (B2408)

Refer to the drawing of a water storage tank with two differential pressure (D/P) level indicators (see figure below).

Indicator 1 was calibrated at 180°F and indicator 2 was calibrated at 120°F. If current tank water temperature is 150°F, then indicator...

A. 1 will read greater than indicator 2 and greater than actual water level.

B. 1 will read greater than indicator 2 and less than actual water level.

C. 2 will read greater than indicator 1 and greater than actual water level.

D. 2 will read greater than indicator 1 and less than actual water level.

ANSWER: A.

請參照下圖的兩個水槽差壓水位計。

第1水位計於180°F的水溫校正，第2水位計於120°F的水溫校正。如果槽內水溫為150°F，此時的水位計……

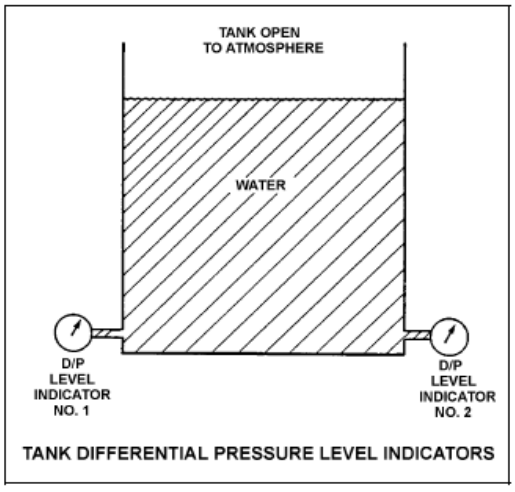
A. 第1水位計的讀取數據將大於第2水位計，亦大於實際水位。

B. 第1水位計的讀取數據將大於第2水位計，並小於實際水位。

C. 第2水位計的讀取數據將大於第1水位計，亦大於實際水位。

D. 第2水位計的讀取數據將大於第1水位計，並小於實際水位。

答案：A.



TANK DIFFERENTIAL PRESSURE LEVEL INDICATORS

科目： 191002
知能類：K1.06 [2.5/2.6]
序號： P2308 (B2308)

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

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

A. lower; reference leg

B. lower; steam generator

C. higher; reference leg

D. higher; steam generator

ANSWER: D.

請參照下圖的蒸汽產生器差壓水位計，該水位計已於正常運轉條件下校正。

反應器冷卻水系統降溫，造成蒸汽產生器的壓力，從 900 psia 降到 400 psia。假設水位計沒有密度補償，在停止降溫時，蒸汽產生器的水位指示值將_____實際水位，因為_____中的水密度顯著改變所致。

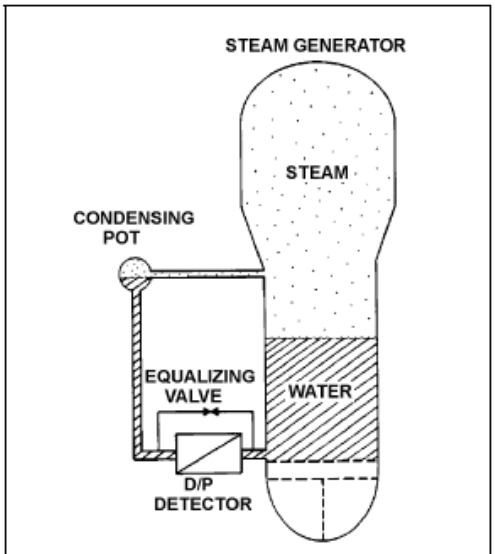
A. 低於；參考水柱

B. 低於；蒸汽產生器

C. 高於；參考水柱

D. 高於；蒸汽產生器

答案：D.



STEAM GENERATOR DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 191002
知能類：K1.06 [2.5/2.6]
序號： P2509

Refer to the drawing of a steam generator (S/G) differential pressure (D/P) level detector (see figure below) that has been calibrated at the current S/G pressure of 400 psia.

A reactor coolant system heatup has resulted in an increase in S/G pressure from 400 psia to 900 psia over 4 hours. The ambient air temperature surrounding the S/G has remained constant.

Without density compensation of the level instrumentation, at the end of the heatup S/G level indication would indicate _____ than actual level because the density of the water in the _____ has changed significantly.

A. higher; steam generator

B. higher; reference leg

C. lower; steam generator

D. lower; reference leg

ANSWER: C.

請參照下圖的蒸汽產生器(S/G)差壓(D/P)水位計，該水位計已於蒸汽產生器目前壓力400 psia下校正。

反應器冷卻水系統升溫，造成蒸汽產生器的壓力在4小時內，從 400 psia 升至 900 psia。蒸汽產生器的四週氣溫維持不變。

假設水位計沒有密度補償，停止升溫時，蒸汽產生器的水位指示值將_____實際水位，因為_____中的水密度顯著改變所致。

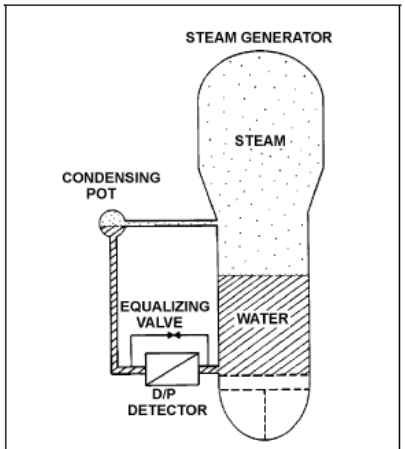
A. 高於；蒸汽產生器

B. 高於；參考水柱

C. 低於；蒸汽產生器

D. 低於；參考水柱

答案：C.



STEAM GENERATOR DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 191002
知能類：K1.06 [2.5/2.6]
序號： P4204 (B4205)

Refer to the drawing of a water storage tank with two differential pressure (D/P) level indicators (see figure below).

Indicator 1 was calibrated at a tank water temperature of 120°F and indicator 2 was calibrated at 180°F. If tank water temperature is currently 150°F, then indicator...

A. 1 will read greater than indicator 2, and indicator 1 will read greater than actual water level.

B. 1 will read greater than indicator 2, and indicator 1 will read less than actual water level.

C. 2 will read greater than indicator 1, and indicator 2 will read greater than actual water level.

D. 2 will read greater than indicator 1, and indicator 2 will read less than actual water level.

ANSWER: C.

請參照下圖的兩個水槽差壓水位計。

第1水位計於120°F的水溫校正，第2水位計於180°F的水溫校正。如果目前的槽內水溫為150°F，此時的水位計……

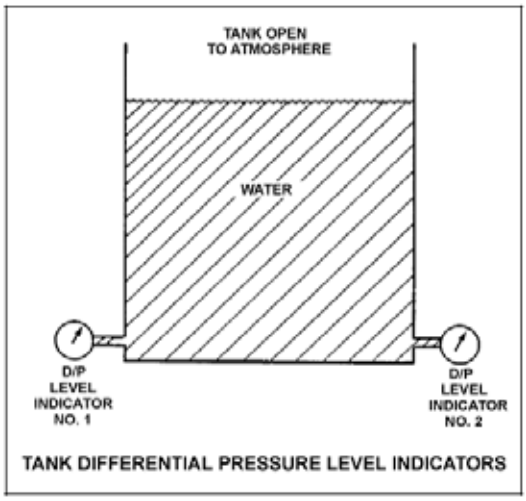
A. 第1水位計的讀取數據將大於第2水位計，亦大於實際水位。

B. 第1水位計的讀取數據將大於第2水位計，並小於實際水位。

C. 第2水位計的讀取數據將大於第1水位計，亦大於實際水位。

D. 第2水位計的讀取數據將大於第1水位計，並小於實際水位。

答案：C.



TANK DIFFERENTIAL PRESSURE LEVEL INDICATORS

科目： 191002
知能類：K1.06 [2.5/2.6]
序號： P4404

Refer to the drawing of a pressurizer differential pressure (D/P) level detector (see figure below). The associated pressurizer level instrument was recently calibrated with the nuclear power plant at normal operating conditions. Assume that the level instrument does not use density compensation.

If the plant is currently shut down at reduced reactor coolant system temperatures and pressure, pressurizer water level will currently indicate _____ than actual water level because, for a given pressurizer water level, the D/P sensed by the D/P detector is currently _____.

A. higher; smaller

B. higher; larger

C. lower; smaller

D. lower; larger

ANSWER: A.

請參照下圖的調壓槽差壓水位計。該調壓槽的水位計，最近於核能電廠正常運轉條件下校正。假設水位計沒有使用密度補償。

如果機組停機並降溫降壓，調壓槽水位計的顯示數據將_____實際水位，這是因為差壓水位計在既定調壓槽水位下，目前測得的差壓_____所致。

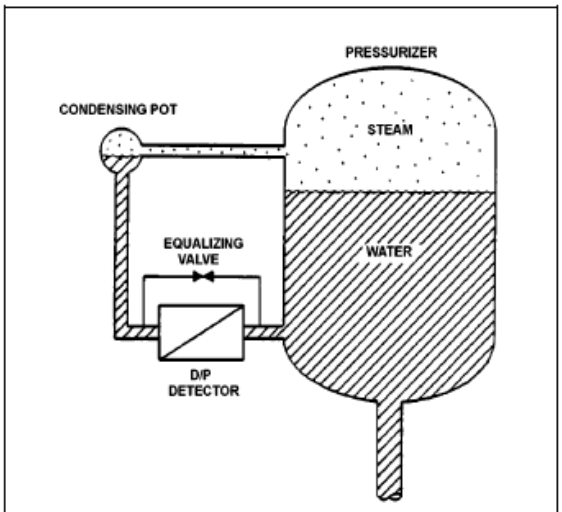
A. 高於；較小

B. 高於；較大

C. 低於；較小

D. 低於；較大

答案：A.



PRESSURIZER DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 191002
知能類：K1.06 [2.5/2.6]
序號： P4504

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

A nuclear power plant uses several differential pressure detectors like the one below to provide multiple channels of pressurizer water level indication. A hot channel was calibrated when the pressurizer was at normal operating temperature. A cold channel was calibrated when the pressurizer was at 160°F.

How do the two pressurizer level indication channels compare when the pressurizer is at normal operating temperature?

A. The cold channel will indicate higher than the hot channel due to the difference in water density in the pressurizer at the two calibration temperatures.

B. The cold channel will indicate lower than the hot channel due to the difference in water density in the pressurizer at the two calibration temperatures.

C. The cold channel will indicate higher than the hot channel due to the difference in water density in the reference legs at the two calibration temperatures.

D. The cold channel will indicate lower than the hot channel due to the difference in water density in the reference legs at the two calibration temperatures.

ANSWER: B.

請參照下圖的調壓槽差壓水位計。

核能電廠採用數個如下圖所示的差壓水位計，提供調壓槽數條控道的水位值。高溫控道於調壓槽處於正常運轉溫度時校正，低溫控道於調壓槽為 160°F 時校正。

調壓槽處於正常運轉溫度時，請比較兩條調壓槽水位指示管的數值？

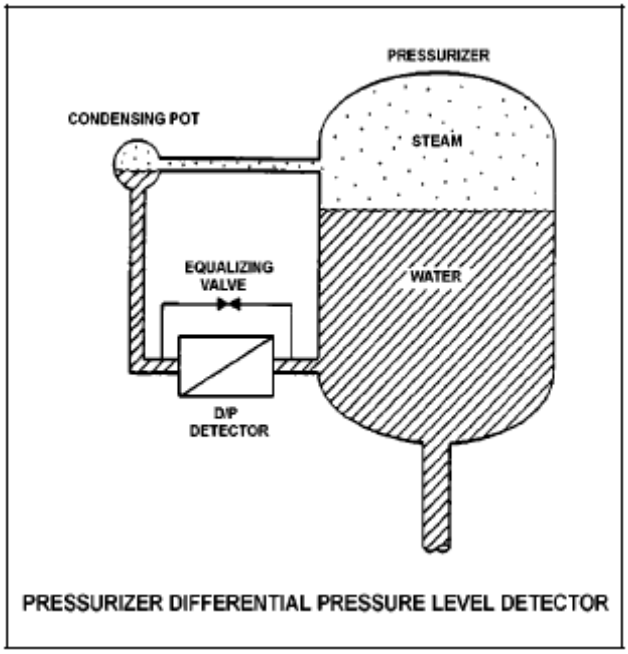
A. 基於調壓槽水密度在兩種校正溫度時的差異，低溫控道指示數據將高於高溫控道。

B. 基於調壓槽水密度在兩種校正溫度時的差異，低溫控道指示數據將低於高溫控道。

C. 基於參考水柱的水密度在兩種校正溫度時的差異，低溫控道指示數據將高於高溫控道。

D. 基於參考水柱的水密度在兩種校正溫度時的差異，低溫控道指示數據將低於高溫控道。

答案：B.



PRESSURIZER DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 191002
知能類：K1.07 [2.5/2.6]
序號： P410

Refer to the drawing of a tank differential pressure level detector (see figure below). If the differential pressure detector equalizing valve is opened, level indication will:

A. decrease and stabilize below actual level.

B. increase and stabilize above actual level.

C. oscillate above and below actual level.

D. remain constant at the current level.

ANSWER: B.

請參照下圖的水槽差壓水位計。差壓水位計平衡閥若開啟，指示水位將：

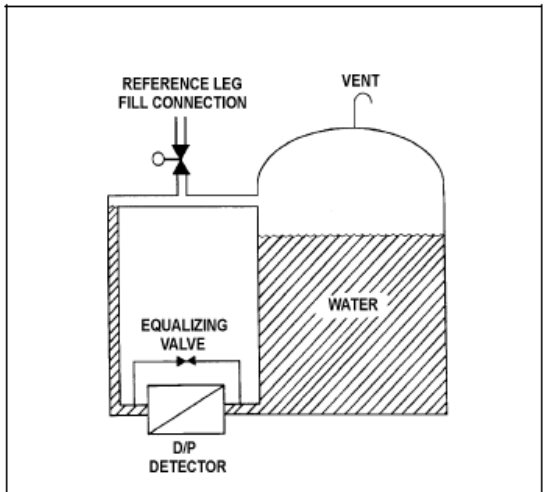
A. 降低，並穩定於實際水位之下。

B. 升高，並穩定於實際水位之上。

C. 於實際水位上下振盪。

D. 維持於現有水位。

答案：B.



TANK DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 191002
知能類：K1.07 [2.5/2.6]
序號： P708 (B2609)

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

The level detector is being used in a level control system that is calibrated to maintain tank level at 75% at the current water temperature of 90°F. If water temperature gradually increases and stabilizes at 120°F, the level control system will cause actual tank level to...

A. remain at 75%.

B. increase and stabilize above 75%.

C. oscillate around 75%.

D. decrease and stabilize below 75%.

ANSWER: B.

請參照下圖的水槽差壓水位計。

水位控制系統使用的水位計，於現有水溫90°F校正以維持75%水槽水位。如果水溫慢慢增加，並於120°F達到穩定，水位控制系統將導致槽的實際水位……

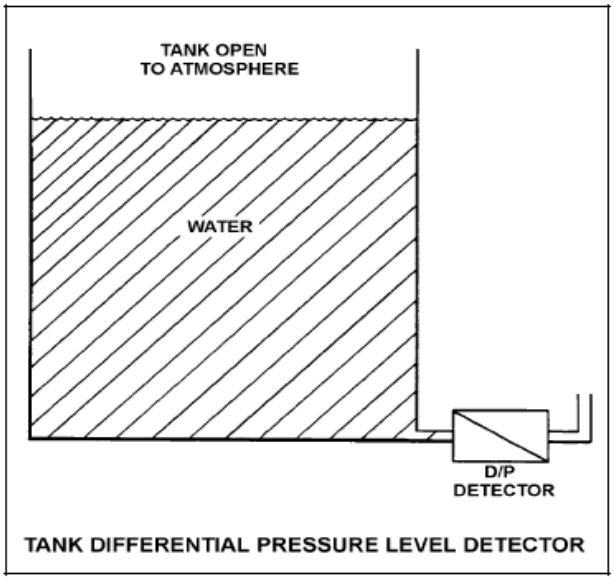
A. 維持在75%。

B. 升高，並穩定於75%以上。

C. 在75%附近震盪。

D. 降低，並穩定在75%以下。

答案：B.



科目： 191002
知能類：K1.07 [2.5/2.6]
序號： P910 (B910)

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

The D/P sensed by the detector varies in the _____ direction as the temperature of the water in the tank if the _____ of the tank water is constant. (Assume reference leg and tank water temperatures are initially the same.)

A. same; level

B. inverse; level

C. same; mass

D. inverse; mass

ANSWER: A.

請參照下圖的水槽差壓水位計。

如果槽內水的_____維持不變，水位計量測的差壓，以_____方向隨著槽內水溫而變化(假設參考水柱與槽內水溫自始相同)。

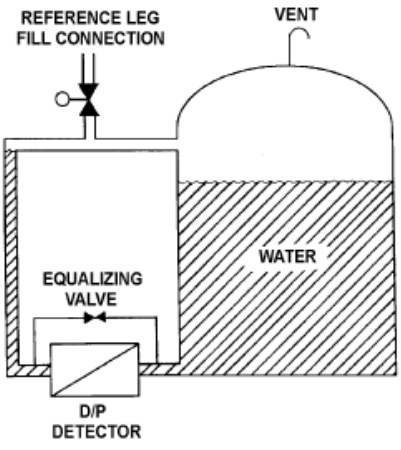
A. 水位；同

B. 水位；反

C. 質量；同

D. 質量；反

答案：A.



TANK DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 191002
知能類：K1.07 [2.5/2.6]
序號： P1008 (B1909)

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

The level detector is being used in a level control system that is calibrated to maintain tank level at 75% at the current water temperature of 120°F. If water temperature gradually decreases and stabilizes at 90°F, actual tank level will...

A. remain at 75%.

B. increase and stabilize above 75%.

C. oscillate around 75%.

D. decrease and stabilize below 75%.

ANSWER: D.

請參照下圖的水槽差壓水位計。

水位控制系統使用的水位計，於120°F的現有水溫校正，以維持75%的槽內水位。如果水溫慢慢降低，並在90°F達到穩定，槽的實際水位將會……

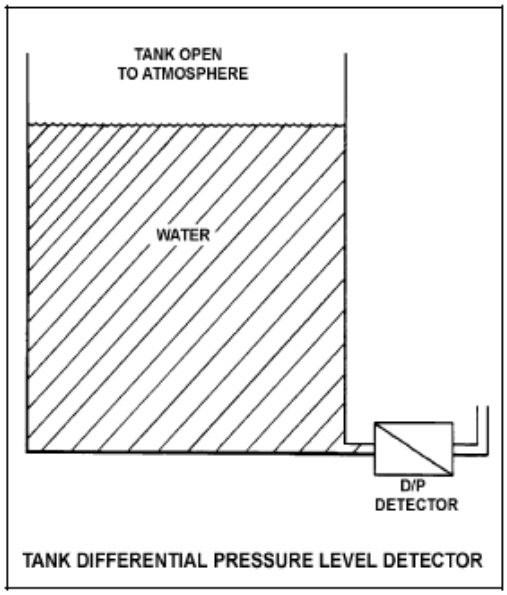
A. 維持在75%。

B. 升高，並穩定於75%以上。

C. 在75%來回震盪。

D. 降低，並穩定於75%以下。

答案：D.



科目： 191002
知能類：K1.07 [2.5/2.6]
序號： P1807 (B1211)

A cooling water system is cooling a lube oil heat exchanger. Cooling water system surge tank level is being measured using a differential pressure level detector that has been calibrated at the current water temperature in the tank. A leak in the heat exchanger results in lube oil collecting in the surge tank.

Assuming that the temperature of the contents in the surge tank does not change, indicated tank level will be _____ than actual tank level because lube oil is _____ than water.

A. higher; more dense

B. higher; less dense

C. lower; more dense

D. lower; less dense

ANSWER: D.

冷卻水系統正在冷卻潤滑油熱交換器。冷卻水系統的緩衝槽(surge tank)水位係利用差壓水位計量測，該水位計已於目前槽內水溫校正。熱交換器發生洩漏，導致潤滑油累積在緩衝槽中。

假設緩衝槽內容物的溫度不變，指示水位將_____實際水位，此乃潤滑油密度____水的密度所致。

A. 高於；高於

B. 高於；低於

C. 低於；高於

D. 低於；低於

答案：D.

科目： 191002
知能類：K1.07 [2.5/2.6]
序號： P2009

Many steam generator water level instruments are designed with a condensing chamber in the reference leg. The purpose of the condensing chamber is to...

A. maintain a constant water level in the reference leg during normal operations.

B. provide reference leg compensation for the steam generator pressure exerted on the variable leg.

C. prevent reference leg flashing during a rapid depressurization of the steam generator.

D. ensure the reference leg temperature remains close to the temperature of the variable leg.

ANSWER: A.

許多蒸汽產生器的水位計設計，都是在參考水柱設置冷凝室。該冷凝室的用意是……

A. 在正常運轉時，維持參考水柱的水位不變。

B. 蒸汽產生器的壓力會影響變動水柱(variable leg)，所以用來彌補參考水柱。

C. 預防參考水柱於蒸汽產生器迅速減壓時閃化(flashing)。

D. 確保參考水柱溫度接近變動水柱溫度。

答案：A.

科目： 191002
知能類：K1.07 [2.5/2.6]
序號： P3008 (B3010)

Refer to the drawing of a tank with differential pressure (D/P) level detector (see figure below). Assume the initial temperature of the reference leg and the water in the tank is 100°F, and that reference leg temperature does not change.

If the temperature of the water in the tank increases by 20°F, the D/P sensed by the detector will _____ as long as the water _____ is maintained constant.

A. increase; level

B. decrease; level

C. increase; mass

D. decrease; mass

ANSWER: A.

請參照下圖的水槽差壓水位計。

假設參考水柱及槽內水的初溫為100°F，而參考水柱的溫度不變。

如果槽內水溫增加20°F，只要槽內水的_____維持不變，水位計量測的差壓會_____。

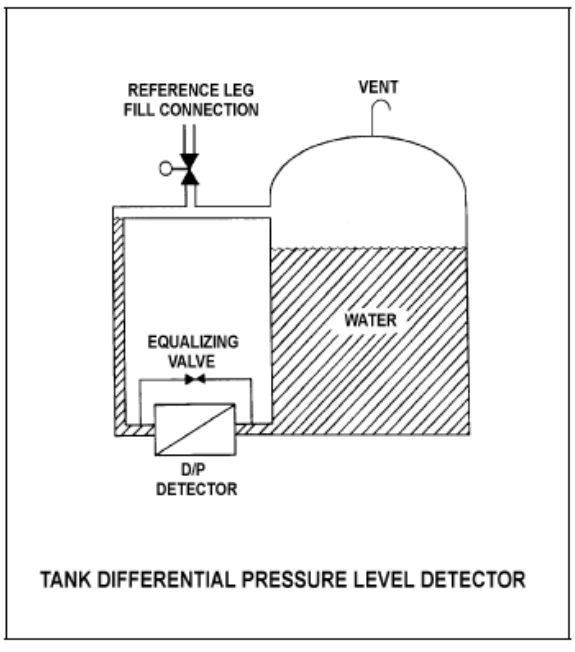
A. 水位；增加

B. 水位；減少

C. 質量；增加

D. 質量；減少

答案：A.



TANK DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 191002
知能類：K1.07 [2.5/2.6]
序號： P3407 (B3408)

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

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

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

A. remain at 75%.

B. increase and stabilize above 75%.

C. oscillate around 75%.

D. decrease and stabilize below 75%.

ANSWER: A.

請參照下圖的水槽差壓水位計。假設參考水柱與槽內水的初溫相等，而參考水柱溫度與水位不變。

該水位計正用於水位控制系統(圖中未顯示)內，並於槽中現有水溫(70°F)與壓力(5 psig)下校正，以維持75%的槽中水位。

如果槽內水溫維持不變，但是槽壓增加10 psig，則此水位控制系統將導致槽內實際水位……

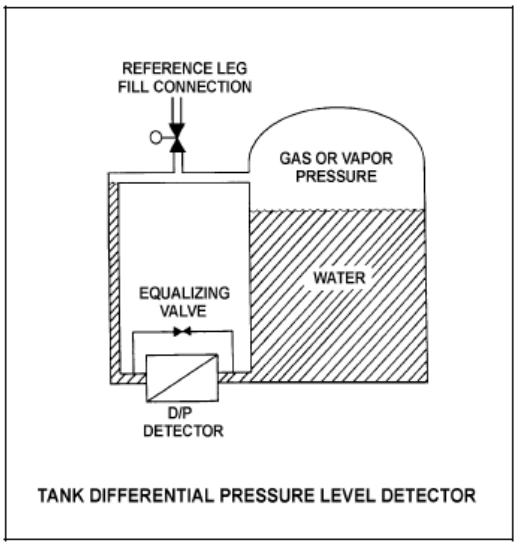
A. 維持在75%。

B. 升高，並穩定於75%以上。

C. 在75%來回震盪。

D. 降低，並穩定於75%以下。

答案：A.



TANK DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 191002
知能類：K1.08 [2.8/3.1]
序號： P11

Refer to the drawing of a water storage tank with a differential pressure (D/P) level detector (see figure below).

The level instrument has just been calibrated to read actual tank water level. If the reference leg subsequently experiences high ambient temperature, indicated level will...

A. equal the actual level.

B. read less than the actual level.

C. read greater than the actual level.

D. drift above and below the actual level.

ANSWER: C.

請參照下圖的儲水槽及差壓水位計。

該水位計剛經過校正，以讀取實際的水槽水位。假如參考水柱的周圍溫度升高，指示水位將：

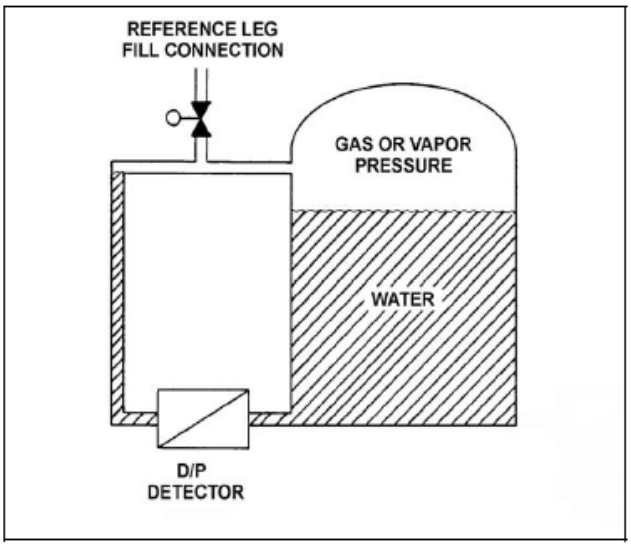
A. 同於實際水位。

B. 讀取數據小於實際水位。

C. 讀取數據大於實際水位。

D. 於實際水位上下飄移。

答案：C.



科目： 191002
知能類：K1.08 [2.8/3.1]
序號： P14 (B510)

Refer to the drawing of a water storage tank with two differential pressure level indicators (see figure below).

Indicator 1 was calibrated at 200°F and indicator 2 was calibrated at 100°F. If tank water temperature is 150°F, then...

A. indicator 1 will read greater than indicator 2.

B. indicator 2 will read greater than indicator 1.

C. indicator 1 and 2 will read the same.

D. both indicators will be inaccurate, but it is impossible to predict which indicator will read greater.

ANSWER: A.

請參照下圖之中，具有兩個差壓水位計的儲水槽。

第1水位計於200°F校正，第2水位計於100°F校正。如果槽內水溫為150°F，則……

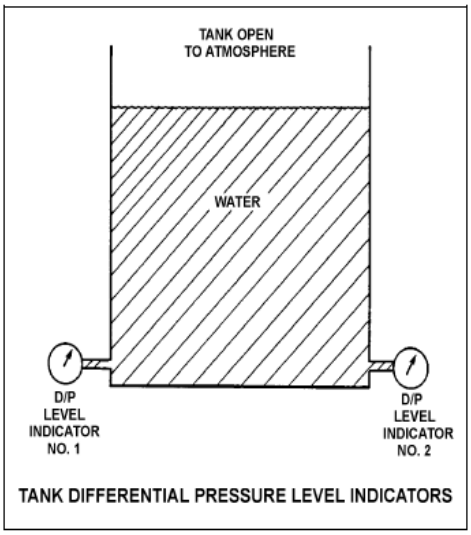
A. 第1水位計的讀取數據大於第2水位計。

B. 第2水位計的讀數據大於第1水位計。

C. 第1水位計的讀取數據同於第2水位計。

D. 兩個水位計均不正確，但無法預測何者讀取數據較大。

答案：A.



TANK DIFFERENTIAL PRESSURE LEVEL INDICATORS

科目： 191002
知能類：K1.08 [2.8/3.1]
序號： P609 (B12)

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

The tanks are identical with equal water levels and both are pressurized to 20 psig. All detectors were calibrated at the current water temperature and 70°F external (ambient) temperature.

Which detectors will provide the most accurate level indication following an increase in external (ambient) temperature from 70°F to 100°F? (Assume tank contents temperatures and external pressure do not change.)

A. 1 and 3

B. 2 and 4

C. 1 and 4

D. 2 and 3

ANSWER: B.

請參照下圖的四個水槽差壓水位計。

兩槽水位相等，壓力均為 20 psig，所有水位計於現有水溫及70°F的外部(環境)溫度下校正。

外部(環境)溫度從70°F增至100°F時，哪些水位計將顯示最準確的水位(假設槽內溫度及外部壓力不變）？

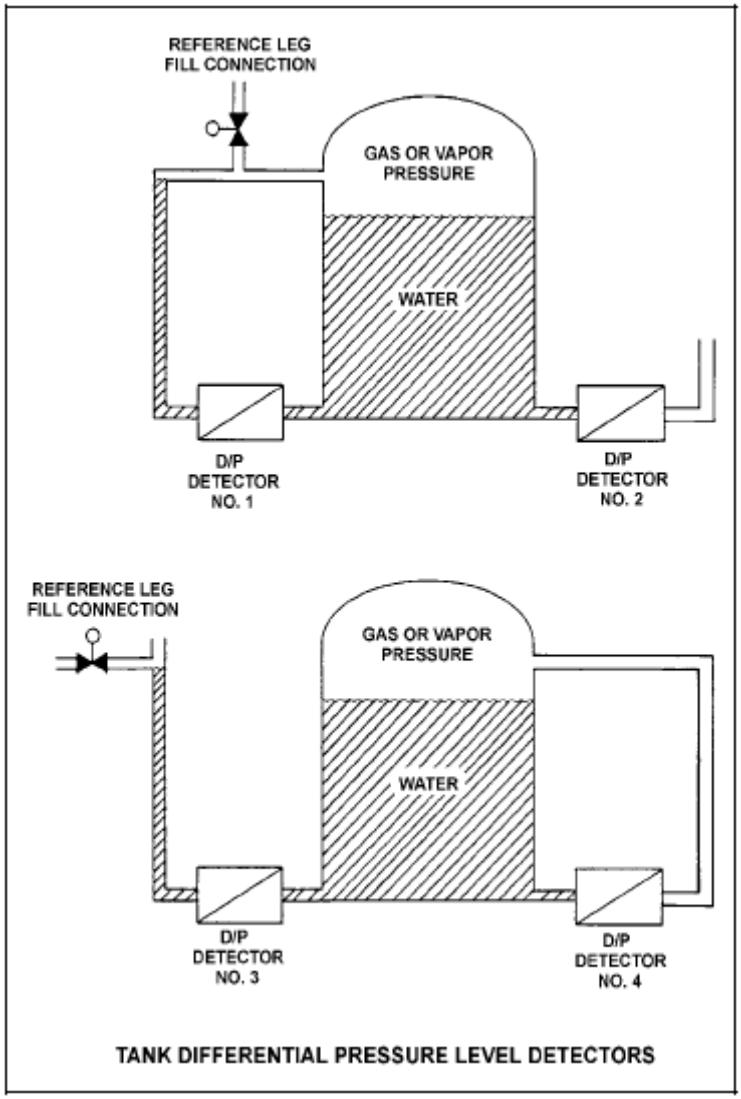
A. 1與3

B. 2與4

C. 1與4

D. 2與3

答案：B.



TANK DIFFERENTIAL PRESSURE LEVEL DETECTORS

科目： 191002
知能類：K1.08 [2.8/3.1]
序號： P1108 (B1609)

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

A calibrated D/P level detector is being used to measure level in a vented tank inside the auxiliary building. If building pressure increases with no change in temperature, the associated level indication will...

A. decrease, then increase and stabilize at the actual level.

B. decrease and stabilize below the actual level.

C. increase and stabilize above the actual level.

D. remain at the actual level.

ANSWER: D.

請參照下圖的水槽差壓水位計。

使用校正過的差壓水位計，來測量置於輔助廠房內的逸氣槽水位。如果廠房壓力增加，但溫度不變，對應的指示水位將……

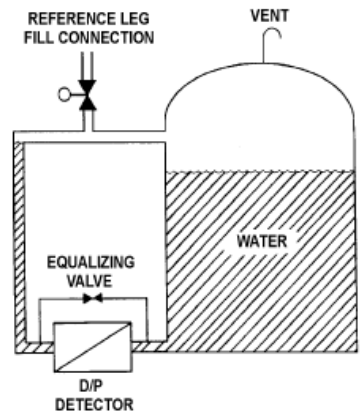
A. 先降低再增加，並於實際水位達到穩定。

B. 降低，並於實際水位以下達到穩定。

C. 升高，並於實際水位以上達到穩定。

D. 維持在實際水位。

答案：D.



TANK DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 191002
知能類：K1.08 [2.8/3.1]
序號： P1411

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

With the nuclear power plant in cold shutdown conditions, a pressurizer level D/P instrument, which was calibrated while the plant was at normal operating conditions, will indicate _____ than actual level because the D/P sensed by the detector at cold shutdown conditions will be _____ than at normal operating conditions. (Assume actual pressurizer level has not changed.)

A. lower; larger

B. lower; smaller

C. higher; larger

D. higher; smaller

ANSWER: D.

請參照下圖的調壓槽差壓水位計。

如果核能電廠處於冷停機狀態，調壓槽的差壓水位計(已於電廠正常運轉時校正)，將顯示_____實際水位的數據，因為水位計在冷停機時測得的差壓，將_____正常運轉下測得的差壓(假設調壓槽的實際水位不變)。

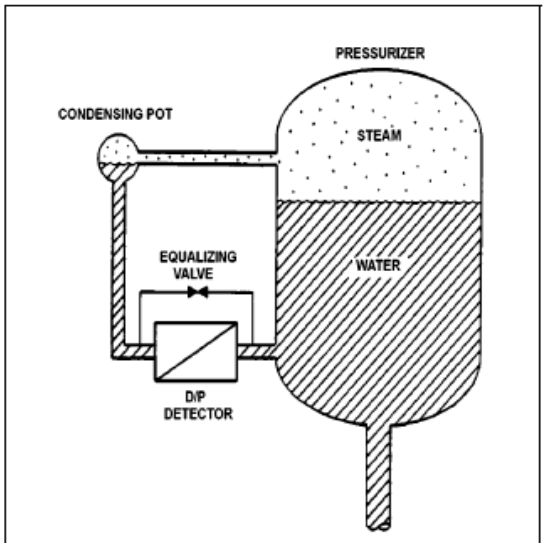
A. 低於；大於

B. 低於；小於

C. 高於；大於

D. 高於；小於

答案：D.



PRESSURIZER DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 191002
知能類：K1.08 [2.8/3.1]
序號： P1607 (B1409)

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

The associated level instrument was calibrated with the water in the tank at 120°F. If the mass of water in the tank remains constant and the water temperature decreases to 100°F, the indicated level will...

A. remain the same although actual level increases.

B. remain the same although actual level decreases.

C. increase in direct proportion to the temperature decrease.

D. decrease in direct proportion to the temperature decrease.

ANSWER: B.

請參照下圖的水槽差壓水位計。

相關水位計於槽內水溫120°F時校正。如果此槽質量維持固定，而水溫降至100°F，指示水位將……

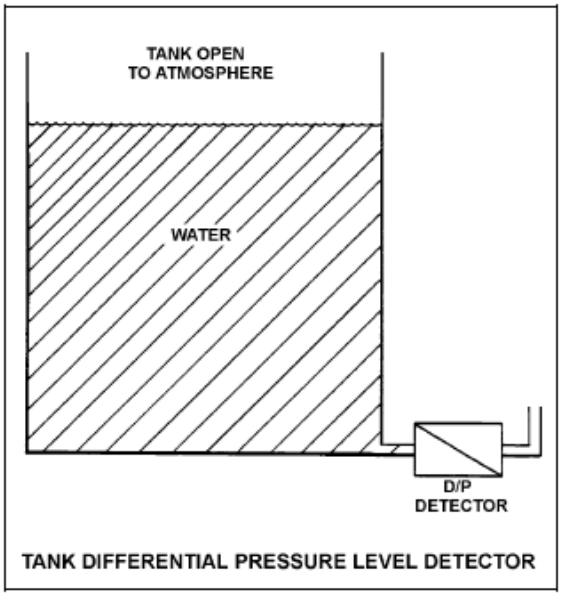
A. 儘管實際水位上升，指示水位仍維持不變。

B. 儘管實際水位降低，指示水位仍維持不變。

C. 隨溫度降低成比例升高。

D. 隨溫度降低成比例降低。

答案：B.



TANK DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 191002
知能類：K1.08 [2.8/3.1]
序號： P2810 (B2808)

Refer to the drawing of a pressurizer level detection system (see figure below). The differential pressure (D/P) detector was calibrated while the nuclear power plant was at normal operating conditions.

With the plant initially at normal operating conditions, a pressurizer steam space leak has occurred. The pressurizer pressure has decreased by 300 psia, and ambient air temperature surrounding the reference leg has increased by 80°F, where these parameters have stabilized.

If the actual pressurizer level is 60%, the reduced pressurizer pressure will tend to make the indicated pressurizer level read _____ than actual; the increased reference leg temperature will tend to make the indicated pressurizer level read _____ than actual.

A. higher; higher

B. higher; lower

C. lower; higher

D. lower; lower

ANSWER: A.

請參照下圖的調壓槽水位偵檢系統。差壓水位計於核能電廠正常運轉時校正。

機組起初正常運轉時，調壓槽的蒸汽外洩。穩定時調壓槽壓力降低300 psia，參考水柱週溫增加80°F。

如果調壓槽的實際水位為60%，調壓槽降壓可能造成指示水位數據_____實際水位；參考水柱溫度增加，將導致調壓槽指示的水位數據_____實際水位。

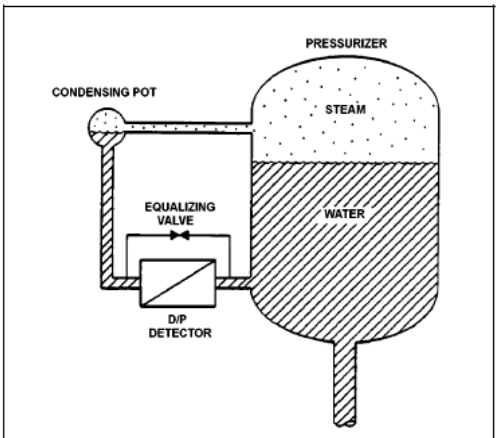
A. 高於；高於

B. 高於；低於

C. 低於；高於

D. 低於；低於

答案：A.



PRESSURIZER DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 191002
知能類：K1.08 [2.8/3.1]
序號： P4004 (B4006)

Refer to the drawing of an open water storage tank with a differential pressure (D/P) level detector (see figure below).

The level instrument has just been calibrated to indicate actual tank water level. Assume that tank water temperature and level remain constant. If the reference leg temperature increases by 20°F, indicated tank water level will...

A. be unpredictable.

B. equal the actual level.

C. read less than the actual level.

D. read greater than the actual level.

ANSWER: B.

請參照下圖的開放式儲水槽，該槽裝有差壓水位計。

水位計剛經過校正，能顯示實際水槽水位。假設槽內水溫與水位維持不變，參考水柱溫度若增加 20°F，指示的槽內水位將……

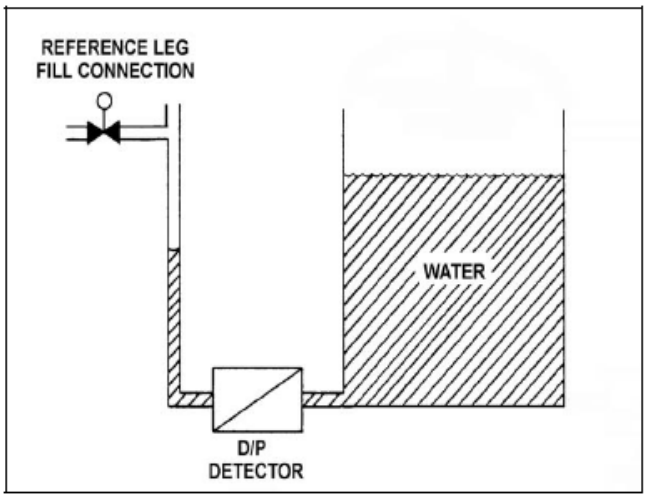
A. 無法預測。

B. 等於實際水位。

C. 讀數小於實際水位。

D. 讀數大於實際水位。

答案：B.



科目： 191002
知能類：K1.09 [2.9/3.0]
序號： P12

The level indication for a reference leg differential pressure (D/P) level instrument will fail low as a result of...

A. a break on the reference leg.

B. a rupture of the diaphragm in the D/P cell.

C. the reference leg flashing to steam.

D. a break on the variable leg.

ANSWER: D.

參考水柱差壓水位計顯示的水位，若出現低值失效(fail low)，其原因在於……

A. 參考水柱破裂。

B. 差壓室(cell)薄膜破裂。

C. 參考水柱閃化成蒸汽。

D. 變動水柱破裂。

答案：D.

科目： 191002
知能類：K1.09 [2.9/3.0]
序號： P209 (B1010)

Refer to the drawing of a steam generator differential pressure (D/P) level detector (see figure below).

Which one of the following failures will cause the associated steam generator level indicator to indicate the lowest level?

A. The D/P detector diaphragm ruptures.

B. The reference leg ruptures.

C. The variable leg ruptures.

D. The equalizing valve is opened.

ANSWER: C.

請參照下圖的蒸汽產生器差壓水位計。

下列何種故障將造成相關的蒸汽產生器水位計，顯示出<u>最低</u>水位？

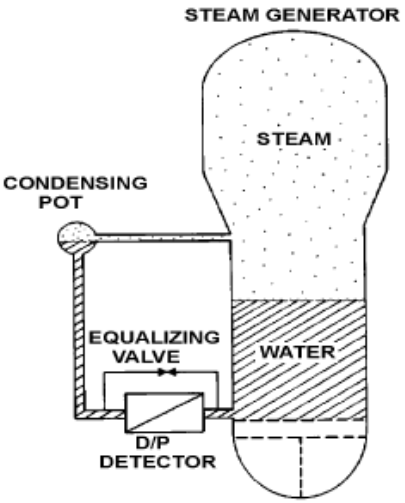
A. 差壓水位計薄膜破裂。

B. 參考水柱破裂。

C. 變動水柱破裂。

D. 平衡閥開啟。

答案：C.



STEAM GENERATOR DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 191002
知能類：K1.09 [2.9/3.0]
序號： P309 (B308)

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

Tank water level indication will be lower than actual level when reference leg temperature is _____ than calibration conditions or when there is a break in the _____ leg of the D/P cell.

A. less; reference

B. less; variable

C. greater; reference

D. greater; variable

ANSWER: B.

請參照下圖的水槽差壓水位計。

當參考水柱溫度_____校正條件時，或是差壓室的_____破裂時，指示水位將低於實際水位。

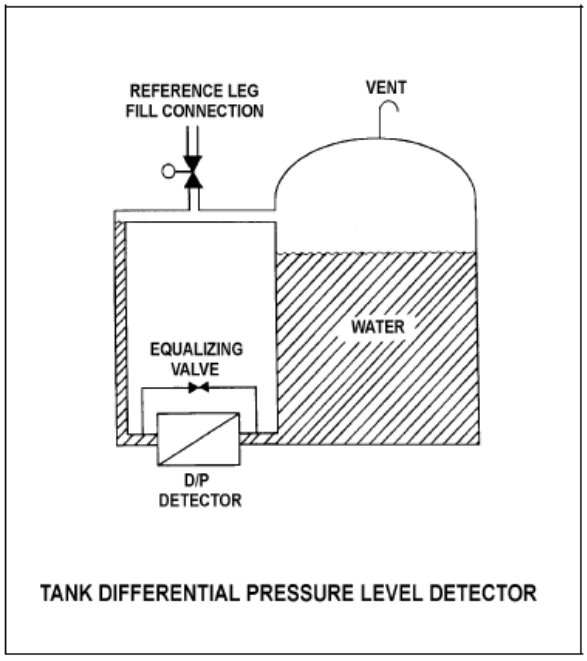
A. 低於；參考水柱

B. 低於；變動水柱

C. 高於；參考水柱

D. 高於；變動水柱

答案：B.



TANK DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 191002
知能類：K1.09 [2.9/3.0]
序號： P911 (B3508)

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

With the nuclear reactor shut down, S/G pressures were inadvertently decreased from 900 psig to 700 psig in 5 minutes due to operator error. S/G pressures were stabilized at 700 psig, but during the pressure decrease a small amount of water in the condensing pot flashed to steam. Assume the reference leg water remains subcooled, except for the small amount of water that flashes to steam in the condensing chamber.

As a result of the small loss of condensing pot water, S/G level will indicate _____ than actual level; and as the condensing pot refills, indicated level will _____.

A. higher; decrease and stabilize above the actual level

B. higher; decrease and stabilize below the actual level

C. lower; increase and stabilize above the actual level

D. lower; increase and stabilize below the actual level

ANSWER: A.

請參照下圖的蒸汽產生器(S/G)差壓水位計，該水位計剛於正常運轉條件下校正。

在核子反應器停機下，由於運轉員疏失使得蒸汽產生器的壓力，意外於5分鐘內從900 psig降至700 psig。蒸汽產生器的壓力於700 psig時趨於穩定，但是在降壓途中，冷凝室(condensing pot)有少量水閃化為蒸汽。假設除了冷凝室的少量水閃化為蒸汽外，參考水柱的水仍維持在次冷狀態。

由於冷凝室損失少量的水，蒸汽產生器指示的水位將_____實際水位；而冷凝室重新補水時，指示水位將_____。

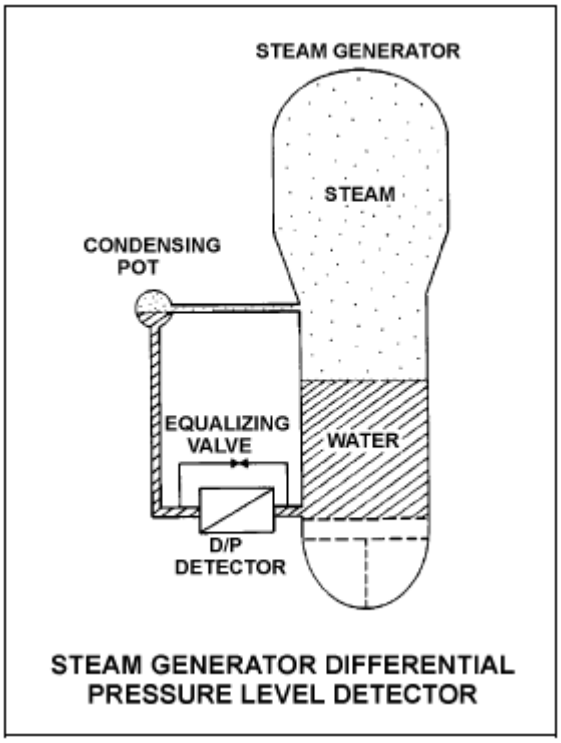
A. 高於；降低，並穩定於實際水位以上。

B. 高於；降低，並穩定於實際水位以下。

C. 低於；升高，並穩定於實際水位以上。

D. 低於；升高，並穩定於實際水位以下。

答案：A



STEAM GENERATOR DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 191002
知能類：K1.09 [2.9/3.0]
序號： P2408 (B1212)

Refer to the drawing of a steam generator (S/G) with a differential pressure (D/P) level detector (see figure below).

Which one of the following events will result in a steam generator level indication that is greater than actual level?

A. The S/G pressure increases by 50 psia.

B. The variable leg breaks and completely drains.

C. A portion of the reference leg water flashes to steam.

D. The temperature surrounding the S/G and reference leg decreases by 30°F.

ANSWER: C.

請參照下圖的蒸汽產生器，該蒸汽產生器裝有差壓水位計。

下列何者將導致蒸汽產生器的指示水位大於實際水位？

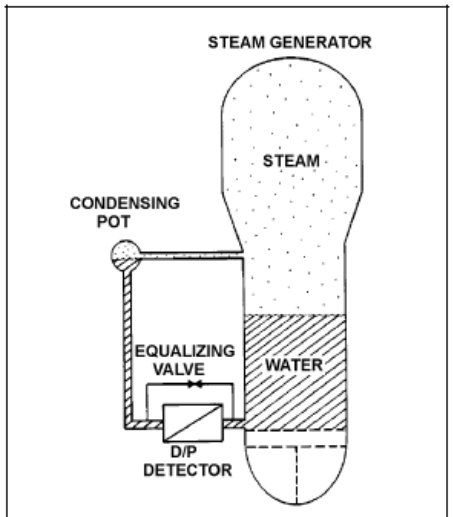
A. 蒸汽產生器壓力增加 50 psia。

B. 變動水柱破裂且漏光。

C. 參考水柱的部份水分閃化成蒸汽。

D. 蒸汽產生器及參考水柱的周圍溫度降低30°F。

答案：C.



STEAM GENERATOR DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 191002
知能類：K1.09 [2.9/3.0]
序號： P2609 (B1410)

Refer to the drawing of a steam generator (S/G) differential pressure (D/P) level detector (see figure below).

The S/G is at normal operating temperature and pressure with accurate level indication. Which one of the following events will result in a S/G level indication that is greater than actual level?

A. The external pressure surrounding the D/P detector increases by 2 psi.

B. S/G pressure increases by 50 psi with no change in actual water level.

C. Actual S/G level increases by 6 inches.

D. The temperature surrounding the reference leg increases by 20°F.

ANSWER: D.

請參照下圖的蒸汽產生器差壓水位計。

蒸汽產生器處於正常運轉溫度及壓力，並能準確顯示水位。下列何者將導致蒸汽產生器指示的水位大於實際水位？

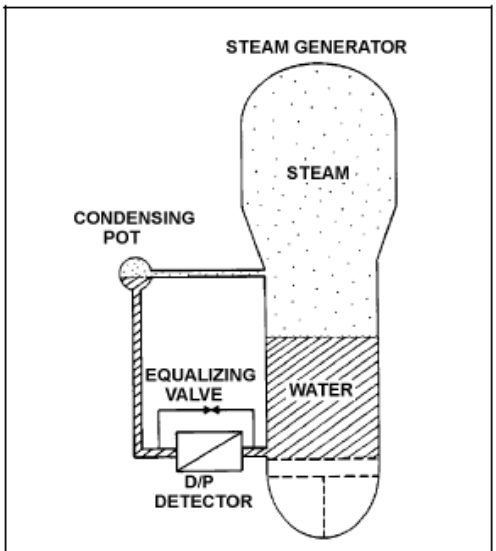
A. 差壓水位計周圍的外部壓力減少2 psi。

B. 實際水位不變下，蒸汽產生器的壓力增加50 psi。

C. 蒸汽產生器的實際水位增加6吋。

D. 參考水柱周圍溫度增加20°F。

答案：D.



STEAM GENERATOR DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 191002
知能類：K1.09 [2.9/3.0]
序號： P2708 (B2709)

Refer to the drawing of a steam generator (S/G) differential pressure (D/P) level detector (see figure below).

The S/G is supplying steam at normal operating temperature and pressure with accurate level indication. Which one of the following events will result in a S/G level indication that is less than actual level?

A. Actual S/G water level decreases by 6 inches.

B. The external pressure surrounding the D/P detector decreases by 2 psi.

C. The temperature surrounding the reference leg increases by 20°F.

D. S/G pressure increases by 50 psi with no change in actual water level.

ANSWER: D.

請參照下圖的蒸汽產生器差壓水位計。

蒸汽產生器正以正常運轉溫度及壓力供應蒸汽，並能準確指示水位。下列何者將導致蒸汽產生器指示的水位小於實際水位？

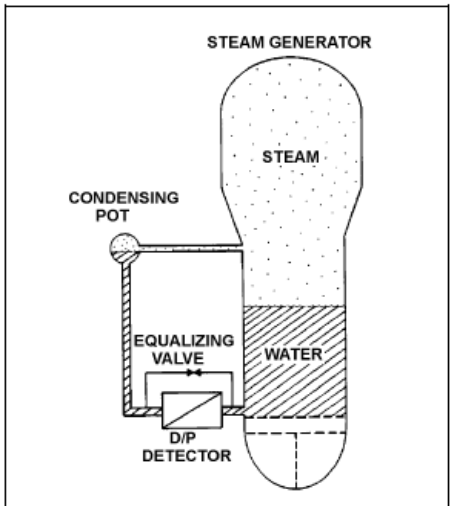
A. 蒸汽產生器的實際水位減少6吋。

B. 差壓水位計周圍的外部壓力減少2 psi。

C. 參考水柱周圍溫度增加20°F。

D. 實際水位不變下，蒸汽產生器的壓力增加50 psi。

答案：D.



STEAM GENERATOR DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 191002
知能類：K1.09 [2.9/3.0]
序號： P2907 (B1410)

Refer to the drawing of a steam generator (S/G) differential pressure (D/P) level detector (see figure below).

The S/G is at normal operating temperature and pressure with accurate level indication. Which one of the following events will result in a S/G level indication that is lower than actual level?

A. Actual S/G level decreases by 6 inches.

B. The temperature surrounding the reference leg decreases by 20°F.

C. The external pressure surrounding the D/P detector decreases by 2 psi.

D. S/G pressure decreases by 50 psi with no change in actual water level.

ANSWER: B.

請參照下圖的蒸汽產生器差壓水位計。

蒸汽產生器處於正常運轉溫度及壓力，並能準確顯示水位。下列何者將導致蒸汽產生器指示的水位低於實際水位？

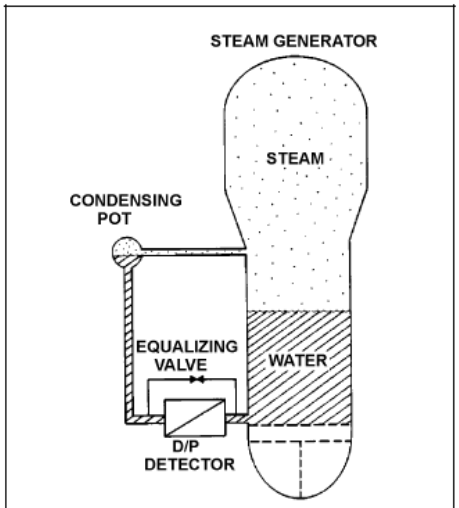
A. 蒸汽產生器的實際水位減少6吋。

B. 參考水柱周圍溫度降低20°F。

C. 差壓水位計周圍的外部壓力減少2 psi。

D. 實際水位不變下，蒸汽產生器的壓力減少50 psi。

答案：B.



STEAM GENERATOR DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 191002
知能類：K1.09 [2.9/3.0]
序號： P3808

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

A nuclear reactor is shutdown with the reactor coolant system being maintained at 100 psia. The level detector has just been calibrated. Suddenly a rupture in the condensing pot of the level detector results in a rapid drop of the condensing pot pressure to atmospheric pressure.

Given the following current conditions:

- The condensing pot is at atmospheric pressure.
- Pressurizer pressure is 98 psia and slowly decreasing.
- Bulk reference leg temperature is 120°F.
- Actual pressurizer level has not changed significantly.

Which one of the following describes the current pressurizer level indication from the detector?

A. Offscale low because the bulk of the water in the reference leg has flashed to steam.

B. Offscale high because the bulk of the water in the reference leg has flashed to steam.

C. Offscale low because the static pressure on the reference leg is much less than the static pressure in the pressurizer.

D. Offscale high because the static pressure on the reference leg is much less than the static pressure in the pressurizer.

ANSWER: D.

請參照下圖的調壓槽差壓水位計。

核子反應器停機且反應器的冷卻水系統維持在 100 psia。水位計剛經過校正。該水位計的冷凝室突然破裂，造成冷凝室壓力驟降至大氣壓力的水平。

已知目前的條件如下：

- 冷凝室處於大氣壓力。
- 調壓槽壓力為 98 psia 且緩慢下降中。
- 大型參考水柱的溫度為 120°F。
- 調壓槽實際水位無大幅異動。

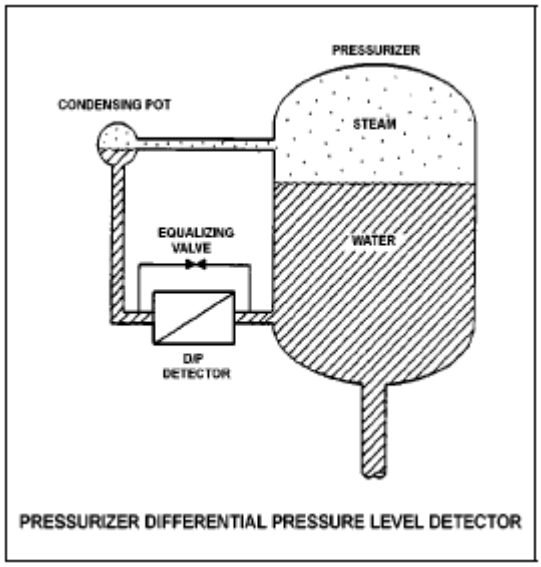
下列何者描述了水位計目前所示的調壓槽水位？
A. 低值失效(offscale low)，因為參考水柱內的水，大多閃化成蒸汽。

B. 高值失效(offscale high)，因為參考水柱內的水，大多閃化成蒸汽。

C. 低值失效，因為參考水柱靜壓遠低於調壓槽靜壓。

D. 高值失效，因為參考水柱靜壓遠低於調壓槽靜壓。

答案：D.



科目： 191002
知能類：K1.10 [2.3/2.5]
序號： P310

Semiconductor strain gages are often used in transmitters for...

A. reactor coolant pressure instruments.

B. reactor coolant temperature instruments.

C. control rod position instruments.

D. steam generator level instruments.

ANSWER: A.

傳送器常採用半導體應變計(semiconductor strain gage)做為……

A. 量測反應器冷卻水系統的壓力。

B. 量測反應器冷卻水系統的溫度。

C. 量測控制棒的位置。

D. 量測蒸汽產生器水位。

答案：A.

科目： 191002
知能類：K1.10 [2.3/2.5]
序號： P413 (B410)

If the pressure sensed by a bourdon tube increases, the curvature of the detector will _____ because of the greatest force being applied to the _____ curve of the detector.

A. increase; inner

B. decrease; inner

C. increase; outer

D. decrease; outer

ANSWER: D.

如果巴登管(bourdon tube)感測的壓力增加，則此偵檢器的曲率將_____，因為最大力施加在此偵檢器的_____曲線上。

A. 增加；內側

B. 減小；內側

C. 增加；外側

D. 減小；外側

答案：D.

科目： 191002
知能類：K1.10 [2.3/2.5]
序號： P810

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

A. rotational movement

B. axial deflection

C. change in circumference

D. change in diameter

ANSWER: B.

膜片壓力計運用薄膜_____來量測壓力。

A. 轉動

B. 軸偏移

C. 圓周改變

D. 直徑改變

答案：B.

科目： 191002
知能類：K1.10 [2.3/2.5]
序號： P1508 (B1011)

A bourdon tube works on the principle that when the pressure inside the tube decreases, the tube tends to: (Assume detected pressure remains above atmospheric pressure.)

A. coil due to an increased pressure-induced force on the outside of the tube.

B. straighten due to an increased pressure-induced force on the outside of the tube.

C. coil due to the spring action of the metal overcoming the pressure-induced force on the inside of the tube.

D. straighten due to the spring action of the metal overcoming the pressure-induced force on the inside of the tube.

ANSWER: C.

巴登管的運作原理是：管內壓力減少時，此管將(假設感測壓力維持在大氣壓力以上)：

A. 盤捲(coil)，因為壓力導致作用於管外部的施力增加。

B. 變直，因為壓力導致作用於管外部的施力增加。

C. 盤捲，因為金屬的彈力作用，克服壓力導致作用於管內部的施力。

D. 變直，因為金屬的彈力作用，克服壓力導致作用於管內部的施力。

答案：C.

科目： 191002
知能類：K1.10 [2.3/2.5]
序號： P2109 (B2109)

A centrifugal pump is taking suction from the bottom of a vented cylindrical storage tank that contains 100,000 gallons of water at 60°F. A pressure gauge at the inlet to the pump indicates 40 psig. Over the next several days storage tank temperature increases to 90°F with no change in tank water level and no change in head loss in the pump suction line.

Which one of the following is the current approximate pressure at the inlet to the pump?

A. 39.8 psig

B. 37.4 psig

C. 34.6 psig

D. 31.2 psig

ANSWER: A.

一離心泵從含60°F、儲水100,000加侖之通氣圓柱形儲存槽底部取水。泵入口處的壓力計指示值為40 psig。其後幾天當中，儲存槽溫度上升到90°F，而儲存槽水位沒有變化，同時泵進水管沒有水頭損失。

下列何者是目前泵入口處的大約壓力？

A. 39.8 psig

B. 37.4 psig

C. 34.6 psig

D. 31.2 psig

答案：A.

科目： 191002
知能類：K1.11 [2.7/3.0]
序號： P210 (B210)

A simple bellows pressure detector is connected to a cooling water system. The detector is located in the reactor containment and has its low pressure side vented to the containment atmosphere. Current system pressure indication is 100 psig.

If a main steam line break raises containment pressure by 40 psig, the system pressure indication will: (Disregard any temperature effect on the pressure detector.)

A. increase by 40 psig.

B. increase by the square root of 40 psig.

C. decrease by 40 psig.

D. decrease by the square root of 40 psig.

ANSWER: C.

一簡單伸縮囊(bellow)壓力計連接一冷卻水系統。此壓力計安裝於反應器圍阻體內，同時其低壓側通向圍阻體之大氣。目前系統壓力指示為100 psig。

如果一主蒸汽管破裂，將圍阻體壓力升高40 psig, 則系統壓力指示值將會(忽略對壓力計的所有溫度效應)：

A. 增加 40 psig。

B. 增加 40 psig的平方根。

C. 減少 40 psig。

D. 減少 40 psig的平方根。

答案：C.

科目： 191002
知能類：K1.11 [2.7/3.0]
序號： P509 (B1310)

A cooling water system bourdon tube pressure detector is located inside a sealed building and system pressure currently indicates 50 psig. A building ambient temperature increase of 100°F will cause a _____ change in indicated system pressure, and a building pressure increase of 20 psig will cause a _____ change in indicated system pressure.

A. significant; significant

B. negligible; significant

C. significant; negligible

D. negligible; negligible

ANSWER: B.

冷卻水系統的巴登管壓力計置於密閉廠房內，系統目前壓力指示值為 50 psig。廠房環境溫度增加100°F，將導致指示之系統壓力產生_____變化，而廠房壓力增加20 psig，將導致指示之系統壓力產生_____變化。

A. 顯著；顯著

B. 微小；顯著

C. 顯著；微小

D. 微小；微小

答案：B.

科目： 191002
知能類：K1.11 [2.7/3.0]
序號： P611

A bellows pressure transmitter with its low-pressure side vented to containment atmosphere is being used to measure reactor coolant system (RCS) pressure. A decrease in the associated pressure indication could be caused by either a containment pressure _____ or a RCS pressure _____.

A. decrease; decrease

B. increase; increase

C. decrease; increase

D. increase; decrease

ANSWER: D.

使用低壓側通向圍阻體大氣的伸縮囊壓力傳送器，來量測反應器冷卻水系統(RCS)的壓力。圍阻體壓力_____或RCS壓力_____，將導致相關壓力指示值降低。

A. 降低；降低

B. 增加；增加

C. 降低；增加

D. 增加；降低

答案：D.

科目： 191002
知能類：K1.11 [2.7/3.0]
序號： P710 (B711)

Cooling water system pressure is being monitored by a simple diaphragm pressure detector with its low pressure side vented to the containment. If a main steam break raises containment pressure by 20 psi, system pressure indication will: (Disregard any temperature effect on the detector.)

A. increase by the square root of 20 psi.

B. decrease by the square root of 20 psi.

C. increase by 20 psi.

D. decrease by 20 psi.

ANSWER: D.

使用簡單的膜片壓力計監測冷卻水系統，該壓力計的低壓側通向圍阻體大氣。如果一主蒸汽管線破裂，將圍阻體壓力升高20 psig，則系統壓力指示值將會(忽略對壓力計的所有溫度效應)：

A. 增加20 psi的平方根。

B. 減小20 psi的平方根。

C. 增加20 psi。

D. 減小20 psi。

答案：D.

科目： 191002
知能類：K1.11 [2.7/3.0]
序號： P3509 (B2912)

The water pressure within a cooling water system is 100 psig, as indicated by a bourdon tube pressure detector. The cooling water system and the detector are located inside a reactor containment building. The pressure detector case is vented to the containment building, which is currently at atmospheric pressure.

If a steam line rupture raises the containment building pressure by 20 psig, the cooling water system pressure indication will: (Disregard any temperature effect on the detector.)

A. increase to 120 psig.

B. increase by a small, but indeterminate amount.

C. decrease by a small, but indeterminate amount.

D. decrease to 80 psig.

ANSWER: D.

巴登管壓力計指示的冷卻水系統水壓為100 psig。該冷卻水系統與壓力計，安裝於一反應器圍阻體廠房內。壓力計外殼通氣至圍阻體廠房，其壓力目前為大氣壓力。

如果一蒸汽管破裂，將圍阻體廠房壓力提高 20 psig，則冷卻水系統壓力指示值將會(忽略對壓力計的任何溫度效應)：

A. 增加至 120 psig。

B. 增加微小卻無法確定的數值。

C. 減小微小卻無法確定的數值。

D. 減小至 80 psig。

答案：D.

科目： 191002
知能類：K1.12 [2.8/2.9]
序號： P211 (B212)

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

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

A. unpredictable.

B. less than 50% of scale.

C. 50% of scale.

D. greater than 50% of scale.

ANSWER: D.

一巴登管壓力計指示50%刻度時，突然暴露在高壓暫態，導致此巴登管遭受永久應變。該壓力計並未破損，而實際壓力恢復至其初始值。

在此壓力暫態當中，起初受影響的壓力指示值很高，且超出量表刻度。在恢復至初始壓力之後，此指示值會是……

A. 無法預測。

B. 小於量表刻度50%。

C. 50%。

D. 高於量表刻度50%。

答案：D.

科目： 191002
知能類：K1.12 [2.8/2.9]
序號： P510 (B1610)

Refer to the drawing of a bellows-type differential pressure (D/P) detector (see figure below).

The spring in this detector (shown in a compressed state) has weakened from long-term use. If the actual D/P is constant, how will indicated D/P respond as the spring weakens?

A. Increase, because the spring will expand more.

B. Decrease, because the spring will expand more.

C. Increase, because the spring will compress more.

D. Decrease, because the spring will compress more.

ANSWER: C.

請參照下圖的伸縮囊差壓計。

此壓力計的彈簧(圖中為壓縮狀態)，因長期使用而疲乏。如果實際差壓維持固定，當彈簧疲乏時，所指示差壓有何反應？

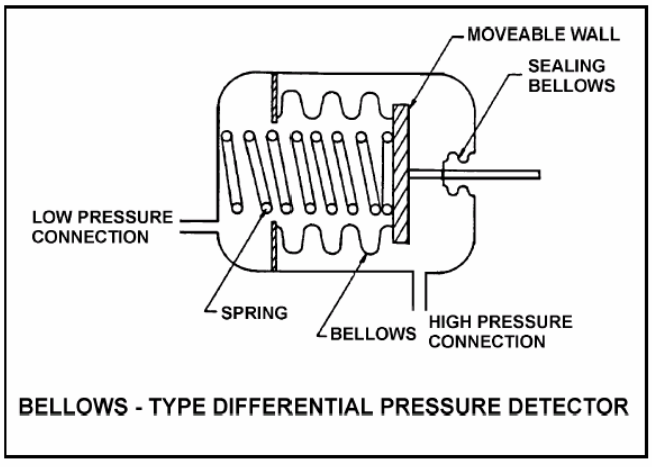
A. 增加，因為彈簧伸張更多。

B. 減小，因為彈簧伸張更多。

C. 增加，因為彈簧壓縮更多。

D. 減小，因為彈簧壓縮更多。

答案：C.



BELLOWS - TYPE DIFFERENTIAL PRESSURE DETECTOR

科目： 191002
知能類：K1.12 [2.8/2.9]
序號： P511

If a bourdon tube pressure detector is over-ranged sufficiently to permanently distort the bourdon tube, subsequent pressure measurement will be inaccurate because the _____ of the detector tube will be inaccurate.

A. distance moved by the tip

B. change in the length

C. expansion of the cross-sectional area

D. change in the volume

ANSWER: A.

巴登管壓力計若承受超出範圍的壓力，此壓力足以使巴登管永久變形，往後量測的壓力將出錯，這是檢測管的_____錯誤導致。

A. 尖端移動距離

B. 長度變化

C. 截面積膨脹

D. 體積變化

答案：A.

科目： 191002
知能類：K1.12 [2.8/2.9]
序號： P1011 (B2910)

A properly calibrated 0 to 100 psia diaphragm pressure detector is connected to a pressurized system; the low pressure side of the detector is vented to the atmosphere.

The detector is currently producing a system pressure indication of 75 psia.

If the detector diaphragm ruptures, indicated pressure will be approximately...

A. 0 psia.

B. 15 psia.

C. 60 psia.

D. 90 psia.

ANSWER: B.

一於 0 至 100 psia 經過適當校正之膜片壓力計，連接於一加壓系統上；該壓力計的低壓側通至大氣。壓力計目前指示的系統壓力為 75 psia。

如果壓力計的薄膜破裂，指示壓力將約為……

A. 0 psia

B. 15 psia

C. 60 psia

D. 90 psia

答案：B.

科目： 191002
知能類：K1.12 [2.8/2.9]
序號： P2211 (B1908)

Refer to the drawing of a bellows-type pressure detector (see figure below).

A bellows-type pressure detector with its low-pressure side vented to containment atmosphere is being used to measure pressurizer pressure. A decrease in the associated pressure indication will be caused by either a containment pressure _____ or a _____.

A. increase; ruptured bellows

B. increase; broken spring

C. decrease; ruptured bellows

D. decrease; broken spring

ANSWER: A.

請參照下圖的伸縮囊差壓壓力計。

一低壓側通向圍阻體大氣的伸縮囊差壓壓力計，正用以量測調壓槽壓力。圍阻體壓力_____或_____時，將導致相關壓力指示值減小。

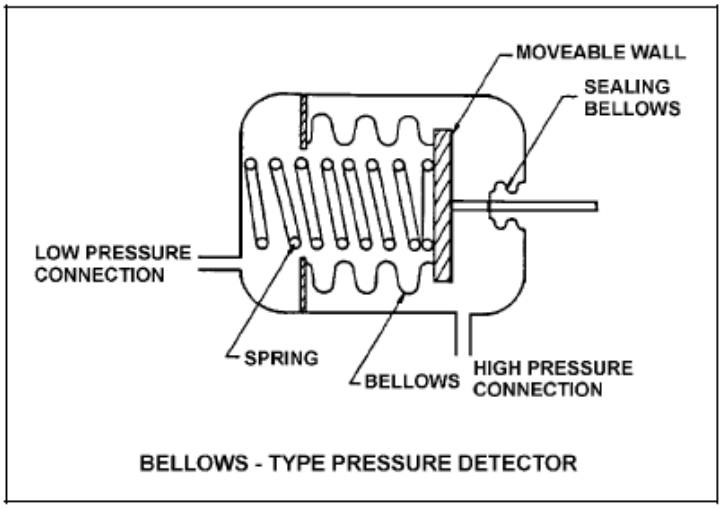
A. 增加；伸縮囊破裂

B. 增加；彈簧斷裂

C. 減小；伸縮囊破裂

D. 減小；彈簧斷裂

答案：A.



BELLOWS - TYPE PRESSURE DETECTOR

科目： 191002
知能類：K1.12 [2.8/2.9]
序號： P2610 (B610)

Refer to the drawing of a bellows-type differential pressure (D/P) detector (see figure below).

The spring in this detector (shown in a compressed state) has weakened from long-term use. If the actual D/P is constant, how will indicated D/P respond as the spring weakens?

A. Decrease, because the high pressure will compress the spring more

B. Increase, because the high pressure will compress the spring more

C. Decrease, because the spring will expand more

D. Increase, because the spring will expand more

ANSWER: B.

請參照下圖的伸縮囊差壓壓力計。

此壓力計的彈簧(圖中為壓縮狀態)因為長期使用而疲乏。如果實際差壓維持固定，則由於彈簧疲乏所得的指示值會？

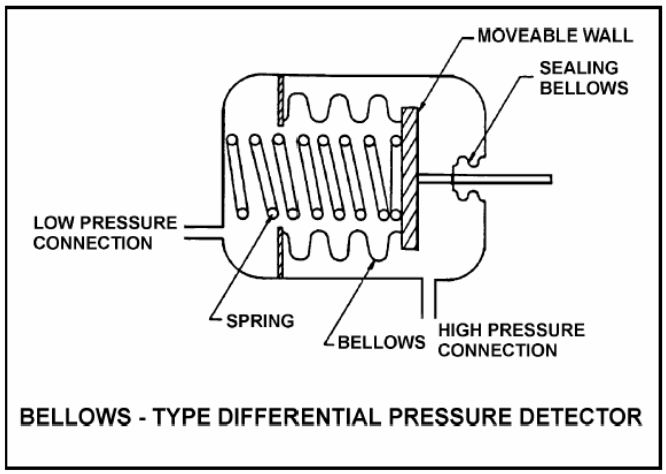
A. 減小，因為高壓將使彈簧壓縮更多。

B. 增加，因為高壓將使彈簧壓縮更多。

C. 減小，因為彈簧會伸張更多。

D. 增加，因為彈簧會伸張更多。

答案：B.



BELLOWS - TYPE DIFFERENTIAL PRESSURE DETECTOR

科目： 191002
知能類：K1.13 [2.6/2.8]
序號： P13

A resistance temperature detector operates on the principle that the change in electrical resistance of...

A. two dissimilar metals is directly proportional to the temperature change measured at their junction.

B. two dissimilar metals is inversely proportional to the temperature change measured at their junction.

C. a metal is directly proportional to its change in temperature.

D. a metal is inversely proportional to its change in temperature.

ANSWER: C.

電阻式溫度計的運作原理，為下列何者……

A. 兩種相異金屬的電阻變化，與兩者接合點測出的溫度變化成正比。

B. 兩種相異金屬的電阻變化，與兩者接合點測出的溫度變化成反比。

C. 一種金屬的電阻變化，與其溫度變化成正比。

D. 一種金屬的電阻變化，與其溫度變化成反比。

答案：C.

科目： 191002
知能類：K1.13 [2.6/2.8]
序號： P212

A resistance temperature detector operates on the principle that the change in metal resistance is _____ proportional to the change in _____.

A. inversely; metal temperature

B. inversely; metal temperature squared

C. directly; metal temperature

D. directly; metal temperature squared

ANSWER: C.

電阻式溫度計的運作原理是：金屬電阻的變化，與_____的變化成_____比。

A. 金屬溫度；反

B. 金屬溫度平方值；反

C. 金屬溫度；正

D. 金屬溫度平方值；正

答案：C.

科目： 191002
知能類：K1.13 [2.6/2.8]
序號： P311

When comparing a thermocouple to a resistance temperature detector, the thermocouple...

A. measures temperature less accurately.

B. requires an external power supply to produce an electrical output.

C. is unable to withstand high temperatures.

D. responds much slower to a temperature change.

ANSWER: A.

比較熱電偶與電阻式溫度計時，熱電偶……

A. 測出的溫度較不準確。

B. 需要外接電源以產生輸出電子信號。

C. 無法承受高溫。

D. 溫度變化反應較慢。

答案：A.

科目： 191002
知能類：K1.13 [2.6/2.8]
序號： P812

If the reference junction temperature of a thermocouple remains constant, the output voltage of the thermocouple is _____ proportional to the _____.

A. directly; measuring junction temperature

B. directly; square root of the measuring junction temperature

C. inversely; measuring junction temperature

D. inversely; square root of the measuring junction temperature

ANSWER: A.

如果熱電偶的接合點參考溫度不變，熱電偶的輸出電壓，與_____成_____比。

A. 接合點量測溫度；正

B. 接合點量測溫度平方根；正

C. 接合點量測溫度；反

D. 接合點量測溫度平方根；反

答案：A.

科目： 191002
知能類：K1.13 [2.6/2.8]
序號： P1209 (B1314)

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

Thermocouple temperature indication is currently 350°F. A small steam leak occurs that raises reference (cold) junction temperature by 20°F. Assume measuring junction temperature remains constant. Without temperature compensation for the reference junction, the new temperature indication will be...

A. 310°F.

B. 330°F.

C. 370°F.

D. 390°F.

ANSWER: B.

請參照下面的熱電偶電路簡圖。

熱電偶目前的溫度指示值為350°F。若發生少量蒸汽洩漏，而將接合點參考(Reference Junction) (冷端)溫度提高20°F。假設量測接合點溫度維持固定，接合參考點沒有溫度補償下，新的溫度指示值將是……

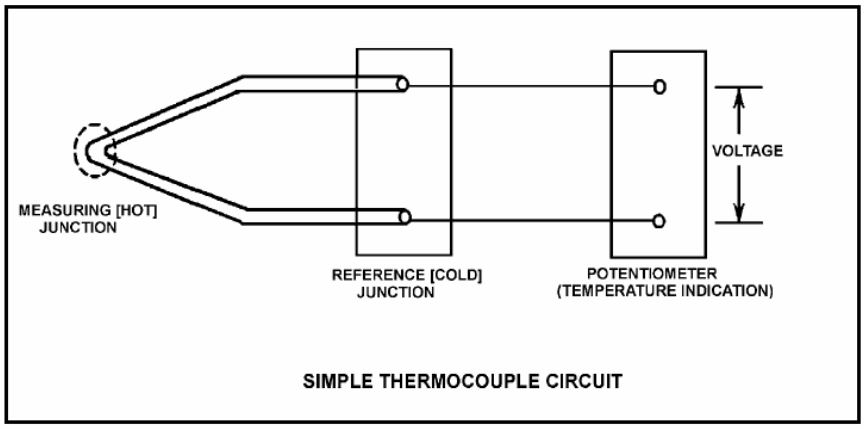
A. 310°F

B. 330°F

C. 370°F

D. 390°F

答案：B.



SIMPLE THERMOCOUPLE CIRCUIT

科目： 191002
知能類：K1.13 [2.6/2.8]
序號： P1311

A thermocouple operates on the principle that a measurable voltage will be produced when two...

A. similar metals form two junctions at the same temperature.

B. similar metals form two junctions at different temperatures.

C. dissimilar metals form two junctions at the same temperature.

D. dissimilar metals form two junctions at different temperatures.

ANSWER: D.

熱電偶的運作原理是：量測電壓是依下列何種情況而產生……

A. 兩種相似金屬的兩接合點處於相同溫度。

B. 兩種相似金屬的兩接合點處於不同溫度。

C. 兩種相異金屬的兩接合點處於相同溫度。

D. 兩種相異金屬的兩接合點處於不同溫度。

答案：D.

科目： 191002
知能類：K1.13 [2.6/2.8]
序號： P1412 (B2911)

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

Thermocouple temperature indication is currently 390°F. A small steam leak occurs that raises reference (cold) junction temperature by 20°F. Assume measuring junction temperature remains constant. Without temperature compensation for the reference junction, the new temperature indication will be...

A. 370°F.

B. 390°F.

C. 400°F.

D. 410°F.

ANSWER: A.

請參照下面的熱電偶電路簡圖。

熱電偶目前的溫度指示值為390°F。若發生少量蒸汽洩漏，而將參考(冷端)接合點溫度提高20°F。假設量測接合點溫度維持固定，參考接合點沒有溫度補償下，新的溫度指示值將是……

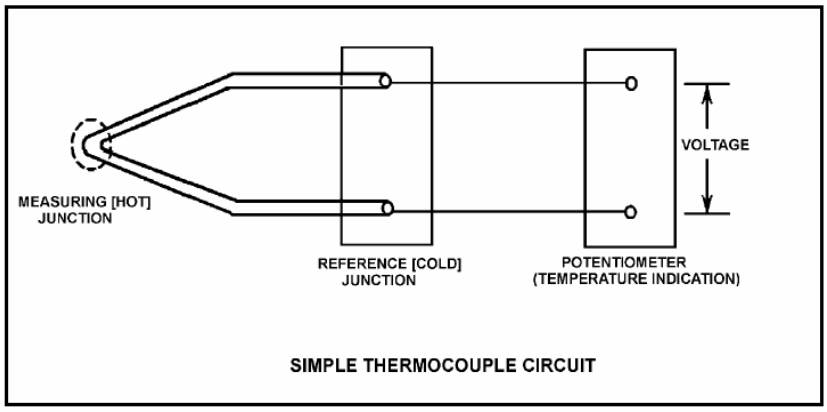
A. 370°F

B. 390°F

C. 400°F

D. 410F°

答案：A.



SIMPLE THERMOCOUPLE CIRCUIT

科目： 191002
知能類：K1.13 [2.6/2.8]
序號： P1510 (B309)

In contrast to a thermocouple, a resistance temperature detector...

A. is used in high temperature applications.

B. does not require an external power supply for temperature indication.

C. uses a single type of metal or alloy in the sensing element.

D. is commonly placed in direct contact with the monitored substance.

ANSWER: C.

相對於熱電偶量測，電阻式溫度計……

A. 應用於高溫量測中。

B. 不需要外部電源便能指示溫度。

C. 在感測元件部分，使用單一金屬或合金。

D. 通常與受測物直接接觸。

答案：C.

科目： 191002
知能類：K1.13 [2.6/2.8]
序號： P1710 (B1710)

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

Thermocouple temperature indication is currently 150°F. A small steam leak occurs that raises both the measuring (hot) junction and reference (cold) junction temperatures by 20°F. Without temperature compensation for the reference junction, the new temperature indication will be...

A. 130°F.

B. 150°F.

C. 170°F.

D. 190°F.

ANSWER: B.

請參照下面的熱電偶電路簡圖。

熱電偶溫度指示值目前為150°F。若發生少量蒸汽洩漏，而將量測(熱端)與參考(冷端)接合點溫度都提高20°F，參考接合點若沒有溫度補償，新的溫度指示值將是……

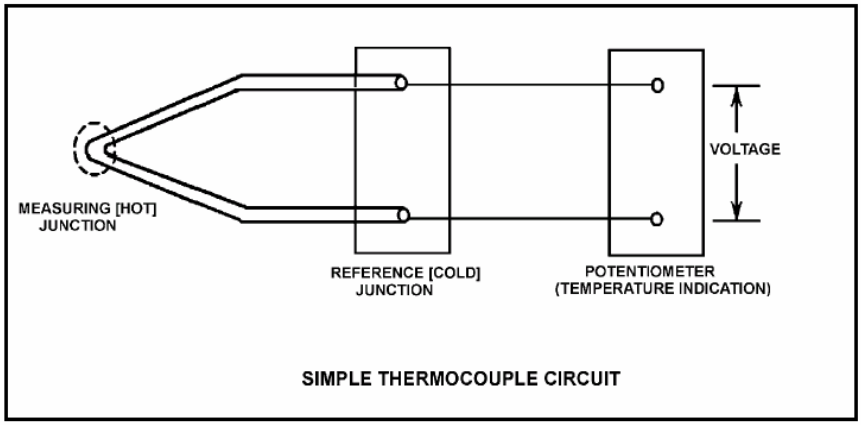
A. 130°F

B. 150°F

C. 170°F

D. 190°F

答案：B.



科目： 191002
知能類：K1.13 [2.6/2.8]
序號： P2212 (B1510)

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

Circuit temperature indication is currently 350°F. The reference (cold) junction temperature decreases by 10°F. Assume the measuring junction temperature remains constant. Without temperature compensation for the reference junction, the new temperature indication will be...

A. 340°F.

B. 350°F.

C. 360°F.

D. 370°F.

ANSWER: C.

請參照下面的熱電偶電路簡圖。

電路溫度指示值目前為350°F。若參考(冷端)接合點溫度降低10°F，假設量測接合點溫度維持固定，參考接合點若沒有溫度補償，新的溫度指示值將是……

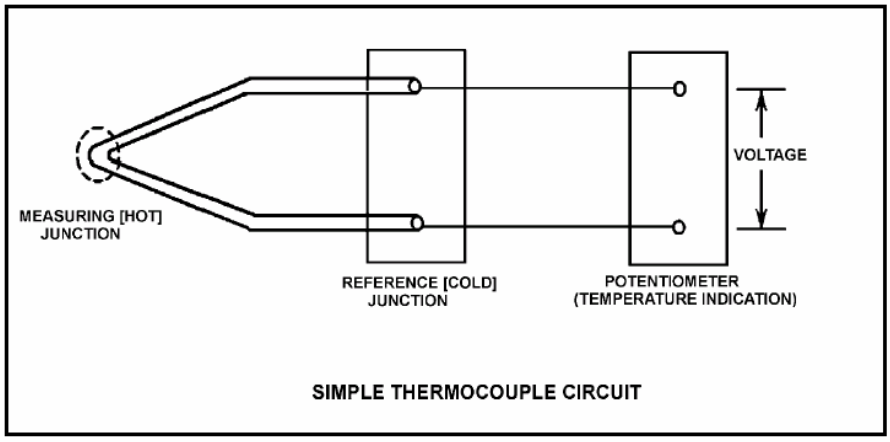
A. 340°F

B. 350°F

C. 360°F

D. 370°F

答案：C.



科目： 191002
知能類：K1.13 [2.6/2.8]
序號： P2409 (B2412)

What is the purpose of the reference junction panel that is provided with many thermocouple circuits?

A. Ensures that thermocouple output is amplified sufficiently for use by temperature indication devices.

B. Ensures that temperature changes away from the thermocouple measuring junction do not affect thermocouple temperature indication.

C. Ensures that electrical noise in the thermocouple extension wires does not affect thermocouple temperature indication.

D. Ensures that different lengths of thermocouple extension wires do not affect thermocouple temperature indication.

ANSWER: B.

提供多支熱電偶電路共用的參考接合點連接面板，其用途為何？

A. 確保熱電偶輸出充分放大，可作為溫度指示裝置使用。

B. 確保熱電偶量測接合點以外的溫度變化，不會影響熱電偶之溫度指示。

C. 確保熱電偶延長線之電子雜訊，不會影響到熱電偶之溫度指示。

D. 確保不同長度的熱電偶延長線，不會影響到熱電偶之溫度指示。

答案：B.

科目： 191002
知能類：K1.13 [2.6/2.8]
序號： P2711 (B2712)

Unlike a resistance temperature detector, a typical thermocouple...

A. uses a single type of metal in the sensing element

B. requires a temperature-controlled reference junction.

C. can provide temperature input to a valve controller in a cooling water system.

D. requires an external power supply to provide indication of temperature.

ANSWER: B.

不同於電阻式溫度計，典型的熱電偶……

A. 在感測元件中，使用單一種類金屬。

B. 參考接合點需要溫度控制。

C. 能提供冷卻水系統閥控制器之溫度輸入訊號。

D. 需要外部電源，方能提供溫度指示。

答案：B.

科目： 191002
知能類：K1.13 [2.6/2.8]
序號： P3011 (B3013)

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

Thermocouple temperature indication is 410°F with the reference (cold) junction at 125°F. An ambient temperature decrease lowers reference junction temperature to 110°F. Assume the measuring junction temperature remains constant. Without temperature compensation for the reference junction, the new thermocouple temperature indication will be...

A. 380°F.

B. 395°F.

C. 410°F.

D. 425°F.

ANSWER: D.

請參照下面的熱電偶電路簡圖。

熱電偶溫度指示值目前為 410°F，而參考(冷端)接合點為125°F。環境溫度下降讓參考接合點溫度降至110°F。假設量測接合點溫度維持固定，參考接合點沒有溫度補償下，新的熱電偶溫度指示值將是……

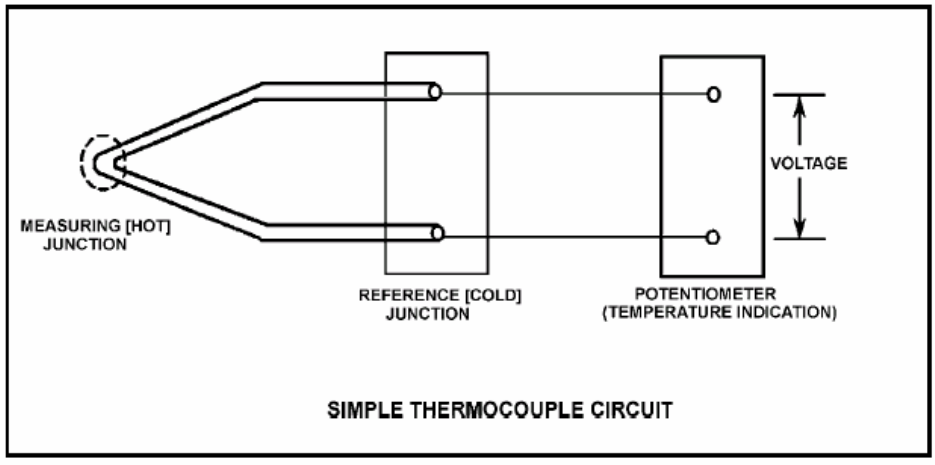
A. 380°F

B. 395°F

C. 410°F

D. 425°F

答案：D.



SIMPLE THERMOCOUPLE CIRCUIT

科目： 191002
知能類：K1.13 [2.6/2.8]
序號： P4206 (B4206)

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

Given that the temperatures at the measuring and reference junctions remain constant, if a ventilation system malfunction causes the temperature of the temperature indication panel to increase by 10°F, indicated temperature will...

A. not be affected.

B. increase by 10°F.

C. decrease by 10°F.

D. change in an unpredictable manner.

ANSWER: A.

請參照下面的熱電偶電路簡圖。

當量測與參考接合點溫度維持相同，倘若通風系統故障，造成溫度顯示儀板的溫度增加 10°F，溫度指示值將……

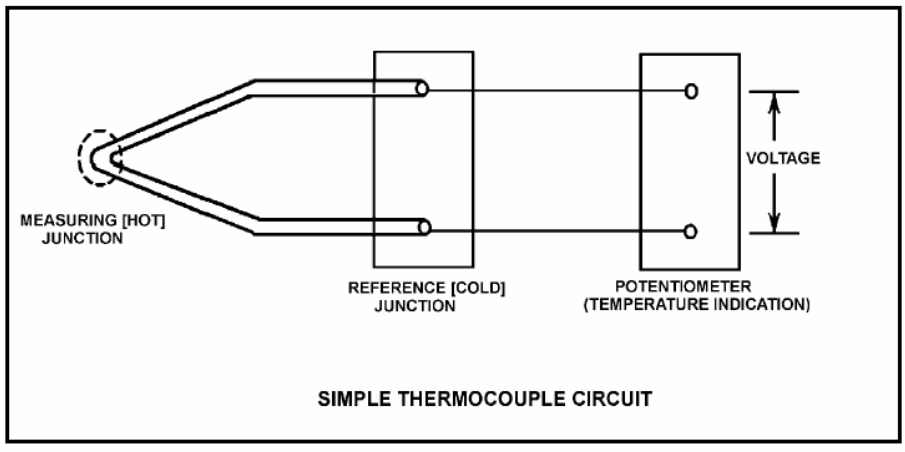
A. 不受影響。

B. 增加 10°F。

C. 減少 10°F。

D. 無法預測如何變化。

答案：A.



SIMPLE THERMOCOUPLE CIRCUIT

科目： 191002
知能類：K1.14 [2.8/2.9]
序號： P213

An open circuit in a thermocouple detector causes the affected temperature indication to fail...

A. high.

B. low.

C. to reference junction temperature.

D. as is.

ANSWER: B.

熱電偶溫度計若發生開路，將使受影響的溫度指示值……

A. 高值失效。

B. 低值失效。

C. 指在參考接合點溫度並失效。

D. 失效，並維持原指示。

答案：B.

科目： 191002
知能類：K1.14 [2.8/2.9]
序號： P312 (B310)

If shorting occurs within a resistance temperature detector, the associated indication will fail...

A. low.

B. high.

C. as is.

D. to midscale.

ANSWER: A.

電阻式溫度計內部若發生短路，相關指示值將：

A. 低值失效。

B. 高值失效。

C. 失效並維持原指示。

D. 失效並指示在儀錶中間值(midscale)。

答案：A.

科目： 191002
知能類：K1.14 [2.8/2.9]
序號： P414 (B208)

If a resistance temperature detector develops an open circuit (bridge circuit remains intact), indication will fail...

A. high.

B. low.

C. as is.

D. to midscale.

ANSWER: A.

如果電阻式溫度計發生開路(橋式電路維持完整)，則其指示數值將會……

A. 高值失效。

B. 低值失效。

C. 失效並維持原指示不變。

D. 失效並指示在儀錶中間值(midscale)。

答案：A.

科目： 191002
知能類：K1.14 [2.8/2.9]
序號： P2011 (B2009)

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

Thermocouple temperature indication is currently 150°F. Reference junction temperature is currently 90°F. Indicator range is from 0°F to 2000°F.

If one of the thermocouple extension wires loosens and becomes dislodged from its terminal in the reference junction panel, which one of the following temperature indications will occur?

A. Minimum instrument reading (0°F)

B. 60°F

C. 90°F

D. Maximum instrument reading (2000°F)

ANSWER: A.

請參照下面的熱電偶電路簡圖。

熱電偶溫度指示值目前為150°F。參考接合點溫度目前為90°F。指示器範圍從0°F至2000°F。

若熱電偶延長線之一鬆動，同時從參考接合點儀板的接線端子脫落，將發生下列何種溫度指示值？

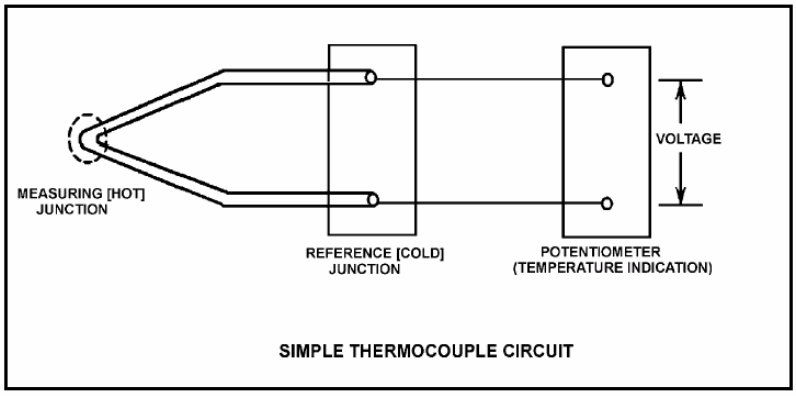
A. 最低儀表讀數(0°F)

B. 60°F

C. 90°F

D. 最高儀表讀數(2000°F)

答案：A.



SIMPLE THERMOCOUPLE CIRCUIT

科目： 191002
知能類：K1.16 [2.3/2.7]
序號： P813 (B812)

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

A. Limit switch

B. Reed switch

C. Servo transmitter

D. Linear variable differential transformer

ANSWER: A.

對於正常狀況下為全開或全關的閥門而言，下列何者是最常用來提供遠端閥位指示的偵檢器？

A. 極限開關(limit switch)。

B. 磁簧開關(reed switch)。

C. 伺服傳送器(serve transmitter)。

D. 線性差動位移計(linear variable differential transformer)。

答案：A.

科目： 191002
知能類：K1.16 [2.3/2.7]
序號： P1313 (B1712)

Which one of the following devices is capable of providing remote indication of valve position on an analog meter in units of "percent of full open"?

A. Reed switch

B. Limit switch

C. Resistance temperature detector

D. Linear variable differential transformer

ANSWER: D.

下列何者可用來提供類比儀表上，遠端閥位「開度百分比」指示的裝置？

A. 極限開關。

B. 磁簧開關。

C. 電阻式溫度計。

D. 線性差動位移計。

答案：D.

科目： 191002
知能類：K1.16 [2.3/2.7]
序號： P2611

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

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

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

A. higher; higher

B. higher; lower

C. the same; higher

D. the same; lower

ANSWER: D.

請參照下面的控制棒位置偵檢器簡圖。

銜接交流電源的線圈，用來監測核子反應器的控制棒位置。線圈裝於反應爐蓋上的圓柱內，於控制棒抽出時，讓鋼製的控制棒驅動桿往上穿過線圈。目前如圖所示，控制棒驅動桿頂端，位於線圈 A 與 B 之間。將控制棒持續抽出至驅動桿頂端抵達線圈 C 的正下方。

對照一開始的線圈輸出電流，控制棒抽出後，線圈 A 的輸出電流將_____；線圈 B 的輸出電流將_____。

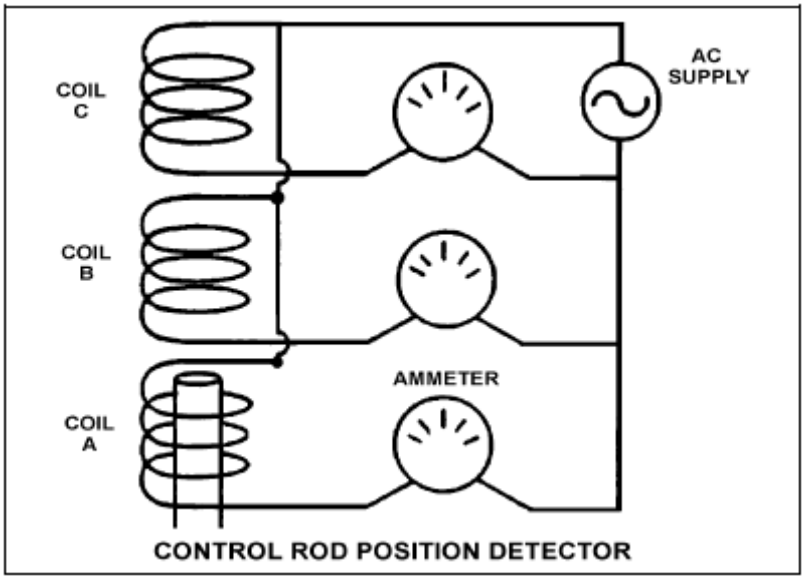
A. 升高；升高

B. 升高；降低

C. 相同；升高

D. 相同；降低

答案：D.



CONTROL ROD POSITION DETECTOR

科目： 191002
知能類：K1.16 [2.3/2.7]
序號： P2813 (B2811)

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

A magnet on the control rod extension (or drive) shaft sequentially closes individual reed switches mounted vertically adjacent to the control rod drive housing. A constant +5 dc volts is supplied to the input of the resistor network at resistor R_1.

A control rod is initially fully inserted such that all reed switch contacts are open; then the rod is withdrawn until reed switch contact S_1 is closed. Compared to the initial circuit currents, the current through resistor R_5 after the rod withdrawal will be _____, and the output current of the resistor network to the amplifier will be _____.

A. lower, higher

B. lower, lower

C. higher, higher

D. higher, lower

ANSWER: A.

請參照下面的控制棒位置感測電路簡圖。

控制棒延伸桿(或驅動桿)上的磁極(垂直安裝於控制棒驅動套管(control rod drive housing))，依序關閉各個磁簧開關。固定供應+5V直流電壓，至電阻R_1處的電阻電路輸入端。

控制棒開始時完全插入，此時所有磁簧開關接觸點開啟；當控制棒開始抽出，直到磁簧開關接點S_1 關閉。與開始時電流相比較，在控制棒抽出後，流經電阻R_5 的電流將會_____，而此電阻電路流向放大器的輸出電流將會_____。

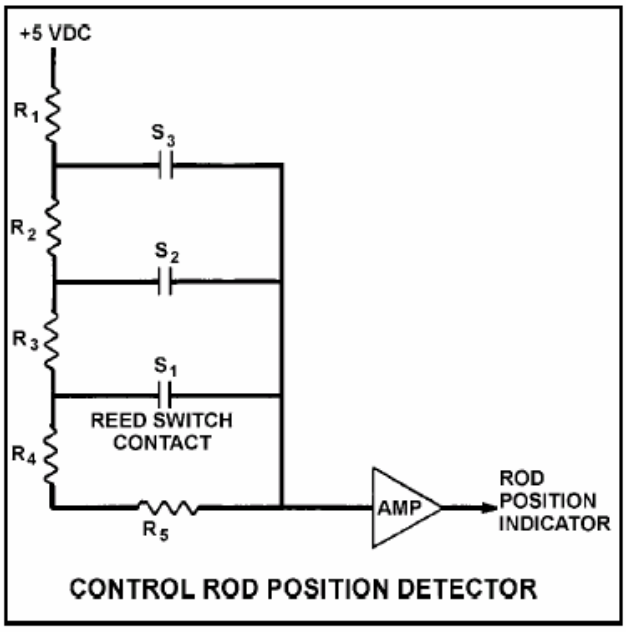
A. 降低；升高

B. 降低；降低

C. 升高；升高

D. 升高；降低

答案：A.



CONTROL ROD POSITION DETECTOR

科目： 191002
知能類：K1.16 [2.3/2.7]
序號： P2911 (B2611)

Reed switches are being used in an electrical measuring circuit to monitor the position of a control rod in a nuclear reactor. The reed switches are mounted in a column above the reactor vessel such that the control rod drive shaft passes by the reed switches as the control rod is withdrawn.

Which one of the following describes the action that causes the electrical output of the measuring circuit to change as the control rod is withdrawn?

A. An ac coil on the control rod drive shaft induces a voltage into each reed switch as the drive shaft passes by.

B. A metal tab on the control rod drive shaft mechanically closes each reed switch as the drive shaft passes by.

C. The primary and secondary coils of each reed switch attain maximum magnetic coupling as the drive shaft passes by.

D. A permanent magnet on the control rod drive shaft attracts the movable contact arm of each reed switch as the drive shaft passes by.

ANSWER: D.

電子量測電路使用磁簧開關，以監測核子反應器中控制棒的棒位。此磁簧開關安裝於反應器槽上方一圓柱，以便在控制棒抽出時，控制棒驅動桿通過磁簧開關。

控制棒抽出時，下列何者說明導致此量測電路的信號輸出發生變化的動作？

A. 控制棒驅動桿上的交流電線圈，會在此驅動桿通過時，使得每個磁簧開關產生一電壓。

B. 控制棒驅動桿上的金屬片，會在此驅動桿通過時，機械式關閉每個磁簧開關。

C. 每個磁簧開關上的主線圈與次線圈，會在此驅動桿通過時，獲得最大的磁耦合。

D. 控制棒驅動桿上的永久磁鐵，會在此驅動桿通過時，吸引每個磁簧開關上可移動的接觸臂。

答案：D.

科目： 191002
知能類：K1.17 [3.3/3.5]
序號： P415

A nuclear power plant has experienced a loss of coolant accident with degraded safety injection flow. Core voiding is homogeneous and is currently 20%.

Which one of the following describes excore source/startup range neutron level indication as homogeneous core voiding increases from 20% to 100% of the core? (Assume the neutron detectors are located adjacent to the bottom portion of the core.)

A. Decreases continuously

B. Decreases, then increases

C. Increases continuously

D. Increases, then decreases

ANSWER: D.

核能電廠發生冷卻水流失事故且安全注水流量不足。爐心均勻產生空泡，目前比例為20%。

下列何者描述了均勻的爐心空泡從 20%增至 100%時，爐外源階/啟動階(excore source/startup range)中子偵測器指示值(假設中子偵測器鄰近爐心底部)的變化？

A. 持續減少。

B. 先減少後，再增加。

C. 持續增加。

D. 先增加後，再減少。

答案：D.

科目： 191002
知能類：K1.17 [3.3/3.5]
序號： P1312

A nuclear reactor is shut down at 100 cps in the source/startup range when a loss of coolant accident occurs. How will excore source/startup range neutron level indication change as homogeneous core voiding increases from 20% to 100% in a shutdown reactor?

A. Increases because more neutron leakage occurs and then continues to increase because more neutrons are available for subcritical multiplication.

B. Increases because more neutron leakage occurs and then decreases because fewer neutrons are available for subcritical multiplication.

C. Decreases because less neutron leakage occurs and then increases because more neutrons are available for subcritical multiplication.

D. Decreases because fewer neutrons are available for subcritical multiplication and then increases because more neutron leakage occurs.

ANSWER: B.

核子反應器於發生冷卻水流失事故時停機,此時的爐外源階/啟動階中子偵測器指示值為100 cps。停機反應器的均勻爐心空泡從 20%增至 100%時，爐外源階/啟動階中子偵測器的指示值變化為何？

A. 基於中子洩漏更多而增加，之後，因為有更多中子可供次臨界增殖(subcritical multiplication)而持續增加。

B. 基於中子洩漏更多而增加，之後，因為可供次臨界增殖的中子變少而降低。

C. 基於中子洩漏更少而降低，之後，因為有更多中子可供次臨界增殖而增加。

D. 基於可供次臨界增殖的中子變少而降低，之後，因為中子洩漏量變多而增加。

答案：B.

科目： 191002
知能類：K1.17 [3.3/3.5]
序號： P1612

A nuclear reactor is shut down at 100 cps in the source/startup range when a loss of coolant accident occurs. Which one of the following describes excore source/startup range neutron level indication as homogeneous core voiding increases from 20% to 40%?

A. Increases because more neutron leakage is occurring

B. Decreases because less neutron leakage is occurring

C. Increases because K eff is increasing

D. Decreases because Keff is decreasing

ANSWER: A.

核子反應器於發生冷卻水流失事故時停機，此時的爐外源階/啟動階中子偵測器指示值為 100 cps。均勻爐心空泡從 20%增至 40%時，下列何者說明了爐外源階/啟動階中子偵測器的指示值變化？

A. 因中子洩漏變多而增加。

B. 因中子洩漏變少而減少。

C. 因 K_{eff} 增加而增加。

D. 因 K_{eff} 減少而降低。

答案：A.

科目： 191002
知能類：K1.17 [3.3/3.5]
序號： P1811

A nuclear reactor is shut down at 100 counts per second in the source range when a loss of coolant accident occurs. How will excore source range neutron level indication change as homogeneous core voiding increases from 80% to 100%?

A. Decreases because K eff is decreasing.

B. Increases because K eff is increasing.

C. Decreases because a smaller fraction of the core neutron population is leaking out of the core.

D. Increases because a larger fraction of the core neutron population is leaking out of the core.

ANSWER: A.

核子反應器於發生冷卻水流失事故時停機，此時的源階中子偵測器指示值為 100 cps。均勻爐心空泡從 80%增至 100%時，下列何者說明了爐外源階中子偵測器指示值的變化？

A. 因 K_{eff} 減少而降低。

B. 因 K_{eff} 增加而增加。

C. 因少量爐心中子外漏至爐心外而降低。

D. 因少量爐心中子外漏至爐心外而增加。

答案：A.

科目： 191002
知能類：K1.17 [3.3/3.5]
序號： P1910

During a nuclear reactor refueling, the fuel assemblies were reconfigured to reduce the power being produced at the center of the core while maintaining the same rated thermal power. No maintenance or adjustments have been performed on the power range detectors.

How will reactor power level indication compare to actual reactor power when power is stabilized at 50% power?

A. Indication will be higher than actual power due to increased neutron leakage.

B. Indication will be higher than actual power due to decreased neutron leakage.

C. Indication will be lower than actual power due to decreased neutron leakage.

D. Indication will be lower than actual power due to increased neutron leakage.

ANSWER: A.

核子反應器更換燃料期間，燃料組件重新配置，以便降低爐心中央產生的功率，同時維持相同的額定熱功率。功率階偵檢器沒有進行維修或調整。

功率穩定於 50%時，比較核子反應器功率指示值及實際數值：

A. 因為中子洩漏量增加，指示值高於實際熱功率。

B. 因為中子洩漏量減少，指示值高於實際熱功率。

C. 因為中子洩漏量減少，指示值低於實際熱功率。

D. 因為中子洩漏量增加，指示值低於實際熱功率。

答案：A.

科目： 191002
知能類：K1.17 [3.3/3.5]
序號： P2513

A nuclear power plant startup is in progress immediately following a reactor refueling outage. The external nuclear instrumentation (NI) was calibrated at 90% power just prior to the refueling outage and has not been readjusted.

If actual reactor power level is increased to 90% and stabilized, NI power level will be _____ than actual reactor power level because, when compared to pre-outage 90% power level operation, _____.

A. higher; the total core fission rate has increased

B. lower; the total core fission rate has decreased

C. higher; the fission rate in the outer portion of the core has increased

D. lower; the fission rate in the outer portion of the core has decreased

ANSWER: D.

核能電廠於大修更換燃料後，隨即啟動並升載。爐外核能儀器(NI)於大修更換燃料前，才於 90%功率校正過，之後未再經過調校。

倘若反應器的實際功率，增至 90%後維持穩定，核能儀器之功率指示將_____於反應器的實際功率，因為對照大修前的 90%功率運作情形時，_____。

A. 高；總爐心分裂率增加。

B. 低；總爐心分裂率減少。

C. 高；爐心外圍分裂率增加。

D. 低；爐心外圍分裂率減少。

答案：D.

科目： 191002
知能類：K1.17 [3.3/3.5]
序號： P2713 (N/A)

During a nuclear reactor refueling outage, the fuel assemblies were reconfigured to reduce the radial power peak at the center of the core while maintaining the same rated thermal power. Excore power range detectors were calibrated at 50% of rated power just prior to the outage.

How will actual reactor power compare to indicated reactor power when the nuclear power plant is stabilized at 50% power following the outage?

A. Actual reactor power will be higher than indicated reactor power due to increased core neutron leakage.

B. Actual reactor power will be higher than indicated reactor power due to decreased core neutron leakage.

C. Actual reactor power will be lower than indicated reactor power due to decreased core neutron leakage.

D. Actual reactor power will be lower than indicated reactor power due to increased core neutron leakage.

ANSWER: D.

核子反應器大修更換燃料期間，燃料組件經過重新配置，以降低爐心中央的徑向功率峰值(radial power peak)，同時額定功率維持不變。爐外(excore)功率階偵檢器剛好於大修前，50%額定功率時校正過。

核能電廠於大修之後，穩定於 50%功率時，請比較反應器的實際功率及指示值？

A. 因為爐心中子洩漏增加，反應器的實際功率將高於指示功率。

B. 因為爐心中子洩漏減少，反應器的實際功率將高於指示功率。

C. 因為爐心中子洩漏減少，反應器的實際功率將低於指示功率。

D. 因為爐心中子洩漏增加，反應器的實際功率將低於指示功率。

答案：D.

科目： 191002
知能類：K1.17 [3.3/3.5]
序號： P2812

A nuclear power plant has experienced a loss of coolant accident combined with a loss of emergency coolant injection flow. Homogeneous core voiding has occurred, with the void fraction currently nearing 100%. Now, emergency coolant injection flow is restored, which causes a steady reduction in the core void fraction as the core is refilled.

Which one of the following describes the expected trend in excore source/startup range neutron level indication as the homogeneous core void fraction decreases from 100% to 20% in the core and downcomer? (Assume the source/startup range neutron detectors are located adjacent to the bottom one-third of the core.)

A. Increases, then decreases

B. Increases continuously

C. Decreases, then increases

D. Decreases continuously

ANSWER: A.

核能電廠同時發生喪失冷卻水及喪失緊急冷卻水注入事故，造成均勻爐心空泡，目前的空泡比接近 100%。現在，緊急冷卻水注入恢復，造成爐心空泡比隨著爐心再度補水而逐步降低。

下列何者說明了爐心與降流區(downcomer)的均勻爐心空泡比率，從 100%降至 20%時，爐外源階/啟動階中子偵測器的指示值預期走向？(假設源階/啟動階中子偵測器鄰近爐心底部三分之一處)

A. 先增加再降低。

B. 持續增加。

C. 先降低再增加。

D. 持續降低。

答案：A.

科目： 191002
知能類：K1.17 [3.3/3.5]
序號： P3112

Given:

- The nuclear reactor is shut down.
- The reactor coolant system is at normal operating pressure and temperature.
- The BF_3 source/startup range detectors are properly positioned outside the reactor vessel and adjacent to the lower portion of the core.
- All BF_3 source/startup range detectors are indicating approximately 100 cps.
- A sudden loss of coolant pressure accident occurs that causes bulk boiling and homogeneous core voiding in the reactor vessel.

How and why will source/startup range detector outputs change as homogeneous core voiding increases from 0% to 50%?

A. Increase, because the detectors will experience a higher rate of neutron interactions due to the axial power distribution shifting toward the lower portion of the core.

B. Increase, because the detectors will experience a higher rate of neutron interactions due to increasing neutron leakage from the core.

C. Decrease, because the detectors will experience a lower rate of neutron interactions due to a decreasing subcritical multiplication neutron level.

D. Decrease, because the detectors will experience a lower rate of gamma interactions due to decreasing reactor coolant attenuation.

ANSWER: B.

已知：

- 核能反應爐停機。
- 反應器冷卻水系統運轉壓力及溫度正常。
- BF_3 源階/啟動階偵測器妥善置於反應爐外，鄰近爐心下部。
- 所有 BF_3 源階/啟動階偵測器，均指示 100 cps 左右。
- 突然發生冷卻水失壓事故，造成反應爐內大量沸騰且產生均勻的爐心空泡。

均勻爐心空泡從 0%增至 50%時，源階/啟動階偵測器的輸出的變化如何？理由何在？

A. 增加，軸向功率分佈(axial power distribution)朝爐心底部移動，導致偵測器的中子反應率提高。

B. 增加，爐心中子洩漏提高，導致偵測器的中子反應率提高。

C. 減少，次臨界增殖中子位階降低，導致偵測器的中子反應率降低。

D. 減少，反應器冷卻水衰減效應降低，導致偵測器的伽瑪反應率降低。

答案：B.

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P15 (B314)

Scintillation detectors convert radiation energy into light by a process known as...

A. gas amplification.

B. space charge effect.

C. luminescence.

D. photoionization.

ANSWER: C.

閃爍偵檢器將輻射能轉換成光，此程序稱為……

A. 氣體放大(gas amplification)。

B. 空間充電效應(space charge effect)。

C. 冷光(luminescence)。

D. 光游離(photoionization)。

答案：C.

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P16

A BF_3 proportional counter is being used to measure neutron level during a reactor startup.

Which of the following describes the method used to ensure that neutron indication is not being affected by gamma reactions in the detector?

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

B. The BF3 proportional detector measures neutron flux of sufficient intensity that the gamma signal is insignificant compared to the neutron signal.

C. In a proportional counter gamma-induced pulses are of insufficient duration to generate a significant log-level amplifier output. Only neutron pulses have sufficient duration to be counted by the detector instrumentation.

D. In a proportional counter neutron-induced pulses are significantly larger than gamma pulses. The detector instrumentation filters out the smaller gamma pulses.

ANSWER: D.

使用 BF_3 比例計數器(proportional counter)量測反應器起動時的中子位階。下列何種方法可以確保計數器的中子指示值，不受計數器內伽瑪反應影響？

A. 使用兩個計數器，一個對中子和伽瑪敏感，一個僅對伽瑪敏感。輸出數值在電位上相反，藉此刪除伽瑪引發的電流。

B. BF_3 比例計數器量測的中子通量具備足夠強度，以致相對於中子訊號，伽瑪訊號並不明顯。

C. 比例計數器上，伽瑪引發的脈衝時間，不足以讓對數放大器產生顯著的輸出量。唯有中子脈衝才具有足夠的時間讓計數器計數。

D. 比例計數器上，中子引發的脈衝明顯大於伽瑪脈衝。計數器於是過濾掉較小的伽瑪脈衝。

答案：D.

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P214 (B213)

Most of the electrons collected in a fission chamber are released as a result of ionizations caused directly by...

A. fission betas.

B. fission gammas.

C. fission neutrons.

D. fission fragments.

ANSWER: D.

大部分分裂腔所收集的電子，是被下列何者所直接游離而釋放出來……

A. 分裂產生之貝他射線。

B. 分裂產生之伽瑪射線。

C. 分裂產生之中子。

D. 分裂產生之碎片。

答案：D.

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P215

Which one of the following describes the reason for the high sensitivity of a Geiger-Mueller tube radiation detector?

A. Changes in applied detector voltage have little effect on detector output.

B. Geiger-Mueller tubes are thinner than other radiation detector types.

C. Any incident radiation event causing primary ionization results in ionization of the entire detector gas volume.

D. Geiger-Mueller tubes are operated at relatively low detector voltages, allowing detection of low energy radiation.

ANSWER: C.

下列何者說明了蓋革-牟勒管輻射偵檢器為何具有高靈敏度的理由？

A. 施加於偵檢器的電壓變化，對偵檢器輸出影響甚小。

B. 蓋革-牟勒管壁較其他種類的輻射偵檢器薄。

C. 任何入射的輻射所引發的一次游離，都會造成整個偵檢器的氣體離子化。

D. 蓋革-牟勒管運作所需的偵檢器電壓相對較低，所以能偵測到低能量輻射。

答案：C.

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P314

A gas-filled radiation detector that is operating in the ionization region is exposed to a gamma radiation field. If the gamma radiation field is constant and the applied voltage is increased but maintained within the ionization region, the detector output will:

A. increase, because of an increase in secondary ionizations.

B. remain the same, because detector output is not affected by a change in voltage in this region.

C. increase, because of a decrease in recombination of primary ions.

D. remain the same, because the detector is already producing its maximum output.

ANSWER: B.

運作於游離區(ionization region)的充氣式輻射偵檢器，暴露在伽瑪輻射場中。倘若伽瑪輻射場維持一定，施加電壓雖有增加，但仍然維持在游離區內，則偵檢器輸出將：

A. 提高，因為二次游離增加。

B. 維持相同，因為偵檢器輸出不受此區電壓變動所影響。

C. 增加，因為一次離子再度結合率降低。

D. 維持相同，因為偵檢器已產生最高輸出。

答案：B.

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P316

Which one of the following materials is installed inside an ion chamber that is typically used for thermal neutron detection and reactor power indication?

A. Polyethylene

B. Boron-10

C. Uranium-238

D. Rhodium-103

ANSWER: B.

下列何種裝於離子腔內的材料，通常用來偵測熱中子及顯示反應器功率？

A. 聚乙烯

B. 硼-10

C. 鈾-238

D. 銠-103

答案：B.

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P614

Refer to the drawing of a gas-filled detector characteristic curve (see figure below).

In a gas-filled radiation detector, operating in the "proportional" region, essentially _____ of the ions caused by incident radiation are collected and the number of ions collected from secondary ionizations is _____ applied voltage.

A. all; independent of

B. none; related to

C. all; related to

D. none; independent of

ANSWER: C.

請參照下圖的充氣式偵檢器特性曲線。

基本上，充氣式輻射偵檢器(於「比例」區運作)將入射輻射所形成的離子_____。二次游離收集的離子，與施加電壓_____。

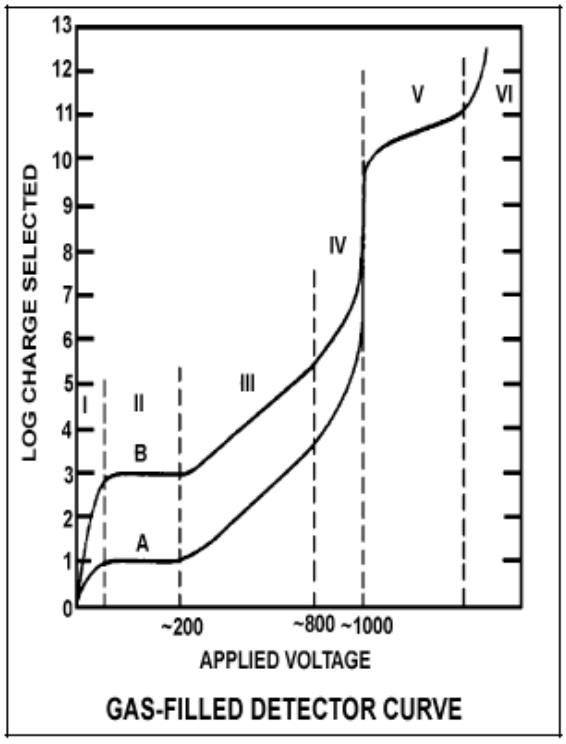
A. 全部收集；無關

B. 不收集；有關

C. 全部收集；有關

D. 不收集；無關

答案：C.



科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P1013

A gas-filled radiation detector that is used to measure thermal neutron flux requires a special feature because thermal neutrons are not directly ionizing particles. Which one of the following will allow thermal neutron detection in a gas-filled detector?

A. Encapsulate the detector with polyethylene

B. Encapsulate the detector with boron-10

C. Line the inside of the detector with polyethylene

D. Line the inside of the detector with boron-10

ANSWER: D.

一個充氣式輻射偵檢器被用來量測熱中子通量，基於熱中子並非直接游離粒子，所以需要一種特別功能。下列何者能讓充氣式輻射偵檢器可用於偵測熱中子？

A. 用聚乙烯填封偵檢器。

B. 用硼-10 填封偵檢器。

C. 偵檢器內襯以聚乙烯。

D. 偵檢器內襯以硼-10。

答案：D.

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P1112

Which one of the following is a characteristic of Geiger-Mueller tube radiation detectors?

A. They can discriminate between neutron and gamma radiation.

B. They can discriminate between gammas of differing energies in the MeV range.

C. They provide an output that is inversely proportional to the applied voltage within the Geiger Mueller region.

D. They undergo maximum gas amplification whenever an ion is formed in the tube.

ANSWER: D.

下列何者是蓋革-牟勒管輻射偵檢器的特性？

A. 能區分中子和伽瑪輻射線。

B. 能區分 MeV 範圍內、能量不同的伽瑪輻射線。

C. 輸出結果與蓋革-牟勒區所施加電壓成反比。

D. 每當管內形成離子時，將產生最大的氣體放大量。

答案：D.

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P1213

Which one of the following describes why a BF_3 proportional counter can be used in the source range to measure neutron radiation in a radiation field that also contains gamma radiation?

A. Neutrons directly ionize the BF_3 gas, producing larger pulses than gammas.

B. Neutrons interacting with the BF_3 gas result in the release of alpha particles which produce larger pulses than gammas.

C. Neutrons are captured by boron-10 and produce additional neutrons that completely ionize the fill gas in the detector.

D. The gamma radiation field is insignificant when compared to the neutron field.

ANSWER: B.

下列何者說明了源階內 BF_3 比例計數器可在一含有伽瑪射線的輻射場中，用來量測中子射線的理由？

A. 中子直接離子化 BF_3 氣體，產生的脈衝大於伽瑪。

B. 中子與 BF_3 氣體的作用，導致阿伐粒子釋出，此種粒子產生的脈衝大於伽瑪。

C. 硼-10 捕捉到中子，產生額外中子，進而將計數器充入氣體完全游離。

D. 相較於中子輻射場，伽瑪輻射場甚小。

答案：B.

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P1314

Which one of the following types of radiation will produce the greatest number of ions while passing through 1 centimeter of air? (Assume the same kinetic energy for each.)

A. Alpha

B. Beta

C. Gamma

D. Neutron

ANSWER: A.

下列何種輻射線將於通過 1 公分氣體時，產生最大量的離子數(假設每種輻射線的動能相同)？

A. 阿伐

B. 貝他

C. 伽瑪

D. 中子

答案：A.

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P1414

Which type of radiation detector is typically used to monitor for alpha radiation?

A. Ion chamber

B. Geiger-Mueller

C. Proportional

D. Scintillation

ANSWER: D.

下列何種輻射偵檢器，常用來監測阿伐輻射線？

A. 離子腔。

B. 蓋革-牟勒偵檢器。

C. 比例偵檢器。

D. 閃爍偵檢器。

答案：D.

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P1513 (B1514)

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

A. Geiger Mueller and ion chamber

B. Proportional and limited proportional

C. Ion chamber and proportional

D. Limited proportional and Geiger Mueller

ANSWER: A.

下列哪兩種充氣式輻射偵檢器，其輸出最不會受到施加於偵檢器的微小電壓變化(+10伏特)所影響(假設電壓維持在正常範圍內)？

A. 蓋革-牟勒與離子腔偵檢器。

B. 比例與限制比例偵檢器。

C. 離子腔與比例偵檢器。

D. 限制比例與蓋革-牟勒偵檢器。

答案：A.

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P1613 (B913)

Which one of the following describes a characteristic of a gas-filled radiation detector operating in the Geiger-Mueller region?

A. Radiation types can be identified by pulse height.

B. Specific radionuclides can be identified by energy level.

C. Small variations in applied voltage will result in large changes in detector output.

D. Any type of radiation that ionizes the detector gas will produce the same magnitude detector output pulse.

ANSWER: D.

下列何者說明了蓋革-牟勒輻射偵檢器的特性？

A. 輻射線類型可以經由脈衝高度而辨識。

B. 特定放射核種可利用能量位階來辨識。

C. 施加電壓上的微小變化，將導致偵檢器輸出的巨大變化。

D. 任何將偵檢器氣體游離的輻射線，都會產生同樣大小的偵檢器輸出脈衝。

答案：D.

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P1713 (B1714)

A Geiger-Mueller radiation detector is located in a radiation field consisting of beta, gamma, and fast neutron radiation. Assuming each type of radiation enters the detector gas chamber and ionizes the detector gas, which one of the following describes the resulting detector pulse sizes?

A. Beta radiation will produce a larger pulse size than either gamma or fast neutron radiation.

B. Gamma radiation will produce a larger pulse size than either beta or fast neutron radiation.

C. Fast neutron radiation will produce a larger pulse size than either beta or gamma radiation.

D. Beta, gamma, and fast neutron radiation will produce pulse sizes that are equal in magnitude.

ANSWER: D.

一蓋革-牟勒輻射偵檢器位於包含貝他、伽瑪以及快中子輻射線之輻射場中。假設每一種輻射線均進入偵檢器氣體腔，同時將偵檢器氣體游離，下列何者描述了產生之偵檢器脈衝大小？

A. 與伽瑪或快中子相比，貝他輻射線將產生較大的脈衝大小。

B. 與貝他或快中子相比，伽瑪輻射線將產生較大的脈衝大小。

C. 與貝他或伽瑪相比，快中子輻射線將產生較大的脈衝大小。

D. 貝他、伽瑪與快中子所產生的脈衝大小相等。

答案：D.

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P1812 (B814)

A gas-filled radiation detector operating in the proportional region is exposed to a constant gamma radiation field. If the applied voltage is increased but maintained within the proportional region, the rate of ion collection will...

A. stay approximately the same because all of the primary ions were already being collected at the lower voltage.

B. stay approximately the same because the ion chamber is operating at saturated conditions.

C. increase because fewer primary ions are recombining in the detector prior to reaching the electrodes.

D. increase because more secondary ionizations are occurring in the detector.

ANSWER: D.

一充氣式輻射偵檢器在比例區中運作，暴露在一穩定伽瑪輻射場中。若施加電壓增加，但是仍維持在比例區中，則離子收集速率將會……

A. 維持大約相同，因為一次離子已經在低電壓時被收集。

B. 維持大約相同，因為離子腔在飽和情況下運作。

C. 增加，因為在到達電極之前，較少的一次離子在偵檢器中進行再結合。

D. 增加，因為在偵檢器會發生更多的二次離子。

答案： D.

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P1909 (B1113)

Which one of the following is the function of the positive electrode in an ion chamber?

A. Produces ions when exposed to a radiation field

B. Releases electrons to combine with positive ions

C. Performs gas quenching to maximize detector sensitivity

D. Collects electrons released during gas ionization

ANSWER: D.

下列何者是游離腔之中正電極的功用？

A. 當暴露於一輻射場中時產生離子。

B. 放出電子與正離子結合。

C. 進行氣淬(gas quenching)以使偵檢器靈敏度增至最大。

D. 收集在氣體游離時所釋放之電子。

答案：D.

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P2013 (B313)

An ion chamber radiation detector is exposed to a constant gamma radiation field. If the applied voltage is increased but maintained within the ion chamber region, the rate of ion collection will...

A. increase with voltage because more secondary ionizations are occurring in the detector.

B. increase with voltage because less primary ions are recombining in the detector prior to reaching the electrodes.

C. stay approximately the same because all of the primary ions were already being collected at the lower voltage.

D. stay approximately the same because the ion chamber is operating at saturated conditions.

ANSWER: C.

離子腔輻射偵檢器暴露於穩定的伽瑪輻射場。倘若施加電壓增加，卻仍維持在離子腔的範圍，離子收集率將……

A. 增加，因為在偵檢器發生更多的二次離子。

B. 增加，因為在到達電極之前，在偵檢器中進行再結合的一次離子較少。

C. 大約維持相同，因為已於低電壓時收集所有一次離子。

D. 大約維持相同，因為離子腔在飽和情況下運作。

答案： C.

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P2014 (B2413)

What is the effect on a proportional neutron detector if it is operated at a voltage near the high end of the proportional (true proportional) region on the gas-filled detector characteristic curve?

A. Neutron-induced pulses will become so large that gamma pulse discrimination is no longer needed, yielding a more accurate neutron count rate.

B. The positive space charge effect will increase and prevent collection of both gamma- and neutron-induced pulses, yielding a less accurate neutron count rate.

C. A high rate of incident gamma radiation will result in the combination of multiple small gamma-induced pulses into larger pulses. The larger combined pulses will be counted as neutron-induced pulses, yielding a less accurate neutron count rate.

D. Detection of any single ionizing event will result in ionizing nearly the entire detector gas volume. The resulting large pulses will prevent the detector from differentiating between radiation types, yielding a less accurate neutron count rate.

ANSWER: C.

比例中子偵檢器若於充氣偵檢器特性曲線中，在接近比例區高限附近的電壓操作，則其影響為何？

A. 中子所生之脈衝將變得非常大，以致於不需要鑑別伽瑪脈衝，因而造成較正確的中子計數值。

B. 正空間充電效應會增加，並排除伽瑪以及中子所生之脈衝的收集，因而造成較不正確的中子計數值。

C. 當伽瑪入射率較高時，會導致多個小型伽瑪所產生的脈衝結合為較大脈衝。結合而成的較大脈衝，將被視為中子所產生的脈衝，因而造成較不正確的中子計數值。

D. 任何單一離子產生時，將導致幾乎整個偵檢器氣體的離子化。所產生的大型脈衝，將阻礙偵檢器對放射種類的鑑別，因而造成較不正確的中子計數值。

答案：C.

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P2313 (B2613)

A gas-filled radiation detector operating in the proportional region is exposed to a constant gamma radiation field. If the applied voltage is decreased but maintained within the proportional region, the rate of ion collection will...

A. stay approximately the same because all of the primary ions were already being collected at the higher voltage.

B. stay approximately the same because the ion chamber is still operating at saturated conditions.

C. decrease because more primary ions are recombining in the detector prior to reaching the electrodes.

D. decrease because fewer secondary ionizations are occurring in the detector.

ANSWER: D.

一充氣式輻射偵檢器用於比例區，並暴露於一固定之伽瑪輻射場。若操作電壓降低，但是仍維持在比例區中，則離子收集率將會……

A. 維持大約相同，因為已於高電壓時，收集所有一次離子。

B. 維持大約相同，因為偵檢器仍然在飽和狀態下操作。

C. 減小，因為在到達電極之前，於偵檢器進行再結合的一次離子較多。

D. 減小，因為在偵檢器中發生較少的二次游離。

答案：D.

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P2413 (B2414)

A gas-filled radiation detector operating in the ionization chamber (IC) region is being exposed to a constant gamma radiation field. If the applied voltage is decreased but maintained within the IC region, the rate of ion collection will...

A. stay approximately the same because all of the primary ions continue to be collected and essentially no secondary ionizations are occurring.

B. stay approximately the same because detector operation in the ionization chamber region is characterized by complete ionization of the detector gas.

C. decrease because fewer primary ionizations are occurring in the detector as detector voltage decreases.

D. decrease because fewer secondary ionizations are occurring in the detector as detector voltage decreases.

ANSWER: A.

一充氣式輻射偵檢器在離子腔(IC)區運作，並暴露於一固定之伽瑪輻射場中。若所施加電壓減小，但是仍維持在該離子腔區中，則離子收集速率將會……

A. 維持大約相同，因為將繼續收集所有一次離子，基本上沒有二次游離發生。

B. 維持大約相同，因為偵檢器在離子腔區運作之特性，為偵檢器氣體將完全離子化。

C. 減小，因為當偵檢器電壓下降時，在偵檢器所發生的一次游離較少。

D. 減小，因為當偵檢器電壓下降時，在偵檢器所發生的二次游離較少。

答案：A.

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P2613 (B1114)

Which one of the following describes the reason for the high sensitivity of a gas-filled ion chamber operating in the Geiger-Mueller region?

A. Any radiation-induced ionization results in a large detector output pulse.

B. Geiger-Mueller detectors are longer than other types of radiation detectors, resulting in greater detector surface area.

C. The detector output is directly proportional to the applied voltage within the Geiger-Mueller region.

D. The high detector voltage allows differentiation between the various radiation types.

ANSWER: A.

下列何者描述了在蓋革-牟勒區運作的充氣式離子腔，之所以具備高靈敏度的原因？

A. 任何輻射線所產生之離子化，均會導致大幅的偵檢器輸出脈衝。

B. 蓋革-牟勒偵檢器較其他輻射線偵檢器為長，因而導致較大的偵檢器表面積。

C. 偵檢器輸出與蓋革-牟勒區內所施電壓成正比。

D. 偵檢器高電壓可鑑別不同類型輻射線。

答案：A.

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P2913 (B414)

Refer to the drawing of a gas-filled radiation detector characteristic curve (see figure below).

Which one of the following statements describes how a gas-filled radiation detector, operating in the "proportional" region, functions?

A. Essentially all of the ions from primary ionizations are collected; the number of ions collected from secondary ionizations are independent of the applied voltage on a logarithmic scale.

B. The number of ions collected from both primary and secondary ionizations vary directly with the applied voltage on a logarithmic scale.

C. Essentially all of the ions from primary ionizations are collected; the number of ions collected from secondary ionizations vary directly with the applied voltage on a logarithmic scale.

D. The number of ions collected from both primary and secondary ionizations are independent of the applied voltage on a logarithmic scale.

ANSWER: C.

請參照下圖的充氣式檢測器特性曲線。

下列何者描述了充氣式輻射偵檢器在「比例區」的運作方式？

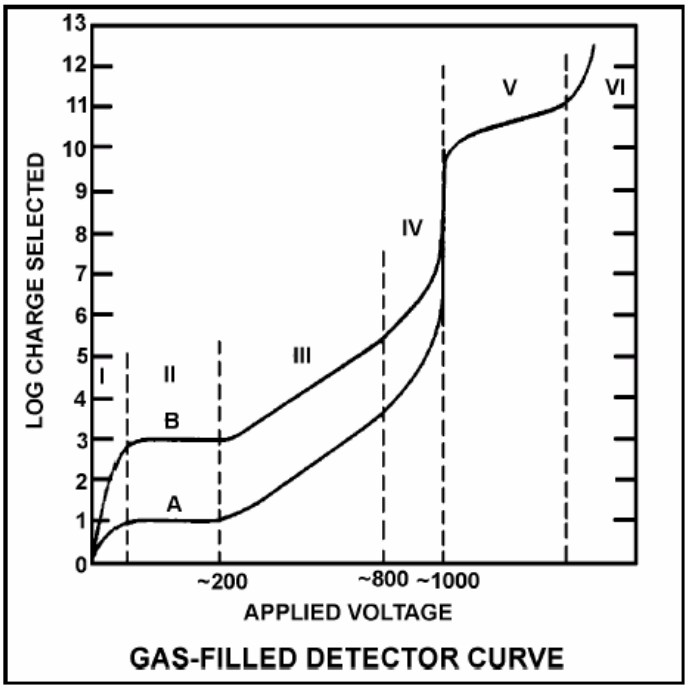
A. 基本上，所有一次游離之離子均被收集；因二次游離而收集的離子數，則與對數座標(logarithmic scale)上的所施電壓無關。

B. 從一次與二次游離收集的離子數，隨著對數座標上施加的電壓變動。

C. 基本上，所有一次游離之離子均被收集；而二次游離而收集的離子數，則隨著對數座標上的所施電壓而變動。

D. 從一次與二次游離收集的離子數，與對數座標上施加的電壓無關。

答案：C.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13
12
11
10
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2
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I
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IV
V
VI
B
A
~200
~800
~1000
APPLIED VOLTAGE
GAS-FILLED DETECTOR CURVE

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P3413

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

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

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

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

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

ANSWER: A.

三氟化硼(BF_3)偵檢器(比例計數器)一般僅用來監測源階爐心中子位階。假如在核子反應器於功率運轉時，不小心施加其他一般偵檢器使用的高電壓，偵檢器與源階計數率的指示值，將受到何種影響？

A. 三氟化硼氣體將完全離子化，源階指示值將於一固定低值趨於穩定。

B. 三氟化硼氣體將完全離子化，源階指示值將於一固定高值趨於穩定。

C. 偵檢器電極將暴露於極高的中子通量下，造成源階指示值出現錯誤高值。

D. 偵檢器電極將暴露於極高的伽瑪通量下，造成源階指示值出現錯誤高值。

答案：A.

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P3906 (B3907)

A beta particle and an alpha particle enter and cause ionization in a gas-filled radiation detector operating in the Geiger-Mueller region. Which one of the following accurately compares the amplitude of the detector pulses caused by each type of radiation?

A. The beta particle pulse will be larger in amplitude.

B. The alpha particle pulse will be larger in amplitude.

C. The pulses will be identical for both types of radiation.

D. Cannot be determined without particle kinetic energy information.

ANSWER: C.

一貝他粒子與一阿伐粒子進入一於蓋革-牟勒區運作之充氣式輻射偵檢器，並導致游離。下列何者正確比較了兩種輻射線產生的偵檢器脈衝大小？

A. 貝他粒子脈衝幅度較大。

B. 阿伐粒子脈衝幅度較大。

C. 兩種輻射線導致的脈衝大小相同。

D. 欠缺粒子的動能資料而無法決定。

答案：C.

科目： 191002
知能類：K1.18 [2.6/2.8]
序號： P4506 (B4507)

A nuclear power plant has been shutdown for one month. A portable gas-filled radiation detector is needed to monitor shutdown reactor core neutron level from a location outside the reactor vessel. The detector must be able to distinguish between ionizations caused by gamma and neutron radiation.

Which region(s) of the gas-filled detector characteristic curve is/are acceptable for operation of the detector?

A. Geiger-Mueller, Ionization, and Proportional regions are all acceptable.

B. Proportional region is acceptable, and Ionization region also may be usable.

C. Ionization region is acceptable, and Geiger-Mueller region also may be usable.

D. Geiger-Mueller region is acceptable, and Proportional region also may be usable.

ANSWER: B.

核能電廠已停機一個月。為了從反應爐外監測停機反應爐心的中子位階，需要使用攜帶型充氣式輻射偵檢器。偵檢器必須能分辨伽瑪與中子輻射線所產生的游離。

此充氣式偵檢器可運作於特性曲線的哪幾區？

A. 蓋革-牟勒區、離子腔區和比例區。

B. 比例區，離子腔區。

C. 離子腔區，蓋革-牟勒區。

D. 蓋革-牟勒區，比例區。

答案：B.

科目： 191002
知能類：K1.19 [3.1/3.3]
序號： P216 (B214)

Which one of the following statements describes the use of a self-reading pocket dosimeter (SRPD)?

A. The indication from an SRPD is a dose rate in mR/hour.

B. SRPDs can be used to record beta and gamma radiation.

C. SRPDs hold their charge indefinitely when removed from a radiation field.

D. SRPD readings must be considered inaccurate when they are dropped.

ANSWER: D.

下列何者描述了易讀袖珍劑量計(SRPD，self-reading pocket dosimeter)的特性？

A. SRPD輸出之劑量率單位為mR/hr。

B. SRPD能用以記錄貝他與伽瑪輻射線。

C. 當從一輻射場中取出時，SRPD會永久保留其電荷。

D. 當摔落時，SRPD讀數應被視為不正確。

答案：D.

科目： 191002
知能類：K1.19 [3.1/3.3]
序號： P714 (B714)

Which one of the following types of radiation is the major contributor to the dose indication on a self-reading pocket dosimeter (SRPD)? (also called SRD, PIC, and direct reading dosimeter)

A. Alpha

B. Beta

C. Gamma

D. Neutron

ANSWER: C.

下列何種輻射線，是易讀式袖珍劑量計(SRPD，self-reading pocket dosimeter，亦稱為SRD、PIC、直讀劑量計) 讀數的主要來源？

A. 阿伐(α)

B. 貝他(β)

C. 伽瑪(γ)

D. 中子

答案：C.

科目： 191002
知能類：K1.20 [2.5/2.7]
序號： P914

Which one of the following is commonly used as a coating inside a fission chamber for the purpose of neutron detection?

A. Uranium coating of natural enrichment on both electrode surfaces

B. Uranium coating of highly enriched U-235 on the inner surface of the chamber

C. Uranium coating of natural enrichment on the inner surface of the chamber

D. Uranium coating with highly enriched U-235 on both electrode surfaces

ANSWER: B.

下列何者常塗在分裂腔(fission chamber)內部，以利偵測中子？

A. 在兩個電極表面塗上天然鈾。

B. 在分裂腔內壁塗上高度濃縮的 U-235。

C. 在分裂腔內壁塗上天然鈾。

D. 在兩個電極表面塗上高度濃縮的 U-235。

答案：B.

科目： 191002
知能類：K1.20 [2.5/2.7]
序號： P1114

Which one of the following describes the ion collection that occurs in a proportional counter, such as a BF_3 detector?

A. A fraction of the ions created by primary ionizations are collected. No secondary ionizations take place.

B. Virtually all of the ions created by primary ionizations are collected. No secondary ionizations take place.

C. Virtually all of the ions created by primary ionizations along with a fraction of the ions created by secondary ionizations are collected.

D. Virtually all of the ions created by primary and secondary ionizations are collected.

ANSWER: D.

下列何者說明了比例計數器(如 BF_3 偵檢器)發生的離子收集情形？

A. 收集一次游離造成的少數離子。未發生二次游離。

B. 收集了一次游離造成的所有離子。未發生二次游離。

C. 收集了一次游離造成的所有離子，以及二次離子造成的少數離子。

D. 收集了一次與二次離子造成的所有離子。

答案：D.

科目： 191002
知能類：K1.20 [2.5/2.7]
序號： P1514 (B511)

A BF_3 gas-filled detector, operating in the proportional region, is being used to monitor reactor power while shut down. If a complete loss of detector gas pressure occurs, the instrument indication will fail...

A. upscale.

B. downscale.

C. as is.

D. to midscale.

ANSWER: B.

使用在比例區運作的BF_3充氣式偵檢器，監控停機時的反應器功率。若偵檢器氣體壓力完全喪失，此裝置指示值將會失效，並指向……

A. 錶頭刻度之上。

B. 錶頭刻度之下。

C. 現值。

D. 中間值。

答案：B.

科目： 191002
知能類：K1.20 [2.5/2.7]
序號： P3714 (B3714)

During reactor power operation, a reactor coolant sample is taken and analyzed. Which one of the following lists three radionuclides that are all indicative of a fuel cladding failure if detected in elevated concentrations in the reactor coolant sample?

A. Lithium-6, cobalt-60, and argon-41

B. Iodine-131, cesium-138, and strontium-89

C. Nitrogen-16, xenon-135, and manganese-56

D. Hydrogen-2 (deuterium), hydrogen-3 (tritium), and oxygen-18

ANSWER: B.

於反應器功率運轉期間，會取反應器冷卻水樣本並分析。若反應器冷卻水樣本中，檢驗出某些核種濃度升高，下列那三種放射核種，均為燃料護套失效之指標？

A. 鋰-6、鈷-138、氬-41。

B. 碘-131、銫-135、鍶-89。

C. 氮-16、氙-135、錳-56。

D. 氫-2(氘)、氫-3(氚)、氧-18。

答案：B.

科目/題號：191002/1 (2016新增)
知能類：K1.02 [2.7/2.9]
序號：P4703 (B4704)

A nuclear power plant is initially operating with the following main steam parameter values:

Main steam pressure = 1,000 psia
Main steam flow rate = 500,000 lbm/hr

Main steam pressure decreases and stabilizes at 950 psia.
Assume 100 percent quality saturated steam and that main steam volumetric flow rate is the same before and after the pressure change.
Which one of the following is the approximate mass flow rate of main steam after the pressure change?
A. 528,000 lbm/hr
B. 500,000 lbm/hr
C. 472,000 lbm/hr
D. 444,000 lbm/hr
ANSWER: C.

一運轉中的核電廠其初始主蒸汽參數值如下：

主蒸汽壓力= 1,000 psia
主蒸汽流量率= 500,000 lbm/hr

主蒸汽壓力降低後穩定在 950 psia。假設壓力改變前和改變後主蒸汽均維持100%乾度飽和及相同體積流量率。
下列何者為壓力改變後的大約主蒸汽質量流量率？
A. 528,000 lbm/hr
B. 500,000 lbm/hr
C. 472,000 lbm/hr
D. 444,000 lbm/hr

答案： C

科目/題號：191002/2 (2016新增)
知能類：K1.02 [2.7/2.9]
序號：P6103 (B6104)

For water flowing through a venturi, there is a proportional relationship between flow rate and differential pressure. For steam flowing through a venturi, the relationship must be modified to account for changes in _____ as the steam flows through the venturi.
A. velocity
B. enthalpy
C. internal energy
D. specific volume
ANSWER: D.

水流經一文氏管，其流量與差壓為正比關係。如為蒸汽流經此文氏管，則其流量與差壓的關係必須作修正，以計入_____的改變。
A.速度
B.焓
C.內能
D.比容

答案： D

科目/題號：191002/3 (2016 新增)
知能類：K1.02〔2.7/2.9〕
序號：P6403

A nuclear power plant is operating at 100 percent power with constant steam generator water levels. Only main feedwater is entering the steam generators and only main steam is leaving the steam generators. Both the main feedwater mass flow rate and the main steam mass flow rate instruments use venturi flow sensing elements. For the above conditions, the indication that most accurately reflects the mass flow rate through a steam generator will typically be the mass flow rate indication for...

A. main feedwater, because condensation can adversely affect the characteristics of a steam flow venturi.
B. main feedwater, because steam generator pressure changes affect the specific volume of steam more than water.
C. main steam, because the enthalpy of high quality steam flowing through a venturi is constant, unlike the enthalpy of water.
D. main steam, because a given mass flow rate of steam through a venturi develops a larger pressure change than the same mass flow rate of water.

ANSWER: B.

某核電廠正以100%功率運轉發電，其蒸汽產生器水位保持固定。進入該蒸汽產生器的流體只有主飼水，離開的流體也只有主蒸汽。主飼水與主蒸汽的質量流量率都是使用文氏管流量計來量測。在上述條件下，最能精準的反映蒸汽產生器之質量流量率的指標通常是：

A.主飼水的質量流量率，因為用文氏管量測蒸汽流量會因蒸汽的凝結而影響其準確度
B.主飼水的質量流量率，因為蒸汽產生器之壓力變化對蒸汽比容的影響超過其對水比容的影響
C.主蒸汽的質量流量率，因為通過文氏管高乾度蒸汽的熱焓值是固定的，而水之熱焓值則不定
D.主蒸汽的質量流量率，因為一定質量流量率的蒸汽通過文氏管會比相同質量流量率的水通過文氏管產生更大的壓力變化

答案： B

科目/題號：191002/4 (2016新增)
知能類：K1.05 [2.6/2.8]
序號：P4804 (B4804)

A cooling water system uses a horizontal venturi with a differential pressure flow detector to provide flow rate indication. Water enters and leaves the venturi at 70°F, 100 psig, and 24 ft/sec. Water velocity at the throat of the venturi is 50 ft/sec. Assume water is incompressible and the venture experiences no unrecoverable head loss. What is the approximate pressure of the water at the throat of the venturi?
A. 98 psig
B. 94 psig
C. 87 psig
D. 74 psig
ANSWER: C.

一冷卻水系統使用水平文氏管及差壓流量偵檢器以提供流量率指示。水以 70°F、100 psig、24 ft/sec 進入與離開文氏管，文氏管喉部水流速為 50 ft/sec。假設水是不可壓縮，而流經文氏管無不可回復的水頭損失。文氏管喉部的水壓大約為何？
A. 98 psig
B. 94 psig
C. 87 psig
D. 74 psig

答案： C

科目/題號：191002/5 (2016新增)
知能類：K1.05 [2.6/2.8]
序號：P6803 (B6804)

Refer to the drawing of a frictionless venturi flow element (see figure below).
Subcooled water is flowing through the venturi with the following initial conditions:

Flow rate = 500 gpm
Tap A pressure = 40 psia
Tap B pressure = 36 psia

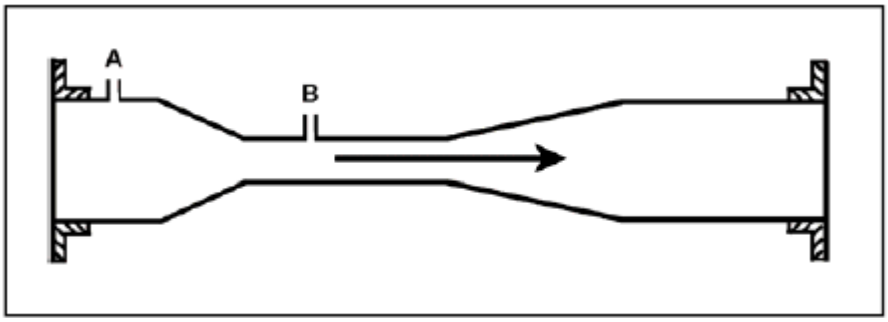
Flow rate increases to 1,000 gpm, which results in a tap A pressure of 68 psia. What is the new pressure at tap B?
A. 60 psia
B. 52 psia
C. 44 psia
D. 32 psia
ANSWER: B.

參考無磨擦力文氏管流量元件圖(見下圖)。次冷水流經文氏管，其初始狀態如下：

流量率=500 gpm
接頭A壓力= 40 psia
接頭B壓力= 36 psia

當流量率增加到1,000 gpm時，接頭A壓力為68 psia。接頭B的新壓力為多少？
A. 60 psia
B. 52 psia
C. 44 psia
D. 32 psia

答案： B



科目/題號：191002/6 (2016新增)
知能類：K1.05 [2.6/2.8]
序號：P7632 (B7632)

Refer to the drawing of a frictionless venturi flow element (see figure below).
Subcooled water is flowing through the venturi with the following initial conditions:

Flow rate = 500 gpm
Tap A pressure = 40 psia
Tap B pressure = 36 psia

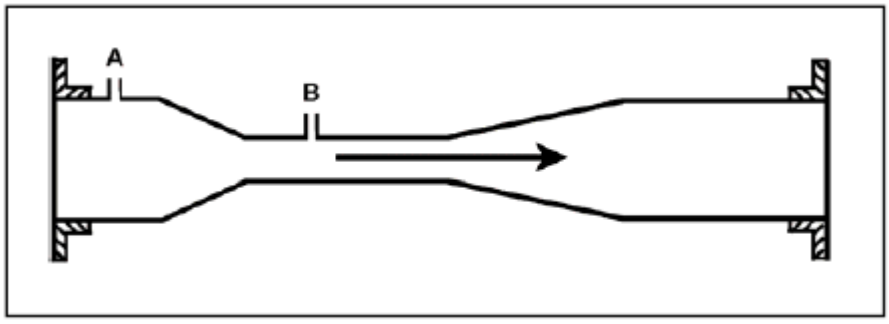
When flow rate is increased to 750 gpm, the pressure at tap A increases to 68 psia.
What is the new pressure at tap B?
A. 66 psia
B. 62 psia
C. 59 psia
D. 52 psia
ANSWER: C.

參考無磨擦力文氏管流量元件圖(見下圖)。次冷水流經文氏管，其初始狀態如下：

流量率=500 gpm
接頭A壓力= 40 psia
接頭B壓力= 36 psia

當流量率增加到750 gpm時，接頭A壓力增加到68 psia。接頭B的新壓力為多少？
A. 66 psia
B. 62 psia
C. 59 psia
D. 52 psia

答案： C



科目/題號：191002/7 (2016 新增)
知能類：K1.06〔2.5/2.6〕
序號：P3208

A reactor is currently shut down with the reactor coolant system at 140°F and 150 psig. Pressurizer level is being monitored using a differential pressure detector with a wet reference leg. The pressurizer level instrument was calibrated at normal plant operating conditions.
The pressurizer level instrument currently indicates _____ than actual pressurizer level because, compared to the calibration conditions, there has been a significant change in the density of the fluid in the _____.
A. lower; reference leg
B. lower; pressurizer
C. higher; reference leg
D. higher; pressurizer
ANSWER: D.

某核能機組停機中，其反應爐冷卻水系統處於140°F與150 psig的狀態。調壓槽水位是利用濕式參考柱差壓偵測計來監測，該水位計校正在機組正常運轉狀況。
調壓槽水位計目前所顯示的水位_____調壓槽實際水位，這是由於相較於校正時的條件，_____的流體密度出現明顯改變所致。
A.低於；參考水柱
B.低於；調壓槽
C.高於；參考水柱
D.高於；調壓槽

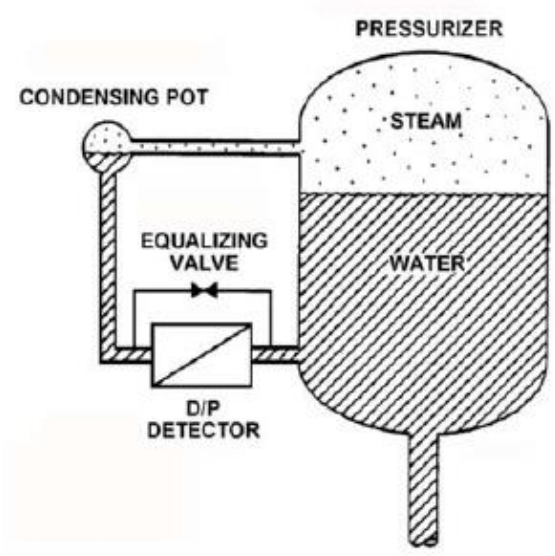
答案： D

科目/題號：191002/8 (2016 新增)
知能類：K1.06〔2.5/2.6〕
序號：P4104

Refer to the drawing of a pressurizer and differential pressure (D/P) level detection system that was recently calibrated at normal operating conditions (see figure below). Assume that the associated pressurizer level instrument does not use density compensation.
With the nuclear power plant shut down at reduced reactor coolant system temperature and pressure, the pressurizer level instrument will indicate _____ than actual water level because the D/P currently sensed by the D/P detector is _____ than the D/P for the same pressurizer water level at normal operating conditions.
A. lower; smaller
B. lower; larger
C. higher; smaller
D. higher; larger
ANSWER: C.

參考調壓槽與差壓式(D/P)水位偵測系統圖(見下圖)，該偵測系統在機組正常運轉的環境下剛校正過。假設相關調壓槽水位儀器未做密度補償。
當核能機組停機降溫、降壓後，調壓槽水位儀器所顯示的數據將_____實際水位，這是因為調壓槽的水位儀器目前測得的差壓值_____相同調壓槽水位在正常運轉狀況下所測得的差壓值。
A.低於；小於
B.低於；大於
C.高於；小於
D.高於；大於

答案： C

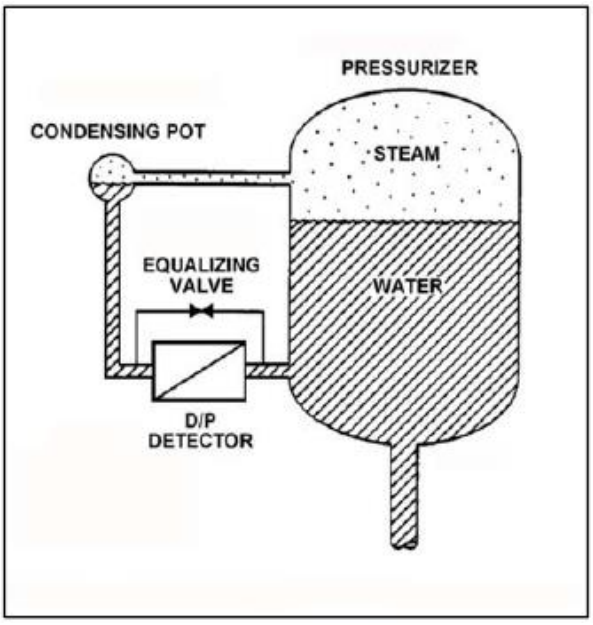


科目/題號：191002/9 (2016 新增)
知能類：K1.06〔2.5/2.6〕
序號：P6203

Refer to the drawing of a pressurizer differential pressure (D/P) level detection system (see figure below).
With the pressurizer containing saturated water and steam at 2,250 psia, pressurizer level indication is 20 feet. Assume that reference leg level and temperature do not change. Also, ignore the effect of steam density changes on level indication.
With no change in actual pressurizer level, what will level indication be at 600 psia (saturated)?
A. 14.9 feet
B. 18.3 feet
C. 22.4 feet
D. 26.8 feet
ANSWER: D.

參考調壓槽之差壓(D/P)水位偵測系統圖(見下圖)。
當包含飽和的水與蒸汽的調壓槽壓力為2,250 psia時，水位指示為20 feet。假設參考水柱水位及溫度不變，同時忽略蒸汽密度變化對水位指示的影響。
在調壓槽實際水位不變的前提下，若調壓槽壓力降為600 psia (飽和壓力)，則其水位指示為_____。
A. 14.9 feet
B. 18.3 feet
C. 22.4 feet
D. 26.8 feet

答案： D



科目/題號：191002/10 (2016 新增)
知能類：K1.07〔2.5/2.6〕
序號：P5003

The downcomer region of a steam generator contains 40 feet of saturated water at 536°F. A steam generator water level detector has a pressure tap located at the bottom of the downcomer region. Approximately how much of the total pressure at the pressure tap is caused by the downcomer water?
A. 0.6 psi
B. 13.0 psi
C. 27.7 psi
D. 156.0 psi
ANSWER: B.

某蒸汽產生器的降流區內有高 40 feet 的飽和水，其溫度為 536°F。該蒸汽產生器水位偵檢器的壓力感測接頭位於降流區的底部。請問在該接頭處所承受的總壓力中，大約多少是來自於降流區的水壓？
A. 0.6 psi
B. 13.0 psi
C. 27.7 psi
D. 156.0 psi

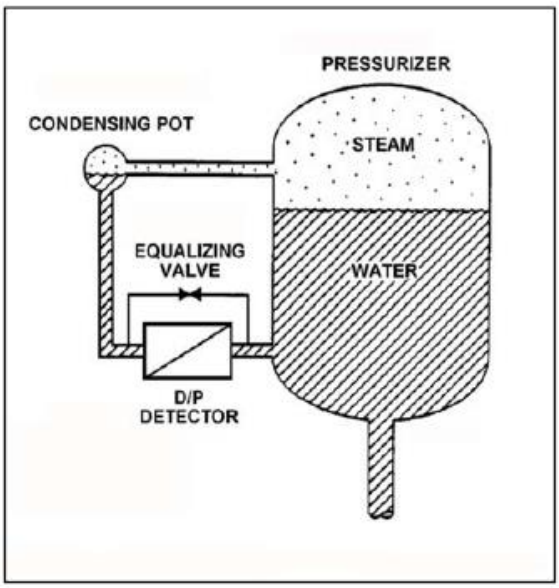
答案： B

科目/題號：191002/11 (2016 新增)
知能類：K1.07〔2.5/2.6〕
序號：P5204

Refer to the drawing of a differential pressure (D/P) level detection system (see figure below) for a pressurizer at normal operating temperature and pressure. The level detector has just been calibrated.
The high pressure side of the detector is connected to the _____; and if the equalizing valve is opened, the indicated pressurizer level will be _____ than the actual level.
A. condensing pot; lower
B. condensing pot; higher
C. pressurizer; lower
D. pressurizer; higher
ANSWER: B.

參考調壓槽差壓(D/P)水位偵測系統圖(見下圖)。該調壓槽處於正常運轉溫度及壓力狀態下，其水位偵檢器才剛校正過。該水位偵檢器的高壓端接到_____；如果開啟平衡閥，則調壓槽的水位指示將_____實際水位。
A.冷凝室；低於
A.冷凝室；高於
C.調壓槽；低於
D.調壓槽；高於

答案： B



科目/題號：191002/12 (2016新增)
知能類：K1.07 [2.5/2.6]
序號：P6104 (B6105)

Refer to the drawing of a water storage tank with a differential pressure (D/P) level detection system (see figure below).
The D/P level detector was just calibrated and returned to operation with the following conditions:

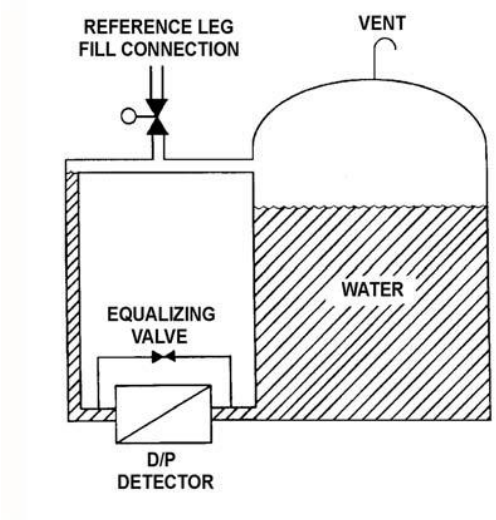
- The reference leg contains 20 feet of water at 70°F.
- The tank contains 18 feet of water at 70°F.
- Tank level indication is 18 feet.

Assume the actual tank water level and the temperature of the water in the tank and reference leg do not change. Which one of the following will be the new tank level indication if the reference leg water level decreases to 18 feet?
A. 22 feet
B. 20 feet
C. 18 feet
D. 2 feet
ANSWER: B.

參考裝有差壓(D/P)液位偵檢系統的儲水槽圖(見下圖)。差壓(D/P)液位偵檢器剛校正後在下列狀況下恢復運轉：

- ●參考柱含有20 feet高、溫度70°F的水
- ●儲水槽含有18 feet高、溫度70°F的水
- ●儲水槽液位指示為18 feet

假設儲水槽實際水位不變，儲水槽與參考水柱水溫也不變。如果參考柱的水位降低到18 feet，下列何者為儲水槽的新液位指示值？
A. 22 feet
B. 20 feet
C. 18 feet
D. 2 feet
答案： B

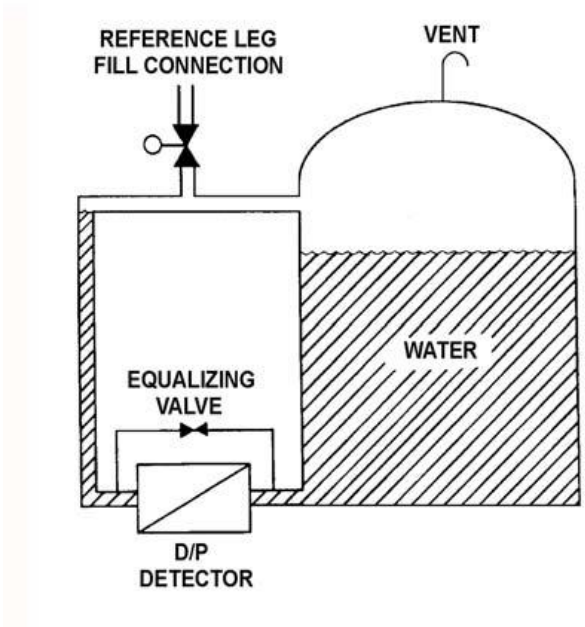


科目/題號：191002/13 (2016新增)
知能類：K1.07 [2.5/2.6]
序號：P6604 (B6606)

Refer to the drawing of a water storage tank with a differential pressure (D/P) level detection system (see figure below).
The water storage tank is 40 feet tall. The level detection system is calibrated to provide a level indication of 30 feet when the tank and reference leg levels are equal.
If the tank is completely filled with water, the tank level will indicate...
A. less than 30 feet.
B. 30 feet.
C. greater than 30 feet, but less than 40 feet.
D. 40 feet.
ANSWER: B.

參考裝有差壓(D/P)液位偵檢系統的儲水槽圖(見下圖)。
儲水槽為40 feet高。當液位偵檢系統在儲水槽與參考柱水位一樣時，作校正顯示儲水槽之水位為30 feet。如果儲水槽充滿水，則儲水槽水位指示值將為…
A.22 feet
B.30 feet
C.大於30 feet，但小於40 feet
D. 40 feet

答案： B

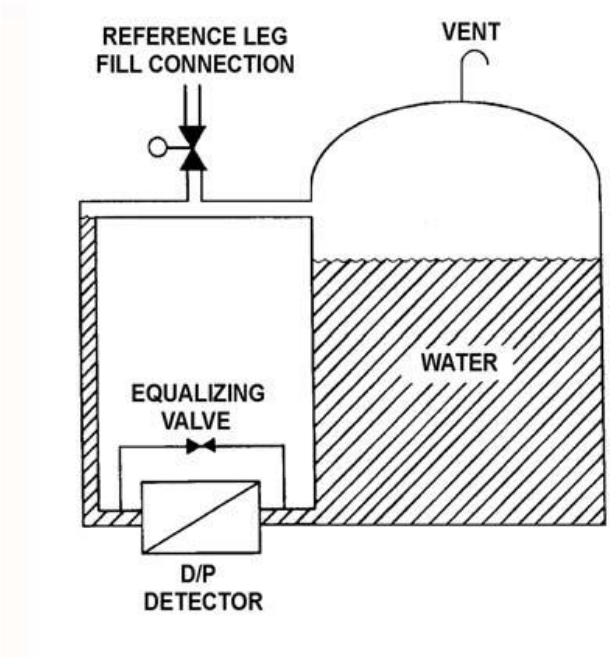


科目/題號：191002/14 (2016新增)
知能類：K1.07 [2.5/2.6]
序號：P6704 (B6705)

Refer to the drawing of a water storage tank with a differential pressure (D/P) level detection system (see figure below).
Assume that the initial temperature of the reference leg and the water in the tank is 100°F, and that reference leg temperature does not change.
If the temperature of the water in the tank increases by 20°F, the D/P sensed by the detector will _____ if the _____ of the water in the tank is constant.
A. decrease; level
B. decrease; mass
C. remain the same; level
D. remain the same; mass
ANSWER: D.

參考裝有差壓(D/P)液位偵檢系統的儲水槽圖(見下圖)。
假設參考柱及儲水槽初始水溫為100°F，又參考柱水溫不變。如果儲水槽水溫增加20°F，則偵檢器量到的差壓將 _____，假設儲水槽水的_____是固定不變。
A.減小；水位
B.減小；質量
C.維持不變；水位
D.維持不變；質量

答案： D



科目/題號：191002/15 (2016新增)
知能類：K1.07 [2.5/2.6]
序號：P7404 (B7404)

Refer to the drawing of a vented water storage tank with a differential pressure (D/P) level detection system (see figure below). The water in the tank and reference leg is at the same temperature.
The tank level indicator was just calibrated to indicate 0 percent when the tank is empty and 100 percent when the water level reaches the upper tap. The indicator's display range is 0 percent to 120 percent. The initial water level is as indicated in the figure.
If the tank water level slowly increases and stabilizes just below the top of the tank, the level indication will increase until…

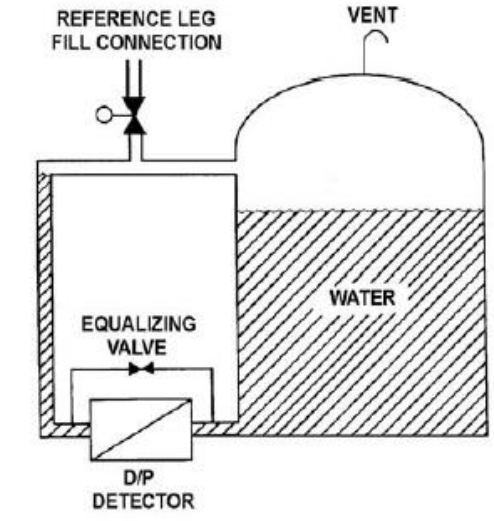
A. the water level stabilizes, at which time the level indication will stabilize at 100 percent.
B. the water level stabilizes, at which time the level indication will stabilize at a value greater than 100 percent.
C. the water level reaches the upper tap, at which time the level indication will remain at 100 percent as the water level continues to increase.
D. the water level reaches the upper tap, at which time the level indication will continue to increase as the water level continues to increase.

ANSWER: C.

參考通氣儲水槽裝有差壓(D/P)液位偵檢系統圖(見下圖)。儲水槽的水與參考柱的水溫度相同。剛校正過的儲水槽水位指示器，在空水槽時水位指示值為0%，在水位達到上接頭時水位指示值為100%。水位指示器的指示範圍為0%到120%。起始水位如圖所示。如果儲水槽水位慢慢上升，並在槽頂正下方達到穩定，則水位指示值將上升直到…

A.水位達到穩定時，水位指示值將穩定在100%
B.水位達到穩定時，水位指示值將穩定在100%以上
C.水位達到上接頭時，水位指示值將停在100%，而水位則繼續上升
D.水位達到上接頭時，水位指示值將跟著水位上升繼續上升

答案： C



科目/題號：191002/16 (2016新增)
知能類：K1.07 [2.5/2.6]
序號：P7602 (B7602)

Refer to the drawing of a water storage tank with a differential pressure (D/P) level detection system (see figure below). The level detector has just been calibrated. How will the indicated level be affected if condensation partially fills the normally dry reference leg?

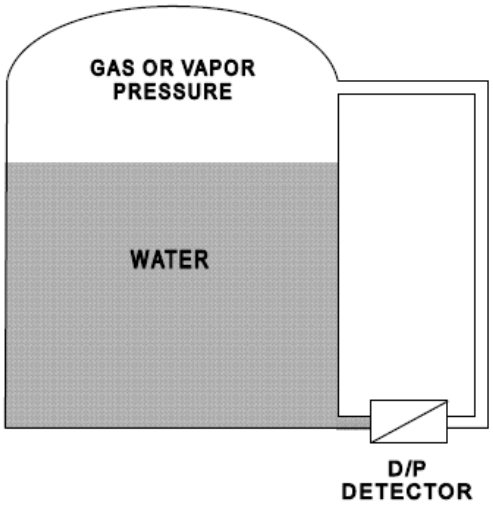
A. Indicated level will not be affected.
B. Indicated level will be lower than actual level.
C. Indicated level will be higher than actual level.
D. Indicated level may be higher or lower than actual level depending on the pressure in the upper volume of the tank.

ANSWER: B.

參考裝有差壓(D/P)液位偵檢系統的儲水槽圖(見下圖)。該水位偵檢器剛校正完成。假如正常時乾燥的參考柱現在有部分凝結水，則水位指示值將會受到什麼影響？

A.水位指示值不會受到影響
B.水位指示值將低於實際水位
C.水位指示值將高於實際水位
D.水位指示值將高於或低於實際水位視貯水槽上部空間之壓力而定

答案： B



科目/題號：191002/17 (2016新增)
知能類：K1.11 [2.7/3.0]
序號：P7503 (B7504)

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

A. Indicated pressure will decrease because the bourdon tube will become more flexible.
B. Indicated pressure will increase because the bourdon tube will become more flexible.
C. Indicated pressure will decrease because the bourdon tube internal pressure will increase.
D. Indicated pressure will increase because the bourdon tube internal pressure will increase.

ANSWER: B.

一冷卻水系統壓力偵檢器使用巴登管(bourdon tube)當感測元件。當有局部蒸汽洩漏使得巴登管溫度提高50°F，下列何者可以說明系統壓力指示值將受到如何的影響？(假設冷卻水系統壓力不變)

A.系統壓力指示值將降低，因為巴登管將變得較可撓
B.系統壓力指示值將增加，因為巴登管將變得較可撓
C.系統壓力指示值將降低，因為巴登管內部壓力將增加
D.系統壓力指示值將增加，因為巴登管內部壓力將增加

答案： B

科目/題號：191002/18 (2016新增)
知能類：K1.11 [2.7/3.0]
序號：P7642 (B7642)

A cooling water system pressure detector uses a bourdon tube as the sensing element. Which one of the following explains how the indicated system pressure will be affected if the temperature of the bourdon tube decreases by 30°F? (Assume the cooling water system pressure does not change.)

A. Indicated pressure will decrease because the bourdon tube will become less flexible.
B. Indicated pressure will increase because the bourdon tube will become less flexible.
C. Indicated pressure will decrease because the bourdon tube internal pressure will decrease.
D. Indicated pressure will increase because the bourdon tube internal pressure will decrease.

ANSWER: A.

一冷卻水系統壓力偵檢器使用波登管當感測元件。如果巴登管(bourdon tube)溫度降低30°F，下列何者可以說明系統壓力指示值將受到如何的影響？(假設冷卻水系統壓力不變)

A.系統壓力指示值將降低，因為巴登管將變得較不可撓
B.系統壓力指示值將增加，因為巴登管將變得較不可撓
C.系統壓力指示值將降低，因為巴登管內部壓力將減少
D.系統壓力指示值將增加，因為巴登管內部壓力將減少

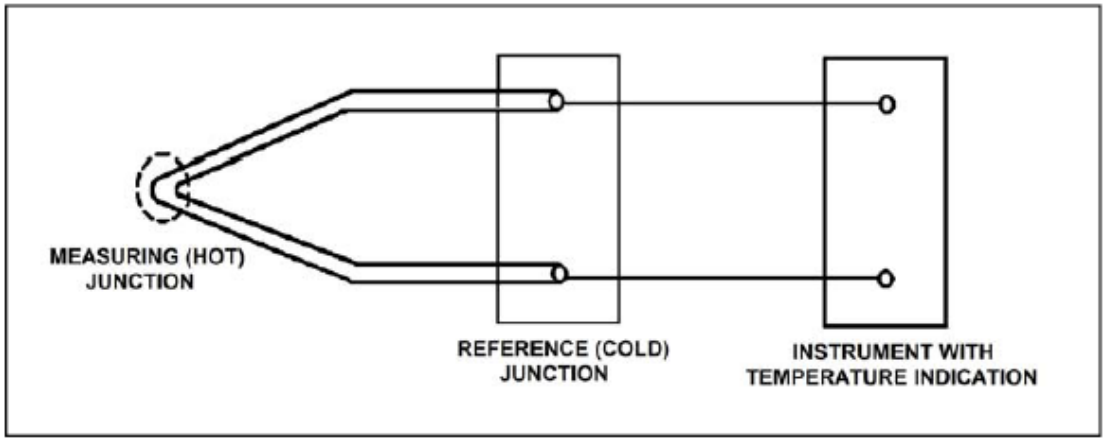
答案： A.

科目/題號：191002/19 (2016新增)
知能類：K1.13 [2.6/2.8]
序號：P5305 (B5305)

Refer to the drawing of a simple thermocouple circuit (see figure below).
The measuring and reference junctions are located inside the reactor containment building while the instrument is located in a remote location outside the containment building. Thermocouple temperature indication is initially 500°F.
An ambient temperature decrease outside the containment building lowers the temperature of the instrument by 10°F, while the measuring and reference junction temperatures remain constant. Thermocouple temperature indication at the lower ambient temperature will be...
A. 490°F.
B. 500°F.
C. 510°F.
D. unpredictable.
ANSWER: B.

參考一熱電偶電路簡圖(見下圖)。
量測接合點及參考接合點位於圍阻體內，儀器則位於圍阻體外遠端處。熱電偶之最初溫度指示值為500°F。圍阻體外環境溫度下降使得儀器溫度下降10°F，量測接合點及參考接合點溫度則維持不變。在較低的環境溫度下熱電偶溫度指示值將是...
A. 490°F
B. 500°F
C. 510°F
D.無法預測

答案： B

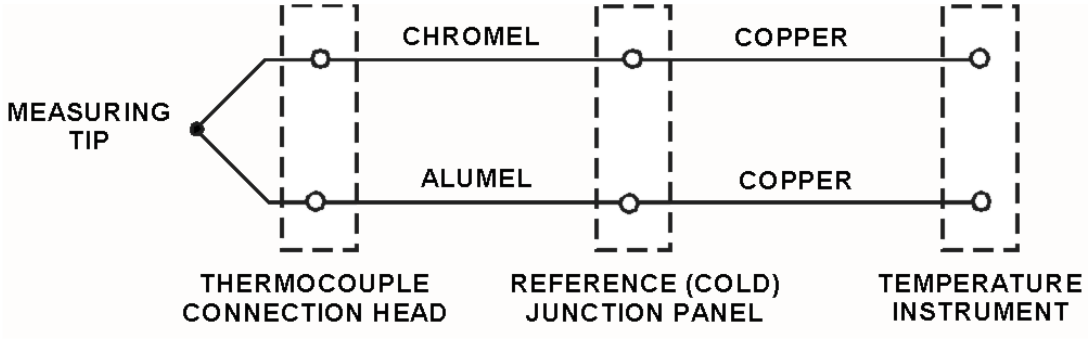


科目/題號：191002/20 (2016新增)
知能類：K1.13 [2.6/2.8]
序號：P5505 (B5507)

Refer to the drawing of a simple chromel-alumel thermocouple circuit (see figure below).
What is the effect on the thermocouple reference junctions if the chromel and alumel extension wires from the thermocouple connection head to the reference junction panel are replaced with copper wires?
A. There will no longer be any reference junctions.
B. The reference junctions will be located in the temperature instrument.
C. The reference junctions will still be located in the reference junction panel.
D. The reference junctions will be located in the thermocouple connection head.
ANSWER: D.

參考一鉻鎳-鋁鎳熱電偶電路簡圖(見下圖)。
如果將熱電偶接出端點到參考接合點連接板的鉻鎳及鋁鎳延伸線換成銅線則其對參考接合點的影響為何？
A.將不再有任何參考接合點
B.參考接合點位置將在溫度儀器
C.參考接合點位置仍將在參考接合點連接板
D.參考接合點位置將在熱電偶接出端點

答案： D



科目/題號：191002/21 (2016新增)
知能類：K1.13 [2.6/2.8]
序號：P5805 (B5805)

Which one of the following is a characteristic of a resistance temperature detector but not a thermocouple?

A. Sensing element is made from a single metal or alloy.
B. Requires a reference junction for accurate temperature measurement.
C. Extension leads made from relatively expensive metals or alloys are required for accurate temperature measurement.
D. Temperature measurement relies on a sensor material property that varies directly with the change in the measured temperature.

ANSWER: A.

下列何者是電阻式溫度偵檢器的特徵但不是熱電偶的特徵？

A.感測元件由單一金屬或合金製成
B.為量取精確溫度需要參考接合點
C.為量取精確溫度需要較昂貴的金屬或合金製成的延伸線
D.溫度量測依據感測器的材質特性而定，而實際量測到的溫度直接隨著量測溫度改變而變更

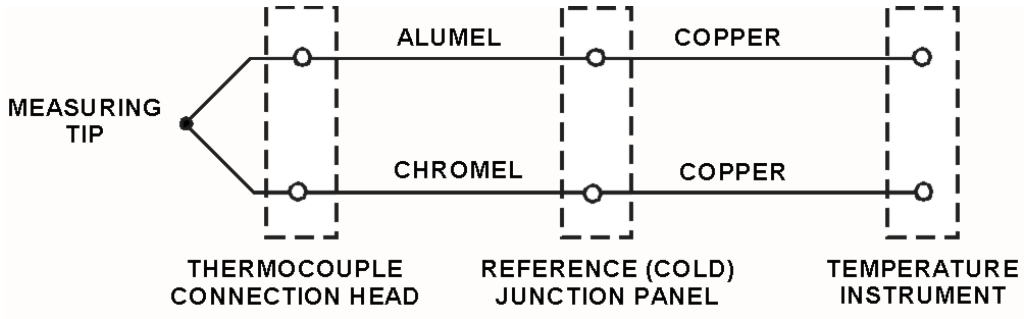
答案： A

科目/題號：191002/22 (2016新增)
知能類：K1.13 [2.6/2.8]
序號：P6004 (B6005)

Refer to the drawing of a simple chromel-alumel thermocouple circuit (see figure below).
What is the effect on the thermocouple reference junctions if the copper extension wires from the reference junction panel to the temperature instrument are replaced with alumel (top) and chromel (bottom) extension wires?
A. The reference junctions will be located in the thermocouple connection head.
B. The reference junctions will still be located in the reference junction panel.
C. The reference junctions will be located in the temperature instrument.
D. There will no longer be any reference junctions.
ANSWER: C.

參考一鉻鎳-鋁鎳熱電偶電路簡圖(見下圖)。
如果將參考接合點連接板到溫度儀器的銅延伸線換成鋁鎳(上)及鉻鎳(下)延伸線，則其對參考接合點的影響為何？
A.參考接合點位置將在熱電偶連接端點
B.參考接合點位置仍將在參考接合點連接板
C.參考接合點位置將在溫度儀器
D.將不再有任何參考接合點

答案： C.

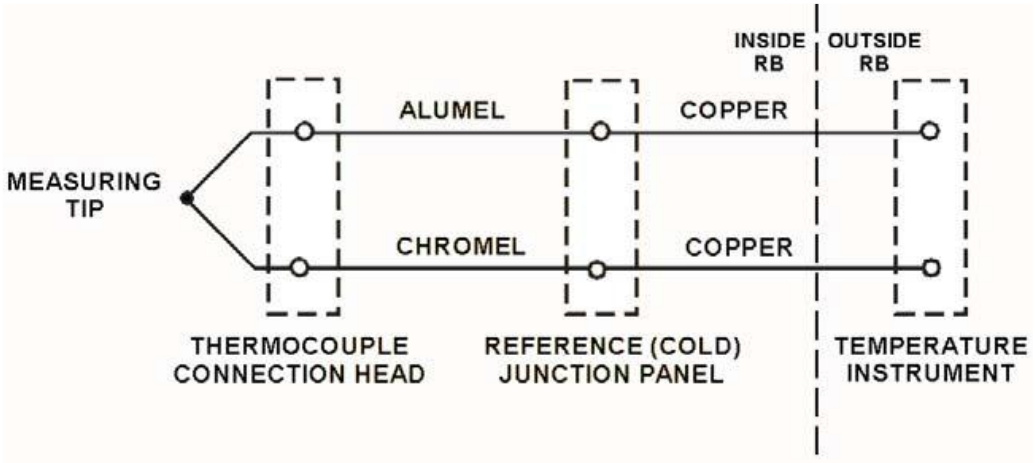


科目/題號：191002/23 (2016新增)
知能類：K1.13 [2.6/2.8]
序號：P6305 (B6306)

Refer to the drawing of a simple chromel-alumel thermocouple circuit (see figure below).
The thermocouple, thermocouple connection head, and reference junction panel are located inside a reactor building (RB) while the temperature instrument is located outside the RB. Thermocouple temperature indication is initially 440°F.
A steam leak inside the RB increases the temperatures of the thermocouple connection head and reference junction panel by 40°F, while the temperature at the measuring tip is unchanged. What is the resulting temperature indication?
A. 400°F
B. 440°F
C. 480°F
D. 520°F
ANSWER: A.

參考一鉻鎳-鋁鎳熱電偶電路簡圖(見下圖)。
熱電偶、熱電偶接出端點及參考接合點連接板位於反應器廠房內而溫度儀器則位於反應器廠房外。熱電偶溫度指示最初為440°F。
反應器廠房內蒸汽洩漏使得熱電偶接出端點及參考接合點連接板溫度上升40°F。當量測端點的溫度不變，則溫度指示將變為多少？
A. 400°F
B. 440°F
C. 480°F
D. 520°F

答案： A



科目/題號：191002/24 (2016新增)
知能類：K1.13 [2.6/2.8]
序號：P6905 (B6905)

A simple two-wire resistance temperature detector (RTD) is being used to measure the temperature of a water system. Copper extension wires run from the RTD to a temperature instrument 40 feet away.
If the temperature of the extension wires decreases, the electrical resistance of the extension wires will _____; and the temperature indication will _____ unless temperature compensation is provided.
A. increase; increase
B. increase; decrease
C. decrease; increase
D. decrease; decrease
ANSWER: D.

用一簡單的雙線電阻式溫度偵檢器(RTD)量測一水系統溫度。電阻式溫度偵檢器以銅延伸線連接到40呎外的溫度儀器。
如果延伸線的溫度降低，延伸線的電阻將_____；若未提供溫度補償，則溫度指示將_____。
A.增加；增加
B.增加；減少
C.減少；增加
D.減少；減少

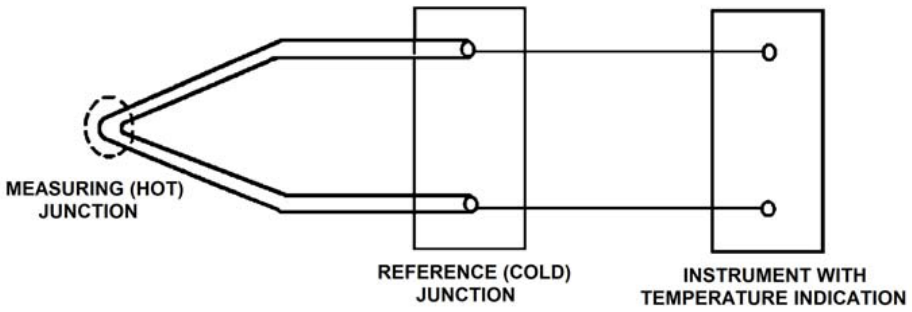
答案： D

科目/題號：191002/25 (2016新增)
知能類：K1.13 [2.6/2.8]
序號：P7405 (B7405)

Refer to the drawing of a simple thermocouple circuit (see figure below).
The measuring junction temperature is currently 300°F while the reference junction temperature is being held constant at 120°F. The thermocouple circuit is capable of indicating 32°F to 600°F and has just been calibrated at the current conditions.
If the measuring junction temperature decreases and stabilizes at 90°F, what temperature will be indicated?
A. 32°F
B. 60°F
C. 90°F
D. 120°F
ANSWER: C.

參考熱電偶電路簡圖(見下圖)。
量測接合點目前溫度為300°F，而參考接合點溫度維持固定於120°F。熱電偶電路可以顯示32°F至600°F，且在目前狀況下剛完成校正，若量測接合點之溫度下降並穩定在90°F，溫度指示將為多少？
A. 32°F
B. 60°F
C. 90°F
D. 120°F

答案： C



科目/題號：191002/26 (2016新增)
知能類：K1.13 [2.6/2.8]
序號：P7612 (B7612)

For proper operation of a thermocouple circuit, the reference junction temperature…
A. must be less than the measuring junction temperature.
B. must be greater than the measuring junction temperature.
C. may be less than, greater than, or equal to the measuring junction temperature.
D. may be less than or greater than, but not equal to, the measuring junction temperature.
ANSWER: C.

為使熱電偶電路正常運作，參考接合點溫度…
A.必須低於量測接合點溫度
B.必須高於量測接合點溫度
C.可以低於、高於或等於量測接合點溫度
D.可以低於或高於，但不能等於量測接合點溫度

答案： C

科目/題號：191002/27 (2016新增)
知能類：K1.14 [2.8/2.9]
序號：P6504 (B6506)

Because of a thermocouple temperature display failure, the millivolt output of a thermocouple circuit is being converted to a temperature value using conversion tables. The tables are based on a thermocouple reference junction temperature of 32°F. The actual reference junction is located in a panel that is maintained at 120°F. Room temperature surrounding the panel is 80°F.
What adjustment must be made to the temperature value taken from the conversion tables to calculate the actual temperature at the measuring tip of the thermocouple?
A. Add 48°F.
B. Subtract 48°F.
C. Add 88°F.
D. Subtract 88°F.
ANSWER: C.

由於熱電偶溫度指示失效，熱電偶電路的毫伏特(mV)輸出用轉換表轉換為溫度值。轉換表係以參考接合點32°F為基準。實際參考接合點位在連接板，該連接板溫度維持在120°F。連接板周遭室溫為80°F。
要計算量測端點的實際溫度，從轉換表取得的溫度值必須做何種調整？
A.加48°F
B.減48°F
C.加88°F
D.減88°F

答案： C

科目/題號：191002/28 (2016新增)
知能類：K1.14 [2.8/2.9]
序號：P7103 (B7106)

A resistance temperature detector (RTD) and a thermocouple (TC) are commonly used sensors for temperature measurement. If a temperature display fails, which of the sensors, if any, has a property that can be measured manually and converted to a temperature value with the aid of conversion tables.
A. TC only.
B. RTD only.
C. Both TC and RTD.
D. Neither TC nor RTD.
ANSWER: C.

電阻式溫度偵檢器(RTD)及熱電偶(TC)係常用的溫度量測元件。若其溫度指示失效，有那種元件具有可先以人工量測後，再藉轉換表轉換為溫度值的特性？
A.只有熱電偶可以
B.只有電阻式溫度偵檢器可以
C.熱電偶及電阻式溫度偵檢器都可以
D.熱電偶及電阻式溫度偵檢器都不可以

答案： C

科目/題號：191002/29 (2016新增)
知能類：K1.14 [2.8/2.9]
序號：P7205 (B7206)

Because of a thermocouple temperature display failure, the millivolt output of a thermocouple circuit is being converted to a temperature value using conversion tables. The tables are based on a thermocouple reference junction temperature of 32°F. The actual reference junction is located in a panel that is currently at 80°F. The temperature value taken from the conversion tables is 120°F.
What adjustment must be made to the temperature value taken from the conversion tables to calculate the actual temperature at the measuring tip of the thermocouple?
A. Add 48°F.
B. Subtract 48°F.
C. Add 88°F.
D. Subtract 88°F.
ANSWER: A.

由於熱電偶溫度指示失效，熱電偶電路的毫伏特(mV)輸出，用轉換表轉換為溫度值。轉換表係以參考接合點32°F為基準。實際參考接合點位在連接板，該連接板目前溫度為80°F。從轉換表取得的溫度值為120°F。
要計算量測端點的實際溫度，從轉換表取得的溫度值必須做何種的調整？
A.加48°F
B.減48°F
C.加88°F
D.減88°F

答案： A

科目/題號：191002/30 (2016新增)
知能類：K1.18 [2.6/2.8]
序號：P1910

Just prior to a plant outage, the power range nuclear instruments (using excore detectors) were calibrated at 50 percent reactor power. During the outage, 25 percent of the fuel assemblies were shuffled to reduce the power being produced at the center of the core. No fuel assemblies were replaced.
Immediately after the outage, when the reactor is stabilized at 50 percent, indicated reactor power will be _____ than actual power because neutron leakage from the core has _____.
A. higher; increased
B. higher; decreased
C. lower; increased
D. lower; decreased
ANSWER: A.

核電廠在大修前，其功率階核儀(使用爐外偵檢器)已經在 50%功率時校正過。大修期間並未更換任何燃料組件，但已挪移 25%的燃料組件，以降低爐心中央產生的功率。
大修剛結束，當反應爐穩定運轉於 50%功率時，反應爐功率的指示值將_____實際值，因為從爐心洩漏的中子量已_____。
A.高於；增加
B.高於；降低
C.低於；增加
D.低於；降低

答案：A

科目/題號：191002/31 (2016新增)
知能類：K1.18 [2.6/2.8]
序號：P2713

During a refueling outage, the fuel assemblies were reconfigured to reduce the radial power peak at the center of the core while maintaining the same rated thermal power. Excore power range detectors were calibrated at 50 percent power just prior to the outage.
How will indicated reactor power compare to actual reactor power when the nuclear power plant is stabilized at 50 percent power following the outage?
A. Indicated reactor power will be higher than actual reactor power due to increased core neutron leakage.
B. Indicated reactor power will be higher than actual reactor power due to decreased core neutron leakage.
C. Indicated reactor power will be lower than actual reactor power due to decreased core neutron leakage.
D. Indicated reactor power will be lower than actual reactor power due to increased core neutron leakage.
ANSWER: A.

某核電廠在大修更換燃料期間，重新配置其燃料組件，以降低爐心中央的徑向功率尖峰，但額定熱功率維持不變。爐外功率階偵檢器剛於大修前，在 50%額定功率時校正過。
大修後，當機組穩定運轉於 50%功率時，反應爐的功率指示值與實際值有何差異？
A.由於爐心中子洩漏量增加，反應爐的指示功率將高於實際功率
B.由於爐心中子洩漏量減少，反應爐的指示功率將高於實際功率
C.由於爐心中子洩漏量減少，反應爐的指示功率將低於實際功率
D.由於爐心中子洩漏量增加，反應爐的指示功率將低於實際功率

答案：A

科目/題號：191002/32 (2016新增)
知能類：K1.18 [2.6/2.8]
序號：P2913 (B414)

Which one of the following statements describes the operation of a gas-filled radiation detector operating in the proportional region?

A. The number of ions collected from both primary and secondary ionizations is independent of the applied voltage.
B. Essentially all of the ions from primary ionizations are collected; the number of ions collected from secondary ionizations is independent of the applied voltage.
C. The number of ions collected from both primary and secondary ionizations varies directly with the applied voltage on a logarithmic scale.
D. Essentially all of the ions from primary ionizations are collected; the number of ions collected from secondary ionizations varies directly with the applied voltage on a logarithmic scale.

ANSWER: D.

下列何者敘述為充氣式輻射偵檢器在比例區之運作？

A.由一次和二次游離所聚集之離子數，與所施加之電壓無關。
B.所有聚集之離子數主要是來自一次游離；來自二次游離所聚集之離子數，與所施加之電壓無關.
C.從一次和二次游離所聚集之離子數，直接隨著與所施加電壓以對數刻度變化.
D.所有聚集之離子數主要是來自一次游離；來自二次游離所聚集之離子數，直接隨著與所施加電壓以對數刻度變化.

答案： D

科目/題號：191002/33 (2016新增)
知能類：K1.18 [2.6/2.8]
序號：P4806 (B4807)

Quench gases are added to gas-filled radiation detectors that operate in the _____ region; the quench gases prevent a single ionization event from causing _____ in the detector gas volume.

A. ion chamber; multiple discharges

B. ion chamber; secondary ionizations

C. Geiger-Mueller; multiple discharges

D. Geiger-Mueller; secondary ionizations

ANSWER: C.

淬熄氣體加到運作於_____區的充氣式輻射偵檢器；淬熄氣體可預防偵檢器氣體容積內之單一游離事件引起_____。

A.游離腔；多重放電

B.游離腔；二次游離

C.蓋革；多重放電

D.蓋革；二次游離

答案： C

科目/題號：191002/34 (2016新增)
知能類：K1.18 [2.6/2.8]
序號：P4906 (B4907)

Which one of the following contains the pair of radiation detector types that are the most sensitive to low-energy beta and/or gamma radiation?
A. Geiger-Mueller and scintillation
B. Geiger-Mueller and ion chamber
C. Ion chamber and scintillation
D. Ion chamber and proportional
ANSWER: A.

下列何者含有對低能量貝他及/或加馬輻射線最敏感的兩種輻射偵檢器？
A.蓋革及閃爍偵檢器
B.蓋革及游離腔
C游離腔及閃爍偵檢器
D.游離腔及比例

答案： A

科目/題號：191002/35 (2016新增)
知能類：K1.18 [2.6/2.8]
序號：P5206 (B5207)

A beta particle and an alpha particle with equal kinetic energies cause ionization in a gas-filled radiation detector. The detector is operating in the ion chamber region of the gas ionization curve. Which one of the following describes the amplitudes of the detector pulses caused by each type of radiation?
A. The beta particle pulse will be larger in amplitude.
B. The alpha particle pulse will be larger in amplitude.
C. The amplitudes of both pulses will be approximately equal for all detector voltages in the ion chamber region.
D. The amplitudes of both pulses will be approximately equal for all detector voltages in the ion chamber region, as well as all detector voltages outside the ion chamber region.
ANSWER: B.

具有相同動能的阿伐粒子及貝他粒子在充氣式輻射偵檢器造成游離。偵檢器在氣體游離曲線的游離腔區運作。
下列何者描述各種輻射線所造成的偵檢器脈衝振幅？
A.貝他粒子脈衝振幅較大
B.阿伐粒子脈衝振幅較大
C.所有偵檢器之工作電壓在游離腔區，兩者脈衝振幅大約相等
D.所有偵檢器之工作電壓在游離腔區和在游離腔區外，兩者脈衝振幅大約相等

答案： B

科目/題號：191002/36 (2016新增)

知能類：K1.18 [2.6/2.8]

序號：P5306 (B5307)

Which one of the following types of radiation detectors is generally not used for measuring a high-intensity beta and gamma radiation field because of a relatively long detector recovery time, or dead time, following each ionization event.
A. Geiger-Mueller
B. Ion chamber
C. Proportional
D. Scintillation
ANSWER: A.

因為在每次游離事件後偵檢器之回復時間或無感時間相對較長，下列何種輻射偵檢器一般不用於量測高強度貝他及加馬輻射場？
A.蓋革
B.游離腔
C.比例
D.閃爍

答案： A

科目/題號：191002/37 (2016新增)
知能類：K1.18 [2.6/2.8]
序號：P5606 (B5607)

A proportional detector with pulse height discrimination circuitry is being used in a constant field of neutron and gamma radiation to provide source range neutron count rate indication. Assume that the pulse height discrimination setpoint does not change. If the detector voltage is increased but maintained within the proportional region, count rate indication will increase because...

A. a single neutron- or gamma-induced ionizing event will result in multiple pulses inside the detector.
B. the ratio of the number of neutron-induced pulses to gamma-induced pulses inside the detector will increase.
C. the positive space charge effect will increase and promote the collection of both gamma- and neutron-induced pulses.
D. all detector pulses will increase in amplitude and previously uncounted gamma pulses will be added to the total count rate.

ANSWER: D.

具有脈高鑑別電路的比例偵檢器用在一穩定中子及加馬輻射場以提供源階中子計數率指示。假設脈高鑑別設定點不變。若偵檢器的電壓增加但維持在比例區，則計數率指示值將增加因為…

A.單一中子或加馬誘發的游離效應將在偵測系統內部產生多個脈衝
B.偵測系統內部中子誘發與加馬誘發的脈衝數比例將增加
C.正空間電荷效應將增加並促進中子誘發脈衝與加馬誘發脈衝的收集
D.所有偵測系統的脈衝振幅將增加，且先前未計入的加馬脈衝將加計到總計數率

答案： D

科目/題號：191002/38 (2016新增)
知能類：K1.18 [2.6/2.8]
序號：P6006 (B6007)

Which one of the following types of radiation detectors uses a gas volume for radiation detection and will typically produce the weakest output signal if all of the detectors are placed in the same gamma radiation field?
A. Geiger-Mueller
B. Ion chamber
C. Proportional counter
D. Scintillation
ANSWER: B.

如果將下列各型輻射偵檢器都放在同樣的加馬輻射場，何者是使用氣體容積做輻射偵檢，且通常產生最弱的輸出訊號？
A.蓋革
B.游離腔
C.比例計數器
D.閃爍

答案： B

科目/題號：191002/39 (2016新增)
知能類：K1.18 [2.6/2.8]
序號：P6206 (B6206)

Which one of the following types of radiation detectors is typically the least accurate in determining the dose rate to a human body from an unspecified source of radiation?
A. Geiger-Mueller
B. Ion chamber
C. Proportional counter
D. Scintillation
ANSWER: A.

對人體受到未界定輻射源的劑量率判定，下列輻射偵檢器中，何者準確度通常是最低的？
A.蓋革
B.游離腔
C.比例計數器
D.閃爍

答案： A

科目/題號：191002/40 (2016新增)
知能類：K1.18 [2.6/2.8]
序號：P6405 (B6407)

A fission chamber neutron detector is located in a constant neutron radiation field and is initially operating in the proportional region. If the voltage applied to the detector is changed such that the detector operates in the ion chamber region, the rate of neutron interactions in the detector will _____; and the amplitude of each neutron-induced detector pulse will _____.
A. increase; increase
B. decrease; decrease
C. remain the same; increase
D. remain the same; decrease
ANSWER: D.

一分裂腔中子偵檢器置於一穩定的中子輻射場中，最初在比例區運作。如果施加於偵檢器的電壓改變導致偵檢器運作於游離腔區，則其偵檢器內的中子交互作用率將_____；而中子誘發的偵檢器脈衝振幅將_____。
A.增加；增加
B.減少；減小
C.維持不變；增加
D.維持不變；減小

答案： D

科目/題號：191002/41 (2016新增)
知能類：K1.18 [2.6/2.8]
序號：P6505 (B6507)

Which one of the following describes the positive space charge effect associated with a gas-filled radiation detector?

A. Multiple detector pulses result from a single ionization event because positive ions form a cloud around the negative electrode, which increases the electric field strength, thereby initiating secondary ionizations.
B. Multiple detector pulses result from a single ionization event because positive ions form a cloud around the positive electrode, which increases the electric field strength, thereby initiating secondary ionizations.
C. The pulse amplitude resulting from an ionization event is reduced because positive ions form a cloud around the negative electrode, which reduces the electric field strength, thereby limiting secondary ionizations.
D. The pulse amplitude resulting from an ionization event is reduced because positive ions form a cloud around the positive electrode, which reduces the electric field strength, thereby limiting secondary ionizations.

ANSWER: D.

下列何者描述與充氣式輻射偵檢器相關的正空間電荷效應？

A.單一游離事件可產生多個偵檢器脈衝，因為正離子雲集在負電極，使電場強度增加，因而引發二次游離
B.單一游離事件可產生多個偵檢器脈衝，因為正離子雲集在正電極，使電場強度增加，因而引發二次游離
C.游離事件產生的脈衝振幅減小，因為正離子雲集在負電極，使電場強度減小，因而限制二次游離
D.游離事件產生的脈衝振幅減小，因為正離子雲集在正電極，使電場強度減小，因而限制二次游離

答案： D

科目/題號：191002/42 (2016新增)
知能類：K1.18 [2.6/2.8]
序號：P6906 (B6906)

In which usable region(s) of the gas-filled detector ionization curve is the pulse height resulting from the detection of a 1 MeV beta particle the same as a 5 MeV alpha particle?
A. Geiger-Mueller only.
B. Geiger-Mueller and Ionization Chamber.
C. Proportional only.
D. Proportional and Ionization Chamber.
ANSWER: A.

在各充氣式偵檢器游離曲線可用區中，何者所偵檢1 MeV貝他粒子的脈高與5 MeV阿伐粒子的脈高相同？
A.只有蓋革區
B.蓋革區及游離腔區
C.只有比例區
D.比例區及游離腔區

答案： A

科目/題號：191002/43 (2016新增)
知能類：K1.18 [2.6/2.8]
序號：P7206 (B7207)

Which one of the following personal radiation monitoring devices can be charged with DC voltage to “zero” the device prior to use?
A. Film badge
B. Alarming dosimeter
C. Thermoluminescent dosimeter
D. Self-reading pocket dosimeter
ANSWER: D.

下列個人輻射監測裝置中，何者在使用前可用直流電充電使之歸零？
A.膠片配章
B.警報劑量計
C.熱發光劑量計
D.自讀式袖珍劑量計

答案： D

科目/題號：191002/44 (2016新增)
知能類：K1.18 [2.6/2.8]
序號：P7505 (B7507)

A Geiger-Mueller detector with a Apancake@ probe (often called a frisker) is being used to monitor personnel leaving a radiologically controlled area. The probe is equipped with a mica window.
Two individuals have radioactive skin contamination—one individual with only alpha emitters, and the other with only beta emitters. Both types of radiation are being emitted at the same rate. The same percentage of each type of radiation enters the probe's detection chamber and causes ionization.
Which one of the following describes the detector=s count rate response to the alpha and beta radiation?
A. The count rate will be higher for the alpha radiation.
B. The count rate will be higher for the beta radiation.
C. The count rate will be the same for both types of radiation.
D. Cannot be determined without knowing the energy levels of the radiation.
ANSWER: C.

一配置薄煎餅型探頭(常稱為frisker搜身者)的蓋革偵檢器，被用來監測離開輻射管制區人員。探頭配有雲母窗。
有兩個人其皮膚受到輻射污染；其中一人只受到阿伐射源污染，另一人只受到貝他射源污染。兩種輻射線的放射率相同。每一種輻射線有相同百分比進入探頭的偵檢腔並引發游離。
下列何者描述偵檢器對阿伐及貝他輻射線的計數率反應？
A.阿伐的計數率將較高
B.貝他的計數率將較高
C.兩種輻射線的計數率將相同
D.不知輻射線的能量大小無法確定

答案： C

科目/題號：191002/45 (2016新增)
知能類：K1.18 [2.6/2.8]
序號：P7506

Just prior to a plant outage, the power range nuclear instruments (using excore detectors) were calibrated at 50 percent reactor power. During the outage, 40 fuel assemblies from the center of the core were exchanged with 40 higher enriched fuel assemblies from the outer portions of the core. No other fuel assemblies were affected.
Immediately after the outage, when the reactor is stabilized at 50 percent power, indicated reactor power will be _____ than actual reactor power because neutron leakage from the core has _____.
A. lower; decreased
B. lower; increased
C. higher; decreased
D. higher; increased
ANSWER: A.

某核電廠在大修前，其功率階核儀(使用爐外偵檢器)已經在 50%功率時校正過了。大修期間並未更換任何燃料組件，但 40 組位於爐心中央的燃料組件與 40 組位於爐心外圍較高濃縮度的燃料組件互換。
大修剛結束，當反應爐穩定運轉於 50%功率時，反應爐功率的指示值將_____實際值，因為從爐心洩漏的中子量已_____。
A.低於；降低
B.低於；增加
C.高於；降低
D.高於；增加

答案：A

科目/題號：191002/46 (2016新增)
知能類：K1.18 [2.6/2.8]
序號：P7613 (B7613)

A proportional detector with pulse height discrimination circuitry is being used in a constant field of neutron and gamma radiation to provide source range neutron count rate indication. Assume the pulse height discrimination value does not change.
If the detector voltage is decreased significantly, but maintained within the proportional region, the detector count rate indication will _____; and the detector will become _____ susceptible to the positive space charge effect.
A. decrease; less
B. decrease; more
C. remain the same; less
D. remain the same: more
ANSWER: A.

一具有脈高鑑別電路的比例偵檢器，用於一穩定的中子及加馬輻射場，以提供源階中子計數率指示。假設脈高鑑別值不變。
如果偵檢器電壓大幅降低，但維持在比例區內，偵檢器的計數率指示將_____；而偵檢器對正空間電荷效應將變得_____敏感。
A.減少；較不
B.減少；較
C.維持相同；較不
D.維持相同；較

答案： A

科目/題號：191002/47 (2016新增)
知能類：K1.19 [3.1/3.3]
序號：P5706 (B5707)

Which one of the following describes a characteristic of a self-reading pocket dosimeter?
A. Provides dose rate indication in mR/hr.
B. More sensitive to gamma radiation than beta radiation.
C. Contains crystals that luminesce when exposed to ionizing radiation.
D. Can be stored as an accurate record of lifetime radiation exposure.
ANSWER: B.

下列何者描述自讀式袖珍劑量計的特性？
A.可提供mR/hr劑量率指示
B.對加馬輻射比對貝他輻射更敏感
C.含有曝露於游離輻射時會發光的晶體
D.可用以存為終生輻射曝露之正確紀錄

答案： B

科目/題號：191002/48 (2016新增)
知能類：K1.19 [3.1/3.3]
序號：P6806 (B6807)

A nuclear plant worker normally wears a thermoluminescent dosimeter (TLD) or similar device for measuring radiation exposure. When a self-reading pocket dosimeter (SRPD) is also required, where will the SRPD be worn and why?
A. Below the waist near the TLD to measure radiation from the same source(s).
B. Below the waist away from the TLD to measure radiation from different sources.
C. Above the waist near the TLD to measure radiation from the same source(s).
D. Above the waist away from the TLD to measure radiation from different sources.
ANSWER: C.

核電廠工作人員平常配帶熱發光劑量計(TLD)或類似裝置以量測輻射曝露。當也有需要自讀式袖珍劑量計(SRPD)時，SRPD應配帶在何處？為什麼？
A.在腰部下方靠近TLD，以量測相同來源的輻射線
B.在腰部下方遠離TLD，以量測不同來源的輻射線.
C.在腰部上方靠近TLD，以量測相同來源的輻射線
D.在腰部上方遠離TLD，以量測不同來源的輻射線

答案： C

科目/題號：191002/49 (2016新增)
知能類：K1.19 [3.1/3.3]
序號：P7633 (B7633)

A Geiger-Mueller detector with a Apancake@ probe (often called a frisker) is being used to monitor workers leaving a radiologically controlled area for contamination. The probe is equipped with a mica window. The background detector count rate is 20 cpm.
As one individual's shoe is scanned, the detector reading increases to 200 cpm. When a sheet of paper is placed between the probe and the shoe, the detector reading decreases to 60 cpm. Which one of the following is indicated by the decrease in the detector reading?
A. The contamination contains beta particles.
B. The contamination contains alpha particles.
C. The contamination does not contain beta particles.
D. The contamination does not contain alpha particles.
ANSWER: B.

一配置薄煎餅型探頭(常稱為frisker搜身者)的蓋革偵檢器，被用來監測離開輻射管制區人員有無污染。探頭配有雲母窗。偵檢器背景計數率為20 cpm。
當有一個人的鞋子被掃瞄時，偵檢器讀數增加到200 cpm。當有一張紙被放在探頭和鞋子之間時，偵檢器讀數降到60 cpm。下列何者敘述顯示偵檢器讀數的減少？
A.污染含有貝他粒子
B.污染含有阿伐粒子
C.污染不含貝他粒子
D.污染不含阿伐粒子

答案： B

科目/題號：191002/50 (2016新增)
知能類：K1.20 [2.5/2.7]
序號：P6406

During power operation, a reactor coolant sample is taken and analyzed. Which one of the following lists three nuclides that are all indicative of a possible fuel cladding failure if found to be at elevated concentrations in the reactor coolant sample?
A. Oxygen-18, iron-59, and zirconium-95
B. Cobalt-60, iodine-131, and xenon-135
C. Krypton-85, strontium-90, and cesium-136
D. Hydrogen-2, hydrogen-3, and nitrogen-16
ANSWER: C.

於功率運轉期間，反應器冷卻水進行取樣分析。下列那三種核種若在反應器冷卻水取樣分析中，檢驗出核種濃度升高，均可能為燃料護套失效之指標？
A.氧-18、鐵-59、鋯-95
B.鈷-60、碘-131、氙-135
C.氪-85、鍶-90、銫-136
D.氫-2(氘)、氫-3(氚)、氮-16

答案： C