PRACTICE EXAM 12: RACM RED SEAL SIMULATION (125 QUESTIONS)

Confirmed. Writing Questions 1–125, each crafted so the correct answer matches its pre-assigned letter from the verified key. This exam is styled toward applied diagnostic and scenario-based reasoning to keep it distinct from prior exams in the series.

Practice Exam 12: RACM Red Seal Simulation (125 Questions)

1. A technician measures a suction pressure that corresponds to a saturation temperature of 2°C while the suction line temperature at the compressor reads 12°C. What does this indicate?

A. The system is overcharged with refrigerant

B. The metering device is starving the evaporator

C. The system has 10°C of useful superheat

D. The condenser is rejecting insufficient heat

2. During a brazing operation on copper tubing carrying refrigerant lines, why must dry nitrogen be flowed through the tubing?

A. To increase the joint temperature for better flow

B. To pressurize the system for a leak test

C. To prevent the formation of copper oxide scale inside the tube

D. To displace residual oil from the joint area

3. On a TXV-controlled system, the bulb has lost its charge. What symptom would most likely result?

A. Excessive subcooling at the condenser outlet

B. Flooding of liquid refrigerant into the compressor

C. Hunting of the valve with rapid cycling

D. The valve drives toward closed, starving the evaporator

4. What is the primary purpose of a receiver in a refrigeration system?

A. To separate oil from the discharge gas

B. To subcool liquid before the metering device

C. To dampen compressor discharge pulsations

D. To store excess liquid refrigerant for varying load conditions

5. A compressor draws high amperage and trips on overload shortly after start. The discharge pressure is abnormally high. What is the most probable cause?

A. Low refrigerant charge

B. A non-condensable gas or restricted condenser airflow

C. A failed run capacitor

D. An open compressor winding

6. Under CSA and provincial regulations, what document must accompany the recovery of refrigerant from a system?

A. A WHMIS safety data sheet

B. A manufacturer's warranty card

C. An equipment nameplate copy

D. A refrigerant recovery/handling record

7. What does a low superheat reading combined with low suction pressure typically indicate?

A. An overcharged condenser

B. A blocked liquid line filter-drier upstream is unrelated

C. Excessive evaporator airflow

D. A restriction in the liquid line reducing refrigerant feed

8. When evacuating a system, why is a deep vacuum (below 500 microns) important?

A. It increases the refrigerant charge capacity

B. It boils off moisture and removes non-condensables

C. It lubricates the compressor bearings

D. It calibrates the low-pressure control

9. A capillary tube system is overcharged. What is the expected effect on operation?

A. High head pressure and liquid floodback at low loads

B. Reduced subcooling and high superheat

C. Frosting only at the metering device outlet

D. Lower-than-normal discharge temperature

10. What is the function of an accumulator in a refrigeration circuit?

A. To store liquid refrigerant ahead of the metering device

B. To prevent liquid refrigerant slugging from reaching the compressor

C. To increase suction superheat by adding heat

D. To filter particulates from the discharge line

11. A PSC compressor motor will hum but not start. The run capacitor tests within tolerance. What is the next most likely faulty component?

A. The start (hard-start) device or relay

B. The compressor discharge valve

C. The condenser fan motor

D. The liquid line solenoid

12. Why is POE (polyolester) oil used with HFC refrigerants such as R-410A?

A. It has a lower viscosity than mineral oil at all temperatures

B. It is less expensive than alkylbenzene oil

C. It resists acid formation better than any other oil

D. It is miscible with HFC refrigerants, which mineral oil is not

13. During a leak search, an electronic leak detector alarms continuously everywhere near the unit. What should the technician suspect?

A. Multiple large leaks at every joint

B. A saturated sensor or high ambient refrigerant background

C. A correctly functioning detector at one small leak

D. The detector battery is fully charged

14. What is the effect of a refrigerant undercharge on suction and discharge pressures?

A. Both pressures rise above normal

B. Suction rises, discharge falls

C. Suction normal, discharge unchanged

D. Both pressures fall below normal

15. A water-cooled condenser shows a high approach temperature (condensing temp far above leaving water temp). What is the most likely cause?

A. Scale or fouling on the water side reducing heat transfer

B. Excessive water flow rate through the condenser

C. An oversized cooling tower

D. Low refrigerant charge

16. On a system using a hot-gas defrost cycle, what is the source of the defrost heat?

A. Discharge gas from the compressor routed to the evaporator

B. Electric resistance heaters in the drain pan

C. Ambient air drawn across the coil

D. Warm liquid from the receiver

17. What is the purpose of a crankcase heater on a compressor?

A. To raise discharge superheat during operation

B. To prevent refrigerant migration and oil dilution during the off cycle

C. To speed up oil return during running

D. To defrost the suction line

18. A technician finds the filter-drier inlet noticeably colder than the outlet, with frost forming. What does this indicate?

A. The drier is correctly sized and operating normally

B. A restriction (clogged drier) causing a pressure/temperature drop

C. The condenser is overcharged

D. The evaporator fan has failed

19. Under what condition does a low-pressure control act as a safety device rather than an operating control?

A. When set to cycle the compressor at normal load

B. When wired to the defrost timer

C. When used to stage condenser fans

D. When set as a loss-of-charge cutout below normal operating range

20. What is the main advantage of an electronically commutated motor (ECM) over a standard PSC motor on a condenser fan?

A. It cannot be speed-controlled

B. It requires a larger run capacitor

C. It offers variable speed and higher efficiency

D. It operates only on three-phase power

21. A reciprocating compressor has worn discharge valves. What symptom is most characteristic?

A. Low volumetric efficiency with high suction and low discharge pressure

B. Excessively high subcooling

C. Liquid floodback at startup

D. A locked rotor on every start

22. Why must refrigerant cylinders never be filled beyond 80% of their capacity?

A. To leave room for the recovery machine oil

B. To meet shipping weight limits only

C. To allow vapor sampling at the top

D. To allow for liquid expansion and avoid hydrostatic rupture

23. A system using R-410A reads 118 psig suction. Using the R-410A pressure-temperature relationship, the saturation temperature is approximately:

A. -10°C

B. 25°C

C. 5°C

D. 40°C

24. What is the function of a liquid-line solenoid valve in a pump-down cycle?

A. To close on the off cycle so the compressor evacuates the evaporator before stopping

B. To meter refrigerant into the evaporator

C. To bypass hot gas during defrost

D. To regulate condenser water flow

25. A capillary tube and a TXV differ primarily in that the TXV:

A. Is a fixed restriction sized for one operating condition

B. Cannot be used with a receiver

C. Modulates flow to maintain constant evaporator superheat

D. Requires no external equalizer ever

26. Excessive subcooling at the condenser outlet combined with low evaporator capacity suggests:

A. A refrigerant undercharge

B. A liquid-line restriction or overcharge holding liquid in the condenser

C. A failed suction valve

D. An open crankcase heater

27. Why is it dangerous to use oxygen to pressurize a refrigeration system for leak testing?

A. Oxygen is too expensive for this use

B. Oxygen freezes the refrigerant oil

C. Oxygen cannot hold pressure

D. Oxygen can react explosively with compressor oil under pressure

28. On a three-phase scroll compressor, reversed phase rotation causes:

A. Higher efficiency operation

B. Normal operation in either direction

C. Faster oil return

D. Reverse rotation, no pumping, and possible damage

29. What is the purpose of an external equalizer line on a TXV?

A. To compensate for evaporator pressure drop so superheat control stays accurate

B. To drain oil from the evaporator

C. To bypass the filter-drier

D. To equalize condenser and receiver pressures

30. A sight glass shows continuous bubbles during steady-state operation. The most common cause is:

A. Insufficient charge or a liquid-line restriction creating flash gas

B. An overcharge of refrigerant

C. Excessive subcooling

D. Normal operation at full load

31. What does TEWI stand for in the context of refrigeration environmental impact?

A. Total Energy Withdrawal Index

B. Thermal Expansion Work Input

C. Total Equivalent Warming Impact

D. Temperature Equalized Water Indicator

32. A blocked or dirty evaporator coil (low airflow) on an air conditioning system tends to cause:

A. High suction pressure and high superheat

B. Normal pressures with high subcooling

C. High head pressure only

D. Low suction pressure and possible coil icing

33. The primary reason to install a discharge-line muffler is to:

A. Increase discharge pressure

B. Separate oil from the gas

C. Reduce gas pulsation noise from the compressor

D. Subcool the discharge gas

34. When charging a system with a near-azeotropic blend like R-410A, the refrigerant should be:

A. Charged as vapor only from the top of the cylinder

B. Charged only after heating the cylinder

C. Vented to atmosphere to set the blend

D. Charged as liquid (metered) to maintain blend composition

35. A compressor that short-cycles on its high-pressure control most likely has:

A. A low refrigerant charge

B. A condenser problem (dirty coil, failed fan, or non-condensables)

C. An open low-pressure switch

D. A stuck-open metering device

36. What safety hazard is associated with refrigerant displacing air in a confined mechanical room?

A. Increased fire risk from the refrigerant

B. Elevated oxygen levels causing dizziness

C. Asphyxiation due to oxygen displacement

D. Corrosion of the refrigerant cylinders

37. A hermetic compressor has a grounded winding. A megohmmeter reading from a terminal to the shell would show:

A. A very low resistance (near zero) to ground

B. Infinite resistance to ground

C. Normal winding resistance only

D. A reading equal to line voltage

38. The function of a defrost termination thermostat on a heat pump is to:

A. Start the defrost cycle on a time schedule

B. Reverse the compressor rotation

C. End defrost when the outdoor coil reaches a set temperature

D. Energize the crankcase heater

39. A system's head pressure rises steadily over several minutes of operation while subcooling increases. This most likely indicates:

A. A refrigerant undercharge

B. Air or non-condensables in the system

C. A failing compressor valve

D. A plugged evaporator

40. What is the correct method to determine the actual operating superheat on a fixed-orifice system?

A. Subtract evaporator saturation temp from liquid line temp

B. Measure discharge temperature alone

C. Subtract evaporator saturation temperature from suction line temperature at the coil outlet

D. Add condenser saturation temp to suction temp

41. Why are pressure relief devices required on larger refrigerant receivers and vessels?

A. To regulate operating pressure during normal running

B. To protect against over-pressurization from heat or fire

C. To meter refrigerant to the evaporator

D. To drain oil from the vessel

42. A direct-expansion chiller loses water flow but the compressor keeps running. The most immediate risk is:

A. Compressor over-oiling

B. Excessive subcooling

C. Freezing and rupture of the evaporator (water side)

D. High oil temperature only

43. What is the purpose of an oil separator located in the discharge line?

A. To cool the discharge gas before the condenser

B. To remove moisture from the refrigerant

C. To add oil to the refrigerant charge

D. To return oil to the compressor and keep it out of the system

44. On a TXV system, an evaporator that is "starved" (low superheat is NOT the issue — superheat is very high) typically points to:

A. An undercharge, restriction, or undersized valve limiting refrigerant feed

B. An overcharge of refrigerant

C. A flooded evaporator

D. Excessive condenser subcooling

45. A single-phase compressor uses a potential (voltage) relay to:

A. Disconnect the start winding/capacitor once the motor reaches speed

B. Provide running torque continuously

C. Protect against high discharge pressure

D. Control condenser fan speed

46. What is the most accurate way to confirm a system is fully evacuated before charging?

A. Visual inspection of the sight glass

B. An isolated micron-gauge reading that holds below the target after closing valves

C. A soap-bubble test on all joints

D. Feeling the suction line temperature

47. A heat pump in heating mode has a reversing valve that fails to shift. The unit will:

A. Run more efficiently than normal

B. Continue to provide cooling instead of heating

C. Trip the high-pressure control immediately

D. Defrost continuously

48. Why should a technician avoid topping up a leaking system repeatedly with refrigerant rather than repairing the leak?

A. It improves system efficiency temporarily, which is acceptable

B. Refrigerant is too inexpensive to justify repair

C. The oil charge will become excessive

D. It is environmentally harmful and prohibited under regulation to release refrigerant

49. The compressor amperage is normal, suction and discharge pressures are normal, but cooling is poor and the airflow is weak. The fault most likely lies in:

A. The refrigerant charge

B. The air-side system (blower, ductwork, or dirty filter)

C. The metering device

D. The high-pressure control

50. What does an abnormally high discharge temperature (compressor outlet) with normal pressures suggest?

A. High superheat at the suction inlet (low charge or restriction)

B. A flooded compressor

C. Excessive subcooling

D. A failed crankcase heater

51. A thermostatic expansion valve is described as a "non-bleed" (hard-shutoff) type. Compared to a "bleed-type" TXV, what is the practical service implication of installing a non-bleed valve?

A. It allows system pressures to equalize through the valve during the off cycle

B. It requires a compressor with high starting torque because pressures will not equalize through it

C. It eliminates the need for an external equalizer line on the evaporator

D. It prevents liquid refrigerant from ever reaching the evaporator coil

52. Subcooling is measured by comparing:

A. Condenser saturation temperature to the actual liquid-line temperature

B. Evaporator saturation temperature to suction temperature

C. Discharge temperature to ambient

D. Suction pressure to discharge pressure

53. A refrigeration system using R-134a is most commonly found in:

A. Medium-temperature commercial and automotive applications

B. Low-temperature freezer systems exclusively

C. Large industrial ammonia plants

D. Cryogenic applications only

54. Why is it important to weigh in the refrigerant charge on a critically-charged (capillary tube) system rather than charging by pressures?

A. Pressures are easier to read on cap-tube systems

B. The system has no receiver buffer, so exact charge is critical to performance

C. Weighing adds oil automatically

D. The cap tube cannot tolerate any subcooling

55. A condenser fan motor runs backward after a bearing replacement. The likely cause is:

A. Low line voltage

B. A failed run capacitor

C. An overcharged system

D. Reversed motor lead connections (single-phase) or rewiring error

56. The reversing valve in a heat pump is actuated by:

A. A mechanical linkage from the compressor

B. Differential water pressure

C. A solenoid pilot valve using system pressure difference

D. The defrost timer motor directly

57. A compressor that has slugged liquid refrigerant repeatedly is most likely to suffer:

A. Gradual loss of charge

B. Improved volumetric efficiency

C. Valve and rod/bearing damage from incompressible liquid

D. Higher superheat readings

58. What is the purpose of a head pressure control (flooding valve / fan cycling) on a system in low ambient conditions?

A. To reduce subcooling

B. To maintain adequate condensing pressure for proper TXV operation

C. To increase evaporator superheat

D. To bypass the compressor

59. A 3-phase motor draws balanced current well above nameplate FLA under load. The most probable cause is:

A. A single open phase

B. Reversed rotation

C. Low control voltage

D. Mechanical overload or excessive head pressure

60. During recovery, the recovery machine slows dramatically as the cylinder fills. This is most likely due to:

A. A leak in the recovery hoses

B. The system being fully empty

C. A failed recovery compressor

D. The cylinder approaching its pressure/fill limit, reducing differential

61. What is the correct lubricant consideration when retrofitting an R-22 system to an HFC blend?

A. No oil change is ever required

B. Mineral oil performs better with HFCs

C. Mineral oil may need replacement with POE for proper oil return

D. The system must be charged with water first

62. A bimetal defrost termination switch on an electric-defrost evaporator fails open permanently. The result is:

A. The unit cools more efficiently

B. The compressor will not start

C. Continuous compressor short-cycling

D. Defrost terminates immediately, leaving the coil iced

63. The primary function of a suction-line accumulator's small oil-return orifice is to:

A. Meter trapped oil and liquid slowly back to the compressor

B. Drain the entire accumulator at once

C. Equalize pressure with the condenser

D. Defrost the suction line

64. A system shows low suction, low discharge, low amp draw, and high superheat. The single most consistent diagnosis is:

A. Overcharge

B. Dirty condenser

C. Undercharge / loss of refrigerant

D. Failed reversing valve

65. Why must a vacuum pump's oil be changed regularly when servicing systems contaminated with moisture or acid?

A. Contaminants degrade the oil and reduce the pump's ability to reach deep vacuum

B. Clean oil increases the refrigerant charge

C. Oil changes lower the system pressure

D. It prevents the pump from over-pressurizing

66. A water-source heat pump uses a desuperheater to:

A. Lower the evaporator temperature

B. Increase suction superheat

C. Cool the condenser water supply

D. Recover discharge heat for domestic hot water

67. What is indicated by frost forming on the suction line all the way back to the compressor?

A. Normal high-load operation always

B. Liquid refrigerant floodback / overfeeding evaporator

C. A loss of charge

D. A failed condenser fan

68. The recommended action when a refrigerant is found to be cross-contaminated (mixed) in a cylinder is to:

A. Continue using it as recovered

B. Vent it to atmosphere

C. Label it and send for reclamation/destruction, never reuse

D. Add it to the system anyway

69. A capacitor-start, capacitor-run (CSCR) motor provides:

A. Lower starting torque than a PSC motor

B. High starting torque plus efficient running performance

C. No need for a start relay

D. Operation only on DC supply

70. On a flooded evaporator chiller, the level control's purpose is to:

A. Drain oil from the shell

B. Cycle the condenser fans

C. Maintain refrigerant liquid level for full tube wetting

D. Control compressor speed directly

71. A technician reads 0 psig on both gauges with the system off, in a 25°C room, on an R-134a system. This indicates:

A. A correct, fully charged system

B. The system is overcharged

C. Normal standing pressure for R-134a

D. A complete loss of refrigerant charge (should read ~590 kPa/saturation)

72. The main reason to install vibration eliminators (flexible connectors) in refrigerant piping is to:

A. Increase refrigerant velocity

B. Filter the refrigerant

C. Reduce transmitted compressor vibration and prevent fatigue cracking

D. Add subcooling to the liquid line

73. A liquid-line filter-drier's desiccant becomes saturated with moisture. The likely consequence is:

A. Improved system capacity

B. Acid formation and possible TXV/cap-tube freeze-up or corrosion

C. Higher subcooling and better efficiency

D. Reduced compressor amperage

74. What is the purpose of staging multiple compressors or using unloaders on a large system?

A. To match capacity to varying load and improve part-load efficiency

B. To increase the maximum head pressure

C. To eliminate the need for a metering device

D. To prevent any oil return

75. A heat pump running in heating mode ices up the outdoor coil heavily but never initiates defrost. The most likely faulty component is:

A. The indoor blower motor

B. The crankcase heater

C. The liquid-line drier

D. The defrost control (timer/sensor) or its initiation circuit

76. When a TXV "hunts" (cycles between flooding and starving), a common cause is:

A. A correctly sized valve under steady load

B. An overcharged condenser only

C. An oversized valve or poor bulb contact/location

D. A failed high-pressure switch

77. The purpose of a king valve at the receiver outlet is to:

A. Meter refrigerant to the evaporator

B. Isolate the receiver charge for service (pump-down storage)

C. Relieve excess pressure to atmosphere

D. Separate oil from liquid

78. Non-condensable gases in a system collect primarily in the:

A. Evaporator

B. Suction line

C. Crankcase

D. Condenser/receiver (high side), raising head pressure

79. A compressor's internal overload (klixon) opens on temperature. After cooling, it should:

A. Automatically reset and allow restart

B. Require manual replacement every time

C. Remain permanently open

D. Trip the high-pressure control

80. The recommended way to add oil to an operating low-side system is to:

A. Pour it into the discharge service port

B. Open the compressor and pour it in while running

C. Vent the system and pour through the suction valve

D. Draw it in through the suction service port under controlled vacuum/low pressure

81. A system with an undersized liquid line will most likely experience:

A. Flash gas at the metering device due to excessive pressure drop

B. Excessive subcooling at the evaporator

C. Liquid floodback to the compressor

D. Lower head pressure than normal

82. What does the term "pinch point" refer to in a heat exchanger?

A. The point of maximum refrigerant velocity

B. A mechanical clamp on the tubing

C. The location of the filter-drier

D. The location where the temperature difference between fluids is smallest

83. A scroll compressor offers what advantage over a reciprocating compressor?

A. Fewer moving parts, smoother operation, and tolerance to small liquid amounts

B. Higher noise and vibration

C. Inability to operate on single phase

D. No need for any oil

84. When measuring superheat to charge a fixed-orifice A/C system, the manufacturer's charging chart requires which two inputs?

A. Discharge pressure and ambient only

B. Subcooling and suction pressure

C. Outdoor (condenser entering) temperature and indoor wet-bulb temperature

D. Liquid line temp and discharge temp

85. A solenoid valve coil is energized but the valve does not open. The most likely mechanical cause is:

A. The coil voltage is too high

B. The valve plunger is stuck or debris is lodged in the seat

C. The refrigerant is overcharged

D. The thermostat is set too low

86. The primary safety concern when working on a system charged with a flammable (A2L/A3) refrigerant is:

A. Excessive subcooling

B. High oil viscosity

C. Ignition sources near potential refrigerant leaks

D. Low head pressure

87. A TXV with the bulb mounted on the bottom of a horizontal suction line may give a false reading because:

A. The bulb senses ambient air directly

B. The discharge gas heats the bulb

C. Oil pooling at the bottom can hold liquid and skew the temperature sensed

D. The bulb cannot sense any temperature

88. A compressor runs continuously and never satisfies the thermostat on a hot day, with low suction and high superheat. The most likely cause is:

A. An undercharge or a restriction reducing capacity

B. An overcharge of refrigerant

C. A stuck-closed liquid-line solenoid

D. A failed condenser fan only

89. What is the function of a Schrader-type access valve depressor in a service hose?

A. To open the Schrader core pin for gauge access

B. To meter refrigerant flow

C. To separate oil from gas

D. To relieve high pressure automatically

90. Why is suction-line insulation important on a low-temperature system?

A. To increase the refrigerant flow rate

B. To prevent sweating/icing and unwanted heat gain that raises superheat

C. To reduce the compressor amperage directly

D. To add subcooling to the liquid

91. A pressure-temperature chart shows R-404A as a zeotropic blend with temperature glide. When charging, this means:

A. Liquid charging is preferred to maintain composition through the glide

B. Vapor charging is mandatory in all cases

C. The blend has zero glide

D. Glide makes the refrigerant non-recoverable

92. A reciprocating compressor with a broken suction valve reed will show:

A. Higher-than-normal volumetric efficiency

B. Excessive subcooling

C. Increased discharge pressure only

D. Low capacity, high suction pressure, and reduced pumping

93. The most reliable indicator that a system has the correct charge on a TXV system is:

A. A clear sight glass alone

B. Suction pressure alone

C. Discharge temperature alone

D. Proper subcooling within the manufacturer's specified range

94. What is the consequence of installing a TXV bulb on an uninsulated line in a warm mechanical room?

A. The valve will close permanently

B. The bulb reads warm ambient influence, causing the valve to overfeed

C. The valve develops zero superheat always

D. The compressor will not start

95. A water-cooled condenser uses a water-regulating valve that responds to:

A. Suction pressure

B. Evaporator temperature

C. Head (condensing) pressure to modulate water flow

D. Ambient air temperature only

96. When silver-brazing a joint near a service valve with a Schrader core, the technician should:

A. Braze with the core in place at full heat

B. Increase the flame intensity to finish faster

C. Remove the Schrader core to prevent heat damage to the seal

D. Add extra flux inside the valve body

97. A heat pump's auxiliary (backup) electric heat energizes during normal mild heating operation when it shouldn't. The likely cause is:

A. A faulty outdoor thermostat or staging control calling for aux heat prematurely

B. An overcharge of refrigerant

C. A clogged liquid-line drier

D. A failed reversing valve solenoid

98. The purpose of an EPR (evaporator pressure regulator) valve is to:

A. Prevent evaporator pressure from dropping below a set minimum

B. Increase discharge pressure

C. Drain oil from the evaporator

D. Defrost the condenser

99. A capillary-tube system runs with a partially blocked cap tube. The symptoms would be:

A. High suction and high discharge pressures

B. Liquid floodback to the compressor

C. Low suction pressure, low capacity, and high superheat

D. Excessive evaporator frosting at full load

100. What is the recommended torque consideration when tightening flare fittings on refrigerant lines?

A. Tighten as hard as possible by hand-feel

B. Use a calibrated torque wrench to manufacturer specs to avoid cracking or leaking

C. Tighten only finger-tight always

D. Apply pipe dope to the threads first

101. A system's high-pressure control is set to cut out at a pressure corresponding to a condensing temperature well above design. The risk is:

A. Compressor operation at dangerously high discharge pressure before cutout

B. Premature cutout at low load

C. Excessive subcooling only

D. No effect on safety

102. The most accurate field method to identify an unknown refrigerant in a recovered cylinder is to:

A. Use a refrigerant identifier (analyzer) instrument

B. Read the pressure at one temperature only

C. Smell the refrigerant carefully

D. Weigh the cylinder

103. A heat pump shows good cooling but poor heating capacity. Refrigerant charge and airflow are correct. The likely cause is:

A. A dirty evaporator

B. An overcharge

C. A partially failed reversing valve (internal leak/bypass)

D. A failed crankcase heater

104. Why is a liquid-line sight glass with a moisture indicator useful?

A. It measures the refrigerant flow rate

B. It indicates discharge superheat

C. It changes color to warn of moisture in the system

D. It regulates the metering device

105. A compressor contactor's points are pitted and welded. The result will be:

A. The compressor cannot be turned off by the contactor (runs continuously)

B. The compressor will not start at all

C. The condenser fan reverses

D. The TXV hunts

106. When pressure-testing a system with dry nitrogen, the maximum test pressure should:

A. Not exceed the low-side or component design pressure ratings

B. Always exceed the relief valve setting

C. Equal the cylinder regulator's maximum output

D. Be irrelevant to component ratings

107. A flooded chiller's oil tends to migrate to the evaporator shell. The system addresses this with:

A. A larger receiver

B. A king valve

C. An oil recovery/return system from the evaporator

D. A discharge muffler

108. What does a high subcooling combined with normal-to-high head pressure and low evaporator capacity most strongly suggest?

A. Severe undercharge

B. Refrigerant overcharge holding excess liquid in the condenser

C. A failed suction valve

D. Open crankcase heater

109. The correct first step before opening any sealed refrigeration system for repair is to:

A. Apply line voltage to test the compressor

B. Add refrigerant to raise pressure

C. Braze all joints preemptively

D. Recover the refrigerant charge per regulation

110. A PSC blower motor runs slow and overheats. The run capacitor reads well below its rated microfarads. The fix is to:

A. Increase the supply voltage

B. Add refrigerant

C. Lubricate the compressor

D. Replace the run capacitor with the correct rated value

111. Why is proper refrigerant pipe sizing on vertical suction risers critical?

A. To reduce the refrigerant charge

B. To increase subcooling

C. To maintain adequate velocity for oil return up the riser

D. To lower the condensing temperature

112. A system charged with R-410A must use service equipment rated for higher pressure because R-410A:

A. Operates at lower pressures than R-22

B. Operates at substantially higher pressures than R-22

C. Has the same pressure as R-134a

D. Operates only under vacuum

113. The purpose of a hot-gas bypass valve is to:

A. Increase head pressure

B. Defrost the condenser

C. Provide false load to prevent evaporator pressure from dropping too low at light load

D. Separate oil from refrigerant

114. A technician notices the compressor terminals are discolored and the wire insulation is brittle. This most likely indicates:

A. Normal aging with no concern

B. A history of overheating, possibly from overload or burnout

C. Excessive subcooling

D. A correctly operating crankcase heater

115. When commissioning a split system, the lineset is field-brazed and evacuated. The next critical step before charging is to:

A. Start the compressor immediately

B. Open the service valves and add refrigerant under vacuum only

C. Perform a standing vacuum (decay) test to confirm tightness and dryness

D. Energize the crankcase heater for 24 hours first

116. A scroll compressor that is "locked" and will not start, drawing locked-rotor amps, may be diagnosed by:

A. Checking only the run capacitor

B. Measuring discharge temperature

C. Checking winding resistance and ground, then attempting a hard-start kit if windings are good

D. Adding refrigerant to free the scrolls

117. The main reason a low-temperature system uses a two-stage or cascade arrangement is to:

A. Reduce the number of components

B. Eliminate the need for oil

C. Run on a single low compression ratio stage

D. Achieve very low evaporator temperatures efficiently within compression-ratio limits

118. A suction-to-liquid heat exchanger in a refrigeration circuit is used to:

A. Increase discharge pressure

B. Subcool the liquid and add superheat to the suction to improve efficiency and prevent floodback

C. Defrost the evaporator

D. Separate oil from the discharge

119. When a refrigerant leak is suspected but not located, the most thorough confirmation method after electronic detection is:

A. Replacing the compressor

B. Adding more refrigerant and watching pressures

C. Increasing the head pressure

D. Pressurizing with nitrogen/trace gas and using bubble solution or holding a standing pressure test

120. A heat pump's defrost cycle reverses the valve to cooling mode and shuts off the outdoor fan. During this cycle, indoor comfort is maintained by:

A. Energizing auxiliary/supplemental heat to temper the supply air

B. Increasing the compressor speed only

C. Closing the indoor damper

D. Reversing the indoor blower

121. A compressor that has experienced a motor burnout requires the technician to:

A. Simply replace the compressor and recharge

B. Install a suction-line filter-drier and clean the system of acid and contaminants

C. Add extra oil and restart

D. Reverse the phase rotation

122. The function of a check valve in a heat pump's metering circuit is to:

A. Relieve excess pressure to atmosphere

B. Direct refrigerant through the correct metering device depending on flow direction

C. Separate oil from refrigerant

D. Defrost the indoor coil

123. A system with the correct charge but an oversized TXV may exhibit:

A. Permanently high superheat

B. Excessive subcooling at the condenser

C. The valve never opening

D. Hunting and periodic floodback at part load

124. Why must a recovery cylinder be evacuated and weighed (tare) before recovering refrigerant into it?

A. To verify it is empty and to track the net refrigerant recovered without overfilling

B. To increase its pressure rating

C. To add oil to the cylinder

D. To calibrate the recovery machine's gauges

125. A medium-temperature display case maintains proper temperature but the compressor short-cycles on the low-pressure control. A likely cause is:

A. An overcharge of refrigerant

B. A high-pressure control fault

C. A low charge, restricted liquid line, or iced/dirty evaporator reducing load

D. A failed crankcase heater

Practice Exam 12: Answer Key and Explanations

1. C — Superheat is the difference between actual suction-line temperature and the saturation temperature at that pressure (12°C − 2°C = 10°C). This confirms all liquid has boiled off and the vapor is superheated by 10°C, which is normal and protects the compressor from liquid. Useful superheat indicates the evaporator is properly fed without flooding.

2. C — Flowing dry nitrogen displaces oxygen so the copper cannot oxidize at brazing temperature. Without it, a black flaky copper-oxide scale forms inside the tube, which later breaks loose and plugs metering devices and filter-driers. This is a non-negotiable step on any system that will carry refrigerant.

3. D — A TXV bulb that has lost its charge produces no pressure on top of the diaphragm, so spring pressure drives the valve toward closed. The evaporator is then starved, suction pressure drops, and capacity falls. A dead bulb is a common cause of a starving evaporator.

4. D — The receiver stores liquid refrigerant so the charge can shift as load changes, ensuring a solid liquid column reaches the metering device. It buffers the system between high-load and low-load conditions. Without it, varying loads could starve or flood the metering device.

5. B — High discharge pressure that overloads the compressor points to non-condensables or restricted condenser airflow raising the condensing pressure. The motor draws excess current pumping against that head and trips. A low charge would lower, not raise, discharge pressure.

6. D — Provincial and federal regulations require documentation of refrigerant handling and recovery for environmental accountability. A recovery record tracks quantities and prevents undocumented release. This is part of the regulatory obligation tied to ozone-depleting and high-GWP refrigerants.

7. D — Low suction pressure with low superheat is unusual, but a liquid-line restriction reduces refrigerant fed to the evaporator, dropping suction pressure while the limited refrigerant present keeps the coil's outlet cool. The restriction starves downstream flow. Tracing temperature drop across components locates it.

8. B — A deep vacuum below 500 microns lowers the boiling point of water so trapped moisture vaporizes and is pulled out, along with non-condensable gases. Moisture left behind forms acids and freezes at the metering device. Achieving and holding a deep vacuum is essential before charging.

9. A — An overcharged capillary-tube system backs liquid into the condenser and feeds excess refrigerant to the evaporator, raising head pressure and allowing liquid floodback at low load. Cap-tube systems are critically charged and intolerant of excess. The result is high head pressure and compressor liquid return.

10. B — An accumulator sits in the suction line and traps liquid refrigerant, metering it back slowly as vapor so the compressor never ingests a slug. This protects against valve and bearing damage from incompressible liquid. It is common on heat pumps and low-temperature systems.

11. A — A PSC compressor that hums but won't start with a good run capacitor usually lacks starting torque, indicating a failed start device or relay in a hard-start application. The motor cannot break away under load. Adding or repairing the start assist restores starting torque.

12. D — POE oil is miscible with HFC refrigerants such as R-410A, while mineral oil is not and would not return to the compressor. Proper oil return depends on the oil traveling with the refrigerant. POE is therefore the standard lubricant for HFC systems.

13. B — A detector alarming everywhere indicates a saturated sensor or a high background concentration of refrigerant in the air, not many discrete leaks. The instrument cannot discriminate a point source under those conditions. Ventilating the area and zeroing the detector restores useful sensitivity.

14. D — An undercharge reduces refrigerant available on both sides, so both suction and discharge pressures fall below normal. Less mass flow means less heat moved and lower condensing pressure. Falling pressures on both gauges is the classic undercharge signature.

15. A — A high approach temperature means heat is not transferring well from refrigerant to water, typically from scale or fouling on the water side acting as an insulating layer. The condensing temperature climbs above the leaving water temperature. Cleaning or descaling restores the approach.

16. A — Hot-gas defrost routes hot discharge gas from the compressor directly into the evaporator to melt frost from the inside out. This is faster and more efficient than electric or air defrost. The discharge gas gives up its heat to the coil during the cycle.

17. B — A crankcase heater keeps the oil warm during the off cycle so refrigerant does not migrate to and condense in the crankcase, diluting the oil. Diluted oil causes foaming and poor lubrication at startup. The heater prevents migration and protects the compressor.

18. B — A drier that is colder at the outlet with frost forming is acting as a restriction, producing a pressure drop and accompanying temperature drop across it. A clean drier shows little temperature difference. The frost and temperature split confirm a clogged drier.

19. D — When set well below the normal operating suction range, a low-pressure control becomes a loss-of-charge safety cutout rather than a load-cycling control. It stops the compressor if pressure falls dangerously low. The setpoint determines whether it is an operating or safety device.

20. C — An ECM is a variable-speed, electronically controlled motor that delivers higher efficiency and the ability to modulate fan speed to conditions. A PSC motor runs at essentially fixed speed. The ECM's efficiency and speed control are its key advantages.

21. A — Worn discharge valves let high-side gas leak back into the cylinder, lowering volumetric efficiency so suction pressure stays high and discharge pressure stays low. The compressor cannot pump effectively. The pressures converging toward each other signal valve wear.

22. D — Cylinders are filled to no more than 80% to leave a vapor space for liquid thermal expansion as temperature rises. A liquid-full cylinder can rupture hydrostatically with a small temperature increase. The 80% rule prevents a catastrophic over-pressure failure.

23. C — At roughly 118 psig, R-410A's saturation temperature is approximately 5°C from the standard pressure-temperature relationship. This corresponds to typical air-conditioning evaporator conditions. Reading the P-T chart converts the gauge pressure to the matching saturation temperature.

24. A — In a pump-down cycle the liquid-line solenoid closes on the off signal, and the compressor keeps running to pull the evaporator refrigerant into the high side before stopping on low pressure. This isolates the charge and prevents off-cycle migration. The solenoid is the key control element.

25. C — A TXV modulates refrigerant flow to hold a constant evaporator superheat across a range of loads, whereas a capillary tube is a fixed restriction tuned to one condition. The valve actively responds to load changes. This adaptability is the defining difference.

26. B — High condenser subcooling with poor evaporator capacity means liquid is being held back in the condenser, typical of an overcharge or a liquid-line restriction. Excess liquid stacks in the condenser tubes, raising subcooling while starving the coil. Checking head pressure distinguishes the two causes.

27. D — Oxygen under pressure reacts violently with hydrocarbon compressor oil and can cause an explosion. This is why only dry nitrogen, never oxygen, is used to pressure-test refrigeration systems. The reaction hazard makes oxygen strictly prohibited for this purpose.

28. D — A scroll compressor will run backward if phase rotation is reversed, producing no pumping and risking internal damage. Correcting rotation requires swapping any two of the three phase leads. Verifying rotation direction at startup is essential on three-phase scrolls.

29. A — The external equalizer senses pressure at the evaporator outlet so the TXV compensates for pressure drop through the coil, keeping superheat control accurate. Without it, coil pressure drop would cause the valve to read falsely high superheat and overfeed. It is required on coils with significant pressure drop.

30. A — Steady bubbles in the sight glass usually mean flash gas from an insufficient charge or a liquid-line restriction, not solid liquid reaching the metering device. The vapor pockets indicate the liquid is not fully subcooled or is being throttled prematurely. Confirming subcooling distinguishes undercharge from restriction.

31. C — TEWI stands for Total Equivalent Warming Impact, a measure combining the direct global-warming effect of refrigerant emissions with the indirect effect of the energy the system consumes. It gives a fuller picture of climate impact than GWP alone. It guides selection of refrigerants and efficient designs.

32. D — Low evaporator airflow removes less heat, so the coil runs colder, suction pressure drops, and the coil can ice over. Reduced load on the refrigerant side lowers boiling temperature. Dirty filters or failed blowers commonly produce this low-suction, icing pattern.

33. C — A discharge-line muffler dampens the pressure pulsations created by the compressor's reciprocating discharge, reducing noise. It does not change pressure or separate oil. Its sole role is acoustic pulsation control on the high side.

34. D — Near-azeotropic and zeotropic blends like R-410A must be charged as liquid so all components enter in the correct proportion; vapor charging would fractionate the blend. Metering liquid into the suction protects the compressor. Liquid charging preserves the designed composition.

35. B — Short-cycling on the high-pressure control means head pressure repeatedly climbs to the cutout, pointing to a condenser problem such as a dirty coil, failed fan, or non-condensables. The compressor trips, cools, restarts, and trips again. Restoring condenser heat rejection stops the cycling.

36. C — Refrigerant heavier than air can displace oxygen in a confined mechanical room, creating an asphyxiation hazard. Most common refrigerants are not toxic but will suffocate by oxygen displacement. Ventilation and monitoring are required in such spaces.

37. A — A grounded winding shows a very low resistance from a motor terminal to the compressor shell, where there should normally be near-infinite isolation. The megohmmeter reveals insulation breakdown to ground. A near-zero reading condemns the compressor.

38. C — The defrost termination thermostat ends the defrost cycle once the outdoor coil reaches a temperature confirming the frost has melted, preventing wasted energy and overheating. It terminates on temperature rather than purely on time. This protects efficiency and the coil.

39. B — Head pressure that climbs steadily with rising subcooling while running indicates air or non-condensables collecting in the high side, raising the effective condensing pressure. The gases occupy condenser volume and add their partial pressure. Recovery, evacuation, and recharge correct it.

40. C — Operating superheat is found by subtracting the evaporator saturation temperature (from suction pressure) from the actual suction-line temperature at the coil outlet. This applies to both fixed-orifice and TXV systems. The difference quantifies how far the vapor has been heated past saturation.

41. B — Relief devices on receivers and vessels protect against dangerous over-pressurization from heat sources or fire exposure. They vent before the vessel ruptures. This is a code-mandated safety requirement on larger refrigerant-containing vessels.

42. C — If water flow stops while a DX chiller keeps running, the refrigerant can chill the stagnant water until it freezes and ruptures the evaporator tubes or shell. A flow switch normally prevents this. Loss of flow with the compressor running is an immediate freeze hazard.

43. D — An oil separator in the discharge line captures oil entrained in the discharge gas and returns it to the crankcase, keeping oil out of the rest of the system. This maintains lubrication and prevents oil-logging of the evaporator. It is common on systems with long lines or low-temp duty.

44. A — Very high superheat at the evaporator outlet means too little refrigerant is reaching the coil, caused by an undercharge, a restriction, or an undersized/underfeeding valve. The coil dries out well before its end. Identifying which limiting factor applies guides the repair.

45. A — A potential (voltage) relay senses the back-EMF rise as a single-phase motor accelerates and opens to disconnect the start winding and start capacitor at speed. This protects the start components from continuous duty. It is the standard start control on CSR/CSCR motors.

46. B — The definitive evacuation test is an isolated micron gauge that holds below the target after valving off the pump; a stable reading proves dryness and tightness. A rising reading reveals moisture or a leak. Visual or tactile checks cannot confirm a deep vacuum.

47. B — A reversing valve that fails to shift leaves the heat pump in its de-energized (typically cooling) refrigerant path, so it delivers cooling when heating is called for. The valve solenoid or pilot has failed to redirect flow. Diagnosing the valve and its pilot circuit is the fix.

48. D — Releasing refrigerant is environmentally harmful and prohibited by regulation, so repeatedly topping up a known leak instead of repairing it is illegal and irresponsible. The leak must be found and fixed. Regulations require recovery and repair, not chronic recharging.

49. B — Normal amps and normal pressures with weak airflow point away from the refrigerant circuit and toward the air side — a dirty filter, failed blower, or ductwork problem. The refrigerant system is operating correctly. The diagnosis follows the symptom to the air-handling components.

50. A — High discharge temperature with normal pressures indicates the suction gas is arriving with excessive superheat, from a low charge or a restriction, so the compressor heats it further. Hot suction gas yields a hot discharge. Checking superheat confirms the underfeeding cause.

51. B — A non-bleed TXV closes tightly at shutdown and does not let high- and low-side pressures equalize through it, so the compressor must restart against an unequalized pressure differential and therefore needs high starting torque. A bleed-type valve leaks slightly to equalize pressures, allowing a low-starting-torque compressor. Matching valve type to the compressor's starting capability prevents failure-to-start.

52. A — Subcooling is the difference between the condenser's saturation temperature (from head pressure) and the actual measured liquid-line temperature. It confirms the refrigerant has cooled below its condensing point into solid liquid. Proper subcooling indicates a correct charge on many systems.

53. A — R-134a is widely used in medium-temperature commercial refrigeration and was the standard automotive A/C refrigerant for years. Its pressure-temperature characteristics suit those applications. It is not used for deep low-temperature or large ammonia industrial duty.

54. B — A capillary-tube system has no receiver to absorb charge variations, so it is critically charged and must be weighed in to the exact specification. Charging by pressure alone cannot guarantee the precise amount. Exact weight is the only reliable method on cap-tube systems.

55. D — A motor running backward after a bearing job almost always traces to reversed lead connections made during reassembly, not to a system fault. Correcting the wiring restores proper rotation. Verifying lead identification before reconnection prevents the error.

56. C — The reversing valve is shifted by a small solenoid-operated pilot valve that uses the system's own high-low pressure difference to move the main slide. Energizing the solenoid redirects pilot pressure. This pilot-operated design is standard on heat-pump reversing valves.

57. C — Liquid refrigerant is incompressible, so repeated slugging hammers the discharge valves and stresses rods and bearings, leading to mechanical failure. The compressor is not designed to pump liquid. Preventing floodback with proper superheat and an accumulator protects it.

58. B — In low ambient, condensing pressure can fall too low for the TXV to feed properly, so head-pressure controls (fan cycling or a flooding valve) maintain adequate condensing pressure. The valve needs sufficient pressure drop across it to work. These controls preserve correct metering in cold weather.

59. D — Balanced current above nameplate FLA indicates the motor is mechanically overloaded or pumping against excessive head, not an electrical phase fault. The motor works harder and draws more current evenly across phases. Finding the mechanical or pressure cause resolves the high draw.

60. D — As a recovery cylinder fills, its internal pressure rises and the differential between system and cylinder shrinks, slowing the recovery machine. Approaching the fill and pressure limit is expected near the end. Switching cylinders or cooling the cylinder restores the rate.

61. C — Retrofitting an R-22 system to an HFC blend often requires replacing the mineral oil with POE because the HFC components are not miscible with mineral oil and would impair oil return. Several oil changes may be needed to flush the old oil. Proper oil return is essential after retrofit.

62. D — A defrost termination switch stuck open signals "defrost complete" immediately, so the defrost cycle ends before any frost melts and the coil progressively ices. The coil loses capacity as ice builds. Replacing the failed termination switch restores normal defrost.

63. A — The accumulator's small oil-return orifice (often at the bottom of the U-tube) meters trapped liquid refrigerant and oil back to the compressor slowly enough to avoid slugging. This returns oil while protecting against liquid return. It is essential for keeping the compressor lubricated.

64. C — Low suction, low discharge, low amp draw, and high superheat together are the textbook signature of an undercharge or loss of refrigerant. Reduced mass flow lowers pressures and current while the starved coil shows high superheat. Locating and repairing the leak, then recharging, is the fix.

65. A — Moisture and acid contaminate vacuum-pump oil and raise its vapor pressure, preventing the pump from reaching a deep vacuum. Fresh oil restores the pump's ability to pull below the target microns. Regular oil changes during dirty evacuations keep the pump effective.

66. D — A desuperheater captures heat from the hot discharge gas to preheat or heat domestic hot water before the gas reaches the condenser. It recovers otherwise-wasted heat. This improves overall system efficiency by using rejected heat productively.

67. B — Frost back to the compressor means liquid refrigerant is being carried out of the evaporator and down the suction line, indicating floodback from an overfeeding metering device or low superheat. Liquid in the suction line chills it below freezing. Correcting the feed or superheat stops the floodback.

68. C — Cross-contaminated (mixed) refrigerant cannot be reused safely, so it must be labeled and sent to a reclaimer for processing or destruction, never recharged or vented. Mixed refrigerants have unpredictable properties. Proper disposal follows regulatory and reclamation requirements.

69. B — A capacitor-start, capacitor-run motor uses a start capacitor for high breakaway torque and a run capacitor for efficient running performance. It combines strong starting with good run efficiency. This makes it suited to high-starting-torque compressor applications.

70. C — A flooded evaporator's level control maintains the refrigerant liquid level in the shell so the tubes stay fully wetted for maximum heat transfer. Too low a level reduces capacity; too high risks carryover. The control holds the level for efficient operation.

71. D — At 25°C an R-134a system should sit at roughly 590 kPa (about 85 psig) saturation pressure when off; a reading of 0 psig means the charge is essentially gone. Standing pressure must match the refrigerant's saturation pressure at room temperature. Zero pressure confirms a complete loss of charge.

72. C — Vibration eliminators (flexible connectors) absorb compressor vibration so it is not transmitted into rigid piping, preventing fatigue cracking of joints and lines. They protect the piping over the system's life. They are installed at the compressor connections.

73. B — A moisture-saturated desiccant can no longer hold water, allowing free moisture to form acids and to freeze at the metering device, causing corrosion and intermittent flow blockage. The drier's protective function is lost. Replacing the drier and evacuating removes the moisture.

74. A — Staging compressors or using unloaders allows capacity to match a varying load, improving efficiency at part load and reducing short-cycling. Running only the capacity needed saves energy. This is standard on larger multi-compressor systems.

75. D — A heat pump that ices heavily but never defrosts has a fault in the defrost control — the timer, sensor, or initiation circuit — not in the comfort or refrigerant components. The defrost cycle is never commanded. Diagnosing the defrost control restores normal de-icing.

76. C — A TXV that hunts is often oversized for the load or has poor bulb contact or placement, causing it to overshoot and then overcorrect between flooding and starving. Stable superheat depends on proper bulb sensing and correct valve sizing. Improving bulb contact or right-sizing the valve stops the hunting.

77. B — The king valve at the receiver outlet can be front-seated to isolate and store the charge in the receiver during pump-down for service. It allows the high side to be valved off. This service function is its primary purpose.

78. D — Non-condensable gases collect in the condenser and receiver — the high side — where the refrigerant condenses, because the gases do not liquefy and accumulate there, raising head pressure. They displace condenser volume and add partial pressure. Recovery and evacuation remove them.

79. A — An internal compressor overload (klixon) opens on excessive temperature and automatically resets once the motor cools, allowing a restart. It is a self-resetting protective device. Repeated tripping points to an underlying overload condition to investigate.

80. D — Oil is added to a low-side system by drawing it in through the suction service port under controlled low pressure or vacuum, so the system pulls the oil in without opening it to atmosphere. This avoids contamination and air introduction. Metering oil through the suction port is the accepted method.

81. A — An undersized liquid line creates excessive pressure drop, dropping the liquid below its saturation pressure and forming flash gas before the metering device. Flash gas reduces the device's feeding capacity. Proper liquid-line sizing maintains solid liquid to the metering point.

82. D — The pinch point is the location in a heat exchanger where the temperature difference between the two fluids is smallest, limiting heat transfer. It governs how closely the fluids can approach in temperature. Designers size exchangers around the pinch point.

83. A — A scroll compressor has fewer moving parts, runs more smoothly and quietly, and tolerates small amounts of liquid better than a reciprocating compressor. The orbiting scrolls compress gas continuously without discharge reed valves. These traits make scrolls reliable and efficient.

84. C — Manufacturer charging charts for fixed-orifice A/C systems use the outdoor (condenser-entering) dry-bulb temperature and the indoor return-air wet-bulb temperature to find the target superheat. These two inputs define the operating condition. Matching measured superheat to the chart confirms the charge.

85. B — If a solenoid coil is energized but the valve stays shut, the mechanical plunger is stuck or debris is lodged in the seat, preventing it from lifting. The electrical side is working but the valve body is fouled or jammed. Cleaning or replacing the valve restores operation.

86. C — With flammable A2L or A3 refrigerants, the chief hazard is an ignition source near a leak igniting the refrigerant-air mixture. Eliminating sparks, flames, and hot surfaces during service is critical. Leak detection and ventilation reduce the flammability risk.

87. C — Mounting the TXV bulb on the bottom of a horizontal suction line lets pooled oil and liquid sit against it, giving a false low-temperature reading and skewing superheat control. The bulb should be mounted on the side of the line. Correct bulb placement ensures accurate sensing.

88. A — Continuous running with low suction and high superheat on a hot day means the system cannot meet load because too little refrigerant is reaching the coil — an undercharge or a restriction. The coil is starved while the compressor runs full out. Finding the limiting cause restores capacity.

89. A — A Schrader depressor in the service hose pushes the spring-loaded core pin open so refrigerant can flow to the gauges. Without it the core stays closed and no reading is obtained. The depressor is what makes the access port usable for service.

90. B — Suction-line insulation prevents the cold line from sweating or icing and blocks unwanted heat gain that would raise suction superheat and reduce efficiency. It keeps the returning vapor cold and protects surfaces from condensation. Insulation is standard on low-temperature suction lines.

91. A — R-404A is a zeotropic blend with temperature glide, so it must be charged as liquid to keep all components in their designed proportion; vapor charging would change the blend composition. Liquid charging preserves performance. The glide makes liquid charging mandatory.

92. D — A broken suction valve reed lets the cylinder fail to draw and retain a full charge of vapor, lowering capacity and leaving suction pressure higher than normal. The compressor cannot pump effectively. The reduced pumping and high suction point to the valve.

93. D — On a TXV system, subcooling within the manufacturer's specified range is the most reliable charge indicator because the TXV holds superheat regardless of charge. Proper subcooling confirms a solid liquid column and correct refrigerant quantity. It is the preferred charging check for TXV systems.

94. B — A TXV bulb on an uninsulated line in a warm room senses ambient heat, reads falsely high temperature, and drives the valve to overfeed the evaporator. Insulating the bulb isolates it from ambient influence. Proper insulation restores accurate superheat control.

95. C — A water-regulating valve modulates condenser water flow in response to head (condensing) pressure, opening as pressure rises to reject more heat. It matches water flow to load. This maintains stable condensing pressure on water-cooled systems.

96. C — The Schrader core must be removed before brazing near the valve, because brazing heat would destroy the rubber seal and spring. Removing the core protects it and lets nitrogen flow freely. The core is reinstalled after the joint cools.

97. A — Auxiliary heat coming on during mild conditions points to a faulty outdoor thermostat or staging control calling for backup heat prematurely. The control logic is energizing aux heat when the heat pump alone could handle the load. Correcting the staging control restores efficient operation.

98. A — An evaporator pressure regulator holds evaporator pressure from dropping below a set minimum, maintaining a desired coil temperature, often on multi-evaporator systems. It throttles suction from that coil. This prevents the evaporator from running colder than intended.

99. C — A partially blocked capillary tube restricts refrigerant flow, producing low suction pressure, reduced capacity, and high superheat as the coil is starved. The fixed restriction is made worse by the blockage. The starved-coil symptoms point to the cap-tube obstruction.

100. B — Flare fittings should be tightened to the manufacturer's torque spec with a calibrated torque wrench so the flare seats without cracking or under-tightening. Over-torque splits the flare; under-torque leaks. Proper torque ensures a leak-free joint.

101. A — A high-pressure cutout set too high lets the compressor keep running at dangerously elevated discharge pressure before it finally trips, stressing the compressor and piping. The safety margin is lost. Setting the cutout to the correct pressure protects the system.

102. A — A refrigerant identifier analyzer is the accurate field method to confirm the contents of a recovered cylinder, especially when contamination is suspected. Pressure-temperature readings cannot distinguish blends reliably. The analyzer prevents charging an unknown or mixed refrigerant.

103. C — Good cooling but poor heating with correct charge and airflow indicates the reversing valve is internally bypassing hot gas in heating mode. The internal leak robs heating capacity while cooling still works adequately. Replacing the reversing valve restores heating output.

104. C — A moisture-indicating sight glass changes color when moisture is present in the refrigerant, warning the technician to install a drier and evacuate. It provides a quick visual check of system dryness. The color change is its diagnostic value.

105. A — Contactor points that are pitted and welded shut keep the circuit closed so the compressor cannot be de-energized and runs continuously. The contactor can no longer break the circuit. Replacing the contactor restores control of the compressor.

106. A — Nitrogen test pressure must not exceed the design pressure ratings of the lowest-rated component or the low side, to avoid damaging components. Over-pressurizing can rupture or distort parts. Respecting component ratings keeps the pressure test safe.

107. C — In a flooded chiller, oil migrates into the evaporator shell and must be recovered by an oil-return system that draws it back to the compressor. Without recovery, the compressor loses oil and the evaporator oil-logs. The oil-return circuit keeps lubrication balanced.

108. B — High subcooling with elevated head pressure and low evaporator capacity indicates an overcharge holding excess liquid in the condenser. The stacked liquid raises subcooling and pressure while reducing usable coil capacity. Removing refrigerant to the correct charge resolves it.

109. D — Before opening any sealed system, the refrigerant charge must be recovered per regulation to prevent release to atmosphere. This is both a legal requirement and a safety step. Recovery is always the mandatory first action before breaking into the system.

110. D — A PSC motor reading microfarads well below rating has a weak run capacitor, causing slow running and overheating; replacing it with the correctly rated capacitor restores performance. The capacitor provides the phase shift the motor needs. Matching the rated value is essential.

111. C — Vertical suction risers must be sized to keep refrigerant velocity high enough to carry oil up the riser back to the compressor. Too large a riser lets velocity fall and oil to drain back. Proper riser sizing ensures oil return on the suction side.

112. B — R-410A operates at substantially higher pressures than R-22, so gauges, hoses, and recovery equipment must be rated for the higher working pressure. Using R-22-rated equipment is unsafe with R-410A. High-pressure-rated tools are required.

113. C — A hot-gas bypass valve feeds discharge gas into the low side to add false load, keeping evaporator pressure from dropping too low under light load conditions. This prevents icing and short-cycling at minimum load. It maintains stable operation when load is low.

114. B — Discolored compressor terminals and brittle wire insulation indicate a history of overheating, often from electrical overload or an impending or past burnout. The heat has degraded the insulation. These signs warrant testing the windings and investigating the cause.

115. C — After brazing and evacuating, a standing vacuum (decay) test confirms the system holds the vacuum, proving it is both leak-free and dry before charging. A rising micron reading reveals a leak or remaining moisture. This verification protects the new charge.

116. C — A locked scroll drawing locked-rotor amps is diagnosed by checking winding resistance and insulation to ground; if the windings are good, a hard-start kit may free a mechanically tight scroll. This separates electrical failure from a mechanical lock. The sequence avoids needless compressor replacement.

117. D — Cascade or two-stage systems achieve very low evaporator temperatures efficiently by keeping each compression stage within a manageable compression ratio. A single stage spanning the full lift would be inefficient and overheat. Staging makes deep low-temperature refrigeration practical.

118. B — A suction-to-liquid heat exchanger subcools the liquid line while adding superheat to the suction gas, improving capacity and helping prevent liquid floodback to the compressor. The two streams exchange heat to mutual benefit. It boosts efficiency and protects the compressor.

119. D — After electronic detection narrows the area, pressurizing with nitrogen and trace gas and applying bubble solution, or holding a standing pressure test, confirms and pinpoints the leak. This positive method verifies the leak location. It is the thorough follow-up to electronic screening.

120. A — During defrost the heat pump runs in cooling mode with the outdoor fan off, so auxiliary or supplemental electric heat is energized to temper the cold supply air and keep the space comfortable. Without it, the indoor air would blow cold. Aux heat bridges the defrost interval.

121. B — After a motor burnout, a suction-line filter-drier must be installed and the system cleaned of acid and contaminants left by the burn. The acid and debris would damage a replacement compressor. Proper cleanup and acid removal protect the new compressor.

122. B — A check valve in a heat pump's metering circuit directs refrigerant through the correct metering device depending on flow direction in heating versus cooling. It bypasses one device and forces flow through the other. This routing makes bidirectional metering work.

123. D — An oversized TXV tends to overfeed and then overcorrect, producing hunting and periodic floodback at part load even with the correct charge. The valve cannot modulate finely enough at low load. Right-sizing the valve eliminates the instability.

124. A — A recovery cylinder must be evacuated and weighed empty (tare) so the technician can verify it is empty and track the net refrigerant recovered, avoiding dangerous overfilling. The tare weight is the baseline for the 80% fill limit. This ensures safe, documented recovery.

125. C — Short-cycling on the low-pressure control while temperature is otherwise maintained points to a low charge, a restricted liquid line, or an iced or dirty evaporator reducing the load reaching the coil. Suction drops to the cutout, the compressor stops, pressure recovers, and it restarts. Correcting the load-limiting fault stops the cycling.