TOPIC: 193004
KNOWLEDGE: K1.11 [2.4/2.5]
QID: P74 (B2277)

Condensate depression is the process of...

A. removing condensate from turbine exhaust steam.

B. spraying condensate into turbine exhaust steam.

C. heating turbine exhaust steam above its saturation temperature.

D. cooling turbine exhaust steam below its saturation temperature.

ANSWER: D.

TOPIC: 193004
KNOWLEDGE: K1.11 [2.4/2.5]
QID: P274

Excessive heat removal from the low pressure turbine exhaust steam in the main condenser will result in...

A. thermal shock.

B. loss of condenser vacuum.

C. condensate depression.

D. fluid compression.

ANSWER: C.

TOPIC: 193004
KNOWLEDGE: K1.11 [2.4/2.5]
QID: P477 (B277)

Main condenser pressure is 1.0 psia. During the cooling process in the condenser, the temperature of the low pressure turbine exhaust decreases to 100°F, at which time it is a...

A. saturated liquid.

B. saturated vapor.

C. subcooled liquid.

D. superheated vapor.

ANSWER: C.

TOPIC: 193004
KNOWLEDGE: K1.11 [2.4/2.5]
QID: P576 (B2676)

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

A. To provide a better condenser vacuum.

B. To maximize overall steam cycle thermal efficiency.

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

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

ANSWER: C.

TOPIC: 193004
KNOWLEDGE: K1.11 [2.4/2.5]
QID: P876 (B1876)

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

A. 2°F

B. 19°F

C. 25°F

D. 53°F

ANSWER: C.

TOPIC: 193004
KNOWLEDGE: K1.11 [2.4/2.5]
QID: P1076

Which one of the following is a positive effect of having condensate depression in the main condenser?

A. Increased secondary cycle efficiency.

B. Increased feedwater temperature entering the steam generators.

C. Increased net positive suction head available to the condensate pumps.

D. Increased inventory in the main condenser hotwell.

ANSWER: C.

TOPIC: 193004
KNOWLEDGE: K1.11 [2.4/2.5]
QID: P1176 (B2176)

A nuclear power plant is operating at 80 percent power with 5°F of condensate depression in the main condenser. If the condensate depression increases to 10°F, the steam cycle thermal efficiency will _____; and the condensate pumps will operate _____ cavitation.

A. increase; closer to

B. increase; farther from

C. decrease; closer to

D. decrease; farther from

ANSWER: D.

TOPIC: 193004
KNOWLEDGE: K1.11 [2.4/2.5]
QID: P1376

What is the approximate value of condensate depression in a steam condenser operating at 2.0 psia with a condensate temperature of 115°F?

A. 9°F

B. 11°F

C. 13°F

D. 15°F

ANSWER: B.

TOPIC: 193004
KNOWLEDGE: K1.11 [2.4/2.5]
QID: P1576 (B2976)

What is the approximate condensate depression in a condenser operating at 28 inches Hg vacuum with a condensate temperature of 100°F?

A. Less than 2°F

B. 3°F to 5°F

C. 6°F to 8°F

D. 9°F to 11°F

ANSWER: A.

TOPIC: 193004
KNOWLEDGE: K1.11 [2.4/2.5]
QID: P1977

Condensate is collecting in a main condenser hotwell at 90°F with a condenser pressure of 28 inches Hg vacuum. Which one of the following will improve steam cycle efficiency?

A. Main condenser cooling water flow rate decreases by 5 percent with no change in condenser vacuum.

B. Main condenser cooling water inlet temperature decreases by 10°F with no change in condenser vacuum.

C. Main condenser vacuum decreases to 27 inches Hg vacuum due to buildup of noncondensible gases.

D. Steam flow through the turbine decreases by 10 percent with no change in condenser vacuum.

ANSWER: A.

TOPIC: 193004
KNOWLEDGE: K1.11 [2.4/2.5]
QID: P2276 (B78)

The steam cycle thermal efficiency of a nuclear power plant can be increased by...

A. decreasing power from 100 percent to 25 percent.

B. removing a high-pressure feedwater heater from service.

C. lowering condenser vacuum from 29 inches to 25 inches.

D. decreasing the amount of condensate depression (subcooling).

ANSWER: D.

TOPIC: 193004
KNOWLEDGE: K1.11 [2.4/2.5]
QID: P2476 (B2077)

A nuclear power plant is operating at 90 percent of rated power. Main condenser pressure is 1.69 psia and hotwell condensate temperature is 120°F.

Which one of the following describes the effect of a 5 percent decrease in cooling water flow rate through the main condenser on steam cycle thermal efficiency?

A. Efficiency will increase because condensate depression will decrease.

B. Efficiency will increase because the work output of the main turbine will increase.

C. Efficiency will decrease because condensate depression will increase.

D. Efficiency will decrease because the work output of the main turbine will decrease.

ANSWER: D.

TOPIC: 193004
KNOWLEDGE: K1.11 [2.4/2.5]
QID: P2576 (B2576)

A nuclear power plant is operating at 80 percent power with 5°F of condensate depression in the main condenser. If the condensate depression decreases to 2°F, the steam cycle thermal efficiency will _____; and the condensate pumps will operate _____ cavitation.

A. increase; closer to

B. increase; farther from

C. decrease; closer to

D. decrease; farther from

ANSWER: A.

TOPIC: 193004
KNOWLEDGE: K1.11 [2.4/2.5]
QID: P2976

What is the approximate value of condensate depression in a condenser operating at 27 inches Hg vacuum with a condensate temperature of 100°F?

A. 2°F

B. 4°F

C. 8°F

D. 16°F

ANSWER: D.

TOPIC: 193004
KNOWLEDGE: K1.11 [2.4/2.5]
QID: P3576 (B1484)

A main condenser is operating at 28 inches Hg vacuum with a condensate outlet temperature of 92°F. Which one of the following is the approximate amount of condensate depression?

A. 5°F

B. 9°F

C. 13°F

D. 17°F

ANSWER: B.

TOPIC: 193004
KNOWLEDGE: K1.11 [2.4/2.5]
QID: P3876 (B3877)

Main turbine exhaust enters a main condenser and condenses at 126°F. The condensate is cooled to 100°F before entering the main condenser hotwell. Assuming main condenser vacuum does <u>not</u> change, which one of the following would improve the thermal efficiency of the steam cycle?

A. Increase condenser cooling water flow rate by 5 percent.

B. Decrease condenser cooling water flow rate by 5 percent.

C. Increase main condenser hotwell level by 5 percent.

D. Decrease main condenser hotwell level by 5 percent.

ANSWER: B.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P76

A nuclear power plant is maintained at 2,000 psia with a pressurizer temperature of 636°F. A pressurizer relief safety valve is leaking to a collection tank which is being held at 10 psig. With dry saturated steam in the pressurizer vapor space, which one of the following is the approximate temperature of the fluid just downstream of the relief valve?

A. 280°F

B. 240°F

C. 190°F

D. 170°F

ANSWER: B.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P148

A pressurizer relief valve is leaking by with the leakage being collected in a pressurizer relief tank. The pressurizer pressure is 2,200 psia and the relief tank pressure is 5 psig.

With dry saturated steam in the pressurizer vapor space, which one of the following is the condition of the fluid just downstream of the relief valve?

A. Superheated steam

B. Subcooled liquid

C. Dry saturated steam

D. Wet vapor

ANSWER: D.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P276

A reactor coolant system is being maintained at 1,000 psia. A leaky pressurizer safety/relief valve is slowly discharging to a collection tank, which is maintained at 5 psig.

With dry saturated steam in the pressurizer vapor space, what is the approximate enthalpy of the fluid entering the collection tank? (Assume no heat is lost from the discharge line.)

A. 1,210 Btu/lbm

B. 1,193 Btu/lbm

C. 1,178 Btu/lbm

D. 1,156 Btu/lbm

ANSWER: B.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P377

What is the approximate temperature and phase of the fluid just downstream of the pressurizer relief valve if it sticks partially open with 2,200 psia in the pressurizer and a 50 psia backpressure? (Assume the pressurizer vapor space contains dry saturated steam.)

A. 281°F, saturated

B. 281°F, superheated

C. 332°F, saturated

D. 332°F, superheated

ANSWER: A.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P677

A routine nuclear power plant shutdown is in progress with a steam bubble (dry saturated steam) in the pressurizer. Pressurizer pressure is 415 psig and pressurizer pressure and level are slowly decreasing. The operator suspects a pressurizer power-operated relief valve (PORV) is partially open but the position indicating lights are not working.

Which one of the following will be the approximate PORV tailpipe temperature if the PORV is partially open? (Assume downstream pressure is 15 psia and no heat is lost from the tailpipe.)

A. 212°F

B. 280°F

C. 330°F

D. 450°F

ANSWER: C.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P150

A nuclear power plant is operating at 100 percent power. As steam escapes via a main steam header-to-atmosphere leak, which one of the following steam parameters will increase?

A. Enthalpy

B. Pressure

C. Specific volume

D. Temperature

ANSWER: C.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P1277

A heatup and pressurization of the reactor coolant system (RCS) is in progress following a maintenance shutdown. RCS pressure is 800 psia with a steam bubble (97.5 percent quality saturated steam) in the pressurizer. Pressurizer power-operated relief valve (PORV) tailpipe temperature has been steadily rising. PORV downstream pressure is 30 psia.

Which one of the following will be the approximate PORV tailpipe temperature if a PORV is leaking by? (Assume no heat is lost from the tailpipe.)

A. 262°F

B. 284°F

C. 302°F

D. 324°F

ANSWER: B.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P1477

A nuclear power plant is operating at 100 percent power with steam generator pressure at 900 psia. A steam generator safety valve is leaking dry saturated steam to atmosphere.

Which one of the following is the approximate temperature of the escaping steam once it reaches standard atmospheric pressure?

A. 532°F

B. 370°F

C. 308°F

D. 212°F

ANSWER: C.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P1577

A heatup and pressurization of the reactor coolant system (RCS) is in progress following a maintenance shutdown. RCS pressure is 800 psia with a steam bubble (96.0 percent quality saturated steam) in the pressurizer. Pressurizer power-operated relief valve (PORV) tailpipe temperature has been steadily rising. PORV downstream pressure is 20 psia.

Which one of the following will be the approximate PORV tailpipe temperature if a PORV is leaking by?

A. 226°F

B. 258°F

C. 284°F

D. 320°F

ANSWER: B.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P1677

A nuclear power plant is being maintained at 2,220 psig. A pressurizer relief valve is leaking dry saturated steam to a collection tank, which is being held at 20 psig.

Which one of the following is the approximate temperature of the fluid downstream of the relief valve?

A. 162°F

B. 228°F

C. 259°F

D. 320°F

ANSWER: C.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P1777

Which one of the following is essentially a constant enthalpy process?

A. Steam flowing through an ideal convergent nozzle.

B. Condensation of turbine exhaust in a main condenser.

C. Expansion of main steam through the stages of an ideal turbine.

D. Throttling of main steam through a main turbine steam inlet valve.

ANSWER: D.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P2077 (B2075)

A nuclear power plant is operating with the following main steam parameters at the main turbine steam inlet valves:

Pressure = 900 psia
Quality = 98 percent

The main turbine steam chest pressure is 400 psia. Assuming an ideal throttling process, what is the quality of the steam in the steam chest?

A. 97 percent

B. 98 percent

C. 99 percent

D. 100 percent

ANSWER: A.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P2377

A heatup and pressurization of the reactor coolant system (RCS) is in progress following a maintenance shutdown. RCS pressure is 800 psia with a steam bubble (96.0 percent quality saturated steam) in the pressurizer. Pressurizer power-operated relief valve (PORV) tailpipe temperature has been steadily rising. PORV downstream pressure is 20 psia.

Which one of the following will be the approximate PORV tailpipe temperature and phase of the escaping fluid if a PORV is leaking by?

A. 258°F, saturated

B. 258°F, superheated

C. 228°F, saturated

D. 228°F, superheated

ANSWER: B.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P2876

Refer to the drawing of two 1,000 ft^3 pressure vessels with installed relief valves (see figure below).

Both vessels are in saturated conditions at 281°F and approximately 35 psig. Vessel A is completely filled with saturated water. Vessel B contains one-half saturated steam (100 percent quality) and one-half saturated water (0 percent quality) by volume. Both vessels are protected by identical relief valves.

If both relief valves begin to leak at a rate of 0.1 percent of design flow, the higher temperature fluid will initially be leaving the relief valve of vessel _____. And, if 100 lbm of fluid is released through both relief valves, the larger pressure decrease will occur in vessel _____.

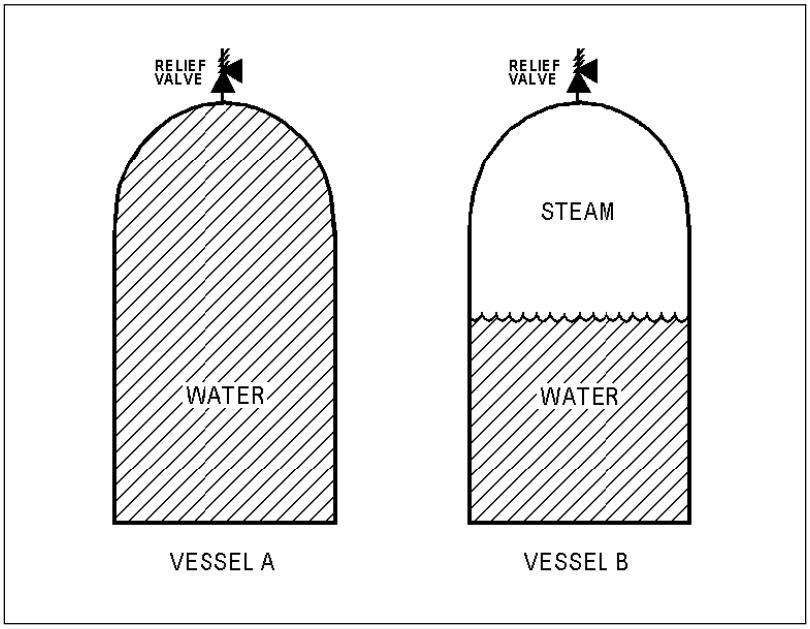
A. A; A

B. A; B

C. B; A

D. B; B

ANSWER: D.



TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P3077 (B3074)

A nuclear power plant is operating at 100 percent power. Steam is escaping to atmosphere through a flange leak in a steam supply line to the low pressure section of the main turbine.

Given:

- Steam line pressure is 300 psia.
- Steam line steam temperature is 440°F.

What is the approximate temperature of the steam as it reaches standard atmospheric pressure?

A. 212°F

B. 268°F

C. 322°F

D. 358°F

ANSWER: D.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P3277

A nuclear power plant is operating at 100 percent power. Steam is escaping to atmosphere through a flange leak in a steam line that supplies the low pressure unit of the main turbine.

Given:

- Steam line pressure is 280 psia.
- Steam line steam temperature is 450°F.

What is the approximate temperature of the steam as it reaches standard atmospheric pressure?

A. 212°F

B. 268°F

C. 322°F

D. 378°F

ANSWER: D.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P3477

A pressurizer safety valve is leaking by, allowing the dry saturated steam in the pressurizer to flow to the pressurizer relief tank (PRT). The reactor has been shut down, and a plant cooldown and depressurization are in progress. PRT pressure is being maintained constant at 35 psia.

Which one of the following describes how the safety valve tailpipe temperature will be affected as pressurizer pressure slowly decreases from 1,500 psia to 500 psia? (Assume there is <u>no</u> ambient heat loss from the tailpipe.)

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

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

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

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

ANSWER: B.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P3577 (B3575)

Dry saturated steam at 1,000 psia is being supplied to the inlet of a partially open steam throttle valve on a main turbine. Pressure in the steam chest downstream of the throttle valve is 150 psia. Assume a typical throttling process with no heat gain or loss to/from the steam.

When compared to the conditions at the inlet to the throttle valve, which one of the following describes the conditions in the steam chest for specific enthalpy and specific entropy?

	Steam Chest Specific Enthalpy	Steam Chest Specific Entropy
A.	About the same	About the same
B.	About the same	Significantly higher
C.	Significantly lower	About the same
D.	Significantly lower	Significantly higher

ANSWER: B.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P3677 (B3675)

A nuclear power plant is shut down and steam is escaping to atmosphere through a leak in a main steam line. The main steam line contains dry saturated steam at 300 psia. What is the approximate temperature of the steam as it reaches standard atmospheric pressure?

A. 212°F

B. 268°F

C. 322°F

D. 358°F

ANSWER: C.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P4040

A heatup and pressurization of a reactor coolant system (RCS) is in progress following a maintenance shutdown. RCS pressure is 1,000 psia with a steam bubble (dry saturated steam) in the pressurizer. Pressurizer power-operated relief valve (PORV) tailpipe temperature has been steadily rising. PORV downstream pressure is 40 psia.

Which one of the following will be the approximate PORV tailpipe temperature and phase of the escaping fluid if a PORV is leaking by?

A. 267°F, saturated

B. 267°F, superheated

C. 312°F, saturated

D. 312°F, superheated

ANSWER: D.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P5340 (B5338)

A nuclear power plant is operating with the following main steam parameters at the main turbine steam inlet valves:

Pressure = 900 psia
Quality = 99 percent

The main turbine steam chest pressure is 300 psia. Assuming an ideal throttling process, what is the quality of the steam in the steam chest?

A. 100 percent

B. 98 percent

C. 88 percent

D. 87 percent

ANSWER: B.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P5640

A pressurizer safety valve is leaking by, allowing 100 percent quality steam from the pressurizer to enter the discharge pipe, which remains at a constant pressure of 30 psig. Initial safety valve discharge pipe temperature is elevated but stable. Assume no heat loss from the safety valve discharge pipe.

Upon discovery of the leak, the reactor is shut down and a plant cooldown and depressurization are commenced. Throughout the cooldown and depressurization, dry saturated steam continues to leak through the pressurizer safety valve.

As pressurizer pressure decreases from 2,000 psig to 1,800 psig, the safety valve discharge pipe temperature will...

A. decrease, because the entropy of the safety valve discharge will decrease during the pressurizer pressure decrease.

B. decrease, because the enthalpy of the safety valve discharge will decrease during the pressurizer pressure decrease.

C. increase, because the safety valve discharge will become more superheated during the pressurizer pressure decrease.

D. remain the same, because the safety valve discharge will remain a saturated steam-water mixture at 30 psig.

ANSWER: D.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P6540 (B6538)

A nuclear power plant is operating at power. Steam is escaping to atmosphere through a flange leak in a steam line supplying the low pressure section of the main turbine.

Given:

- Steam line pressure is 200 psia.
- Steam line temperature is 400°F.

Assuming no heat transfer to/from the steam, what is the approximate temperature of the steam as it reaches atmospheric pressure?

A. 212°F

B. 284°F

C. 339°F

D. 375°F

ANSWER: C.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P7140 (B7138)

A nuclear power plant is operating with the following main steam parameters at the main turbine steam inlet valves:

Pressure = 1,050 psia
Quality = 100 percent

The main turbine steam chest pressure is 400 psia. Assuming an ideal throttling process, which one of the following describes the steam in the steam chest?

A. Saturated, 96 percent quality

B. Saturated, 98 percent quality

C. Saturated, 100 percent quality

D. Superheated

ANSWER: B.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P7610

A pressurizer safety valve is leaking by, allowing the dry saturated steam from the pressurizer to enter the discharge pipe, which remains at a constant pressure of 40 psia. Initial safety valve discharge pipe temperature is elevated but stable. Assume no heat loss occurs from the safety valve discharge pipe.

Upon discovery of the leak, the reactor is shut down, and a plant cooldown and depressurization are commenced. Throughout the cooldown and depressurization, dry saturated steam continues to leak through the pressurizer safety valve.

As pressurizer pressure decreases from 1,000 psia to 700 psia, the safety valve discharge pipe temperature will...

A. decrease, because the entropy of the safety valve discharge will decrease during the pressurizer pressure decrease in this range.

B. decrease, because the enthalpy of the safety valve discharge will decrease during the pressurizer pressure decrease in this range.

C. increase, because the safety valve discharge will become more superheated during the pressurizer pressure decrease in this range.

D. remain the same, because the safety valve discharge will remain a saturated steam-water mixture at 40 psia during the pressurizer pressure decrease in this range.

ANSWER: C.

TOPIC: 193004
KNOWLEDGE: K1.15 [2.8/2.8]
QID: P7619 (B7619)

A nuclear power plant is operating with the following main steam parameters at a partially open main turbine steam inlet valve:

Pressure = 1,000 psia
Quality = 100 percent

The main turbine steam chest pressure is 50 psia. Which one of the following describes the steam in the steam chest?

A. Saturated, 98 percent quality

B. Saturated, 99 percent quality

C. Saturated, 100 percent quality

D. Superheated

ANSWER: D.