

PRACTICE EXAM 17: RACM RED SEAL SIMULATION (125 QUESTIONS)

1. A technician measures a suction line that is heavily frosted right up to the compressor while the liquid line feels only slightly warm. What is the most likely cause?
 - A. The condenser fan motor has failed and head pressure is excessive
 - B. The system is overcharged or the metering device is overfeeding the evaporator
 - C. The TXV sensing bulb has lost its charge and is starving the coil
 - D. A restriction in the liquid line drier is reducing refrigerant flow

2. Under CSA B52, what is the primary purpose of a pressure-relief device on a refrigeration system?
 - A. To protect against pressures exceeding the system's design working pressure
 - B. To bleed off non-condensable gases that accumulate in the condenser
 - C. To equalize pressures between the high and low sides during shutdown
 - D. To indicate when the refrigerant charge has dropped below the safe minimum

3. A capillary tube system is being charged. Which method best ensures the correct charge?
 - A. Charge until the sight glass is completely clear of bubbles
 - B. Weigh in the exact charge specified on the equipment nameplate
 - C. Charge until suction pressure reaches the saturation point for the space temperature
 - D. Add refrigerant until the compressor amperage matches rated load amps

4. When superheat is measured at the evaporator outlet and found to be very high, but subcooling at the condenser is normal, the most probable issue is:
 - A. An overcharge of refrigerant flooding the condenser

- B. A non-condensable gas raising head pressure
- C. A slipping compressor with low volumetric efficiency
- D. A starved evaporator caused by an underfeeding metering device

5. What does a "pump down" cycle accomplish in a refrigeration system?

- A. It removes moisture from the system before initial start-up
- B. It draws refrigerant into the condenser/receiver before the compressor stops
- C. It purges air from the low side prior to charging
- D. It recovers refrigerant into a cylinder for service disposal

6. A three-phase compressor motor draws high amperage on two legs and low on the third. This indicates:

- A. A shorted run capacitor on the affected phase
- B. Normal operation under a heavy starting load
- C. A high-resistance connection or open winding on one phase
- D. Excessive head pressure caused by a dirty condenser

7. Which refrigerant property is most directly described by "latent heat of vaporization"?

- A. The temperature at which the refrigerant changes from liquid to vapor at a given pressure
- B. The amount of heat needed to raise refrigerant temperature by one degree
- C. The pressure exerted by refrigerant vapor at saturation conditions
- D. The heat absorbed when refrigerant boils from liquid to vapor without temperature change

8. During recovery, a technician notices the recovery cylinder is becoming very cold and recovery has nearly stopped. The best corrective action is to:

- A. Increase the recovery machine speed to overcome the slowdown
- B. Heat the system being recovered with an open flame to raise pressure
- C. Open the cylinder relief valve briefly to vent excess pressure
- D. Place the recovery cylinder in warm water or use a cylinder cooling method to maintain a pressure differential

9. A halide or electronic leak detector indicates a leak at a flare connection. The correct repair is to:

- A. Disassemble the flare, inspect the seat, reform if damaged, and remake the joint
- B. Apply additional torque until the leak stops while the system is running
- C. Wrap the joint with Teflon tape and retighten the flare nut
- D. Inject a sealant compound into the low side to seal the leak internally

10. On a psychrometric chart, moving horizontally to the left (constant moisture content, decreasing temperature) represents:

- A. Sensible cooling only
- B. Latent cooling with dehumidification
- C. Sensible heating only
- D. Evaporative cooling with humidification

11. What is the function of a thermostatic expansion valve's external equalizer?

- A. To bypass excess refrigerant around the valve during low-load conditions
- B. To compensate for the superheat charge in the sensing bulb
- C. To allow the valve to respond to changes in ambient condenser temperature
- D. To compensate for pressure drop across the evaporator so superheat is controlled accurately

12. A system using R-410A requires service. Compared to R-22, R-410A operates at:

- A. Lower pressures requiring lower-rated service equipment
- B. Identical pressures, so R-22 gauges can be used safely
- C. Slightly lower pressures but the same oil type
- D. Significantly higher pressures requiring properly rated gauges and hoses

13. The purpose of subcooling the liquid refrigerant before it reaches the metering device is to:

- A. Ensure a solid column of liquid reaches the device and prevent flash gas
- B. Lower the discharge temperature of the compressor
- C. Increase the refrigerant's latent heat capacity in the evaporator
- D. Reduce the load on the condenser fan motor

14. A hermetic compressor will not start and hums for a few seconds before the overload trips. The run capacitor tests good. The next component to check is the:

- A. Start relay and start capacitor
- B. Condenser fan motor bearings
- C. Liquid line filter drier for restriction
- D. Low-pressure cutout switch setting

15. Which statement about refrigerant oil is correct for a POE (polyolester) oil system?

- A. POE oil is fully compatible with R-22 and mineral oil systems
- B. POE oil is hygroscopic and readily absorbs moisture from the air
- C. POE oil is used exclusively with CFC refrigerants like R-12
- D. POE oil does not require careful sealing because it repels moisture

16. A water-cooled condenser shows a small temperature rise between water inlet and outlet but high head pressure. The likely cause is:

- A. Scale or fouling on the water side reducing heat transfer
- B. Excessive water flow removing too much heat
- C. A refrigerant undercharge in the system
- D. An oversized cooling tower for the load

17. Under safe work practices, before brazing on a system that contained refrigerant, the technician must:

- A. Increase nitrogen pressure to 500 psig to force out residual oil
- B. Leave a small refrigerant charge to prevent oxidation inside the tubing
- C. Pressurize the system with oxygen to verify there are no leaks
- D. Recover refrigerant and purge with dry nitrogen to prevent toxic decomposition

18. Flowing dry nitrogen through tubing while brazing primarily prevents:

- A. Formation of copper oxide scale inside the tubing
- B. Overheating of the brazing rod
- C. Moisture from entering through the open ends
- D. Excessive flux consumption during the joint

19. A defrost timer on a commercial freezer initiates defrost but the evaporator never clears of ice. The defrost heater tests with continuity. The most likely fault is:

- A. The defrost termination thermostat is stuck open, preventing heater energization
- B. The compressor is short-cycling on the high-pressure switch
- C. The fan delay switch is closing too early after defrost
- D. The metering device is overfeeding during the run cycle

20. In a properly operating air conditioning system, the evaporator saturation temperature relative to the return air temperature is typically:

- A. Equal to the return air temperature
- B. Higher than the return air temperature
- C. Roughly 15–20°F lower than the return air temperature
- D. Exactly at the dew point of the supply air

21. What is the main reason a receiver is installed in a system with a thermostatic expansion valve?

- A. To store the varying refrigerant charge as the TXV modulates with load
- B. To separate oil from the refrigerant before the compressor
- C. To subcool the liquid below the condensing temperature
- D. To act as a secondary metering device during high load

22. A technician finds non-condensable gases are suspected in a system. The correct verification method is to:

- A. Compare suction pressure to the evaporator saturation temperature
- B. Measure the superheat at the evaporator outlet
- C. Compare the condenser pressure to the saturation pressure for the measured liquid line temperature
- D. Check the compressor amperage against rated load amps

23. A three-phase scroll compressor is installed and, on first start-up, it runs but produces an unusually loud noise and fails to develop any pressure differential between the suction and discharge gauges. What is the most likely cause?

- A. The crankcase heater was left disconnected during installation
- B. The liquid-line filter drier was installed backward, blocking flow
- C. The system was overcharged with refrigerant during commissioning

D. The compressor is rotating in reverse because two line leads were swapped

24. Which control protects a compressor against loss of lubrication in a system with an oil pump?

A. The high-pressure cutout switch

B. The defrost termination thermostat

C. The crankcase heater thermostat

D. The oil pressure safety (differential) switch

25. When evacuating a system, a deep vacuum is held and then the gauge rises and levels off at a stable but elevated reading after isolation. This indicates:

A. A leak in the system allowing air to enter

B. Moisture in the system that is still off-gassing

C. A faulty vacuum pump unable to reach deep vacuum

D. A complete and properly dry evacuation

26. The primary advantage of a TXV over a fixed orifice metering device is:

A. Lower initial cost and simpler installation

B. No moving parts that can wear or stick

C. Tolerance of system overcharge without performance loss

D. Maintenance of constant superheat across varying load conditions

27. A split system has correct charge but low airflow across the evaporator. The expected symptom is:

A. High superheat and high suction pressure

B. Low suction pressure and possible coil icing

C. High subcooling and low head pressure

D. Normal pressures with high supply air temperature

28. Per electrical safety and lockout procedures, after locking out a disconnect the technician must next:

- A. Begin work immediately since the lock guarantees zero energy
- B. Verify the absence of voltage with a tested meter before working
- C. Tag the panel and notify the building owner in writing
- D. Re-energize briefly to confirm the lock holds the breaker

29. A compressor's volumetric efficiency decreases primarily as:

- A. The compression ratio increases
- B. The suction superheat decreases
- C. The condenser subcooling increases
- D. The evaporator load decreases

30. Which gas law explains why refrigerant temperature rises during compression?

- A. As pressure increases on a gas, its temperature increases (compression heating)
- B. As volume increases, temperature decreases proportionally
- C. Heat always flows from cold to hot in a closed cycle
- D. The boiling point is independent of pressure in a sealed system

31. A liquid line sight glass shows a steady stream of bubbles even after adding refrigerant to a clear sight glass momentarily. The bubbles return. This most likely indicates:

- A. The system is now overcharged and needs recovery
- B. Normal operation during high ambient conditions
- C. A restriction in the liquid line such as a partially plugged drier
- D. The compressor valves are leaking on the discharge side

32. The recommended method to check a suspected open winding in a single-phase PSC motor is to:

- A. Apply line voltage and observe whether the motor hums
- B. Measure capacitance of the run capacitor
- C. Check resistance between the start and run terminals only
- D. Measure resistance across each winding (C-R, C-S, R-S) and compare to expected values

33. In a multi-evaporator system, EPRs (evaporator pressure regulators) are used to:

- A. Increase suction pressure uniformly across all evaporators
- B. Maintain different evaporator temperatures by preventing pressure from dropping too low
- C. Prevent liquid floodback to the compressor during off cycles
- D. Regulate the condenser pressure for low ambient operation

34. A technician must charge R-407A into a system. Because it is a near-azeotropic blend, charging must be done:

- A. As a liquid (from the cylinder) to maintain the correct blend composition
- B. As a vapor only to protect the compressor
- C. In any phase since the blend has a single boiling point
- D. After mixing it with R-22 to stabilize the glide

35. The "approach" temperature of a cooling tower is defined as the difference between:

- A. The wet-bulb and dry-bulb temperatures of the entering air
- B. The water inlet and water outlet temperatures
- C. The condenser and evaporator saturation temperatures
- D. The leaving water temperature and the entering air wet-bulb temperature

36. A defrost cycle on a heat pump in heating mode is initiated by:

- A. A simple time clock independent of outdoor conditions
- B. The indoor thermostat reaching its setpoint
- C. Sensing of coil temperature and time, indicating frost buildup on the outdoor coil
- D. A rise in indoor air temperature above the comfort range

37. Hot gas defrost differs from electric defrost primarily because it:

- A. Uses the system's own discharge gas to warm the evaporator coil
- B. Requires an external heating element wrapped around the coil
- C. Operates only during the compressor off cycle
- D. Reverses the metering device to drain the evaporator

38. When a TXV is "hunting," the symptom observed is:

- A. A steady, unchanging superheat reading
- B. Continuously high head pressure
- C. A locked-rotor condition on the compressor
- D. Superheat that swings up and down as the valve overshoots and corrects

39. The function of an accumulator on the suction line is to:

- A. Increase suction superheat by adding heat to the vapor
- B. Prevent liquid refrigerant slugging from reaching the compressor
- C. Store excess high-pressure liquid during low-load periods
- D. Separate non-condensable gases from the suction vapor

40. A wattmeter reads the true power of a motor circuit. The ratio of true power to apparent power is the:

- A. Slip percentage
- B. Service factor
- C. Locked rotor ratio
- D. Power factor

41. A reciprocating compressor with worn discharge valves will typically show:

- A. Higher-than-normal subcooling at the condenser
- B. Very low suction pressure with high superheat
- C. Low head pressure and high suction pressure with poor capacity
- D. Normal pressures but excessive oil consumption

42. Under refrigerant management regulations, intentionally venting HFC refrigerant to the atmosphere during service is:

- A. Permitted if the quantity is below one kilogram
- B. Prohibited; refrigerant must be recovered
- C. Allowed only for systems under 5 tons
- D. Acceptable if the refrigerant is a non-ozone-depleting blend

43. The dew point temperature of an air sample represents the temperature at which:

- A. The air reaches its maximum dry-bulb reading
- B. Sensible heat equals latent heat in the airstream
- C. The air becomes saturated and moisture begins to condense
- D. The wet-bulb and dry-bulb readings are farthest apart

44. A purge unit on a low-pressure centrifugal chiller is used to:

- A. Add refrigerant automatically when the charge drops
- B. Remove air and water vapor that leak in because the system runs below atmospheric pressure
- C. Pressurize the evaporator to prevent freezing
- D. Recover oil from the refrigerant during operation

45. A technician measures 240 V across a contactor coil rated for 24 V. The result will be:

- A. The contactor will operate normally at reduced current
- B. The coil will draw less current and chatter
- C. No effect because coils are voltage-tolerant
- D. The coil will overheat and likely burn out

46. Which condition causes a compressor to "slug" with liquid refrigerant on start-up after a long off cycle?

- A. Excessive superheat from a starved evaporator
- B. A clogged liquid line drier holding back refrigerant
- C. Refrigerant migrating to and condensing in the cold compressor crankcase
- D. Non-condensable gases trapped in the condenser

47. The crankcase heater on a compressor is energized during the off cycle to:

- A. Maintain head pressure for faster restart
- B. Prevent the oil from becoming too thick to pump
- C. Keep the discharge line warm to prevent condensation
- D. Drive refrigerant out of the oil to prevent dilution and foaming

48. A pressure-temperature chart for a pure refrigerant shows that at a given pressure the refrigerant has:

- A. One specific saturation temperature
- B. A range of saturation temperatures due to glide
- C. No relationship between pressure and temperature
- D. A saturation temperature that varies with charge amount

49. During a brazing operation, the correct flame for joining copper to copper with a copper-phosphorus rod is:

- A. A heavily oxidizing flame to burn off impurities
- B. A carburizing flame with excess acetylene
- C. A neutral flame applied to heat the base metal evenly
- D. A pinpoint flame applied directly to the rod only

50. A refrigeration system's high-pressure cutout repeatedly trips on a hot day. After confirming the condenser is clean and the fan runs, the next likely cause is:

- A. Overcharge of refrigerant raising condensing pressure
- B. A starved evaporator from an undercharge
- C. A weak compressor with leaking valves
- D. A stuck-open TXV flooding the suction line

51. The term "net refrigeration effect" refers to:

- A. The total heat rejected at the condenser per pound of refrigerant
- B. The compressor work input expressed in BTU per pound
- C. The heat absorbed in the evaporator per pound of refrigerant circulated
- D. The combined sensible and latent heat of the entire airstream

52. A technician needs to verify a thermistor-based temperature sensor. The correct procedure is to:

- A. Apply line voltage and read the output in volts
- B. Measure continuity only to confirm it is not open
- C. Measure resistance and compare to the temperature/resistance chart for the sensor
- D. Substitute a known capacitor of the same rating

53. Refrigerant glide in a zeotropic blend means that during a phase change:

- A. The refrigerant maintains a constant temperature
- B. The boiling and condensing temperatures change across a range
- C. The pressure increases while temperature stays fixed
- D. The blend separates permanently into its components

54. A compressor short-cycles on the low-pressure control. After confirming adequate charge, the technician should check:

- A. The high-pressure cutout setpoint
- B. The crankcase heater operation
- C. The differential and cut-in setting of the low-pressure control or a dirty evaporator
- D. The discharge line temperature

55. When sizing refrigerant tubing, an undersized suction line will cause:

- A. Excessive pressure drop and loss of compressor capacity
- B. Liquid flooding back to the compressor
- C. Reduced oil return only with no capacity effect
- D. Higher subcooling at the condenser outlet

56. A king valve (liquid receiver service valve) front-seated during operation will:

- A. Allow normal refrigerant flow to the metering device
- B. Trap refrigerant in the receiver, eventually starving the system
- C. Equalize the high and low sides immediately
- D. Vent refrigerant to the service port safely

57. The most accurate way to confirm a system's charge on a TXV system is to:

- A. Observe the sight glass until it is clear
- B. Match the suction pressure to the nameplate value
- C. Measure subcooling at the condenser and compare to the manufacturer's target
- D. Weigh the system until the receiver is half full

58. A defrost heater rated 1000 W at 240 V is measured drawing only 250 W at 240 V. This indicates:

- A. The heater is operating normally at low load
- B. A short circuit in the heater element
- C. The supply voltage is doubled
- D. Increased element resistance from partial element failure

59. What happens to the saturation temperature in an evaporator if the suction line becomes restricted between the evaporator and compressor?

- A. Evaporator pressure and temperature both drop sharply
- B. Evaporator temperature rises while compressor suction falls
- C. Evaporator pressure rises (backs up) while compressor suction pressure drops
- D. No change because the restriction is downstream

60. A single-phase motor that runs but cannot start under load most likely has a:

- A. Shorted run winding
- B. Failed start capacitor or start relay
- C. Grounded stator core
- D. Reversed line connection

61. The primary reason to install a liquid-line filter drier with the arrow pointing in the direction of flow is to:

- A. Reduce pressure drop across the metering device
- B. Ensure proper filtration and desiccant contact in the flow direction
- C. Allow refrigerant to be recovered through the drier
- D. Increase subcooling by restricting flow

62. A heat pump stuck in cooling mode when heating is called for most likely has a fault in the:

- A. Reversing valve or its solenoid/pilot
- B. Indoor blower motor capacitor
- C. Liquid line filter drier
- D. Outdoor defrost termination switch

63. When charging by superheat on a fixed-orifice system, the technician adjusts the charge until:

- A. Measured superheat matches the target from the charging chart for the conditions
- B. The sight glass clears completely of bubbles
- C. Subcooling reaches exactly 10°F
- D. The compressor amperage equals locked-rotor amps

64. The purpose of a suction-line heat exchanger (liquid-suction interchanger) is to:

- A. Cool the suction vapor before it enters the compressor
- B. Subcool the liquid and superheat the suction vapor to improve efficiency and prevent floodback
- C. Increase the head pressure for better condensing
- D. Remove oil from the suction vapor before the compressor

65. A compressor contactor has badly pitted and burned contacts. The most likely consequence is:

- A. The contactor coil drawing excessive current
- B. The compressor running at higher efficiency
- C. Voltage drop and overheating, leading to compressor overload trips
- D. Faster compressor cycling with no electrical concern

66. A technician finds the discharge line abnormally hot and the compressor cycling on the internal overload. Suction pressure is low and superheat is high. The most probable cause is:

- A. Refrigerant overcharge flooding the condenser
- B. A stuck-open TXV
- C. Liquid floodback cooling the compressor head
- D. A refrigerant undercharge or restriction starving the system

67. In an ammonia (R-717) refrigeration system, copper tubing must not be used because:

- A. Copper cannot withstand ammonia's operating pressures
- B. Copper increases the system's oil consumption
- C. Ammonia reacts with and corrodes copper in the presence of moisture
- D. Copper raises the refrigerant's glide unacceptably

68. A two-stage compression system with an intercooler is used primarily to:

- A. Increase the evaporator pressure for higher capacity
- B. Eliminate the need for a metering device
- C. Reduce the condenser size requirement
- D. Reduce discharge temperatures and improve efficiency at high compression ratios

69. When a technician reads "100% RH" on a psychrometric measurement, the dry-bulb and wet-bulb temperatures will be:

- A. Separated by the largest possible difference
- B. Equal to each other
- C. Both at the dew point but unequal
- D. Impossible to measure with a sling psychrometer

70. A condensing unit located in a low-ambient environment may experience low head pressure causing:

- A. Excessive compressor amperage
- B. Liquid floodback to the compressor
- C. High superheat and frosted condenser
- D. Insufficient pressure difference for proper TXV operation and feeding

71. The correct sequence when commissioning a new split system after a proper evacuation is to:

- A. Release the holding charge, weigh in the nameplate charge, then verify with superheat/subcooling
- B. Start the compressor immediately before weighing in any charge
- C. Charge to a clear sight glass and skip the weigh-in
- D. Add refrigerant until suction pressure reads 70 psig regardless of refrigerant

72. An oversized evaporator coil relative to the condensing unit will tend to:

- A. Operate at higher suction pressure and reduce dehumidification
- B. Cause persistent coil icing
- C. Increase compressor head pressure dramatically
- D. Starve the metering device of liquid

73. A "bullet" or piercing valve installed for service is generally discouraged because it:

- A. Cannot be used with HFC refrigerants
- B. Creates a potential leak point and restricts flow
- C. Requires brazing to install properly
- D. Only works on the high side of the system

74. The motor terminal markings C, S, and R on a single-phase hermetic compressor identify:

- A. Three line-voltage phases
- B. Capacitor, switch, and relay terminals
- C. Common, start, and run windings
- D. Control, sensor, and rectifier connections

75. When a high-pressure refrigerant gas is throttled through an expansion device, the effect that causes its temperature to drop is:

- A. The Bernoulli pressure-velocity effect
- B. The Joule-Thomson (throttling) effect
- C. Latent heat addition from the surroundings
- D. Adiabatic compression heating

76. A technician suspects a compressor is grounded. The correct test is to:

- A. Measure resistance between the three motor terminals
- B. Apply voltage and observe whether the motor runs
- C. Measure resistance between each motor terminal and the compressor shell/ground
- D. Check the run capacitor microfarad value

77. During the heating cycle of a heat pump, the outdoor coil functions as the:

- A. Condenser, rejecting heat to outdoor air
- B. Receiver, storing excess refrigerant
- C. Subcooler, reducing liquid temperature
- D. Evaporator, absorbing heat from outdoor air

78. A refrigeration compressor short-cycling rapidly with normal pressures and adequate charge most likely has a:

- A. Restricted liquid line drier
- B. Failed condenser fan motor
- C. Faulty or improperly differential-set control such as the thermostat or pressure control
- D. Slugging condition from liquid floodback

79. The main reason to slope a horizontal suction line slightly toward the compressor is to:

- A. Promote oil return to the compressor by gravity
- B. Reduce refrigerant velocity in the line
- C. Prevent liquid from forming in the evaporator
- D. Increase the suction superheat reading

80. A pressure-relief valve that has lifted and reseated on a system should be:

- A. Replaced, because relief valves may not reseat reliably and can leak
- B. Reset by tapping it lightly with a soft mallet
- C. Left in service as it has proven it works
- D. Adjusted to a higher setpoint to prevent future lifting

81. In a system using a hot-gas bypass valve, the device is used to:

- A. Increase head pressure during high-load operation
- B. Reverse the refrigerant flow for defrost
- C. Maintain minimum evaporator load and prevent coil icing at low load
- D. Recover refrigerant during shutdown

82. A technician finds an evaporator fan motor with a run capacitor reading far below its rated microfarads. The expected symptom is:

- A. The motor runs faster than rated speed
- B. No effect since capacitors are not critical to PSC motors
- C. The motor draws lower-than-normal current
- D. The motor runs hot, slow, or fails to reach speed

83. The standard color and connection for the high-side service gauge in a manifold set is:

- A. Yellow hose connected to the vacuum pump
- B. Red hose connected to the discharge/liquid side
- C. Blue hose connected to the suction side
- D. Green hose connected to the recovery cylinder

84. When measuring superheat, the technician must take readings of:

- A. Liquid line temperature and condensing pressure
- B. Suction line temperature at the bulb location and suction saturation pressure
- C. Discharge temperature and head pressure
- D. Ambient temperature and return air temperature

85. A flooded evaporator chiller uses a float valve to:

- A. Maintain a constant liquid refrigerant level in the evaporator
- B. Regulate the condenser water flow rate
- C. Control the speed of the compressor
- D. Bypass hot gas during low-load operation

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

- A. Simply replace the compressor and recharge with no further steps
- B. Add extra oil to the new compressor to compensate
- C. Install suction-line filter driers and clean the system of acid and contaminants
- D. Reuse the old filter drier to save cost

87. The wet-bulb temperature of an air sample is always:

- A. Higher than the dry-bulb temperature except at saturation
- B. Equal to or lower than the dry-bulb temperature
- C. Independent of the air's moisture content
- D. Equal to the dew point at all humidity levels

88. A TXV with the correct superheat charge but installed with the sensing bulb loosely attached to the suction line will likely cause:

- A. The valve to read false high superheat and overfeed the evaporator
- B. The valve to close completely and starve the coil
- C. No change because bulb contact is not critical
- D. The compressor to trip on high pressure immediately

89. A solenoid valve in the liquid line that fails to open when energized should first be checked for:

- A. A reversed refrigerant flow direction
- B. Excessive subcooling at the condenser
- C. Coil continuity/voltage and a stuck or debris-blocked valve seat
- D. A faulty high-pressure cutout

90. The primary purpose of nitrogen pressure testing before evacuation is to:

- A. Detect leaks at a higher pressure than the operating refrigerant
- B. Remove moisture from the system tubing
- C. Lubricate the compressor before start-up
- D. Verify the metering device is feeding correctly

91. A system with R-134a is being retrofitted; the technician must confirm the oil is changed to:

- A. Mineral oil compatible with CFCs
- B. Alkylbenzene oil only
- C. POE (polyolester) oil compatible with the HFC refrigerant
- D. Any available refrigeration oil regardless of type

92. A compressor cycling on its overload with high amperage draw and normal pressures most likely has:

- A. A mechanical problem such as tight bearings or a failing motor
- B. A refrigerant undercharge
- C. A clogged condenser coil
- D. An open run capacitor

93. When two evaporators at different temperatures share one compressor, the colder evaporator typically:

- A. Requires an evaporator pressure regulator to keep it warmer
- B. Operates with no special controls
- C. Needs a hot-gas bypass to lower its temperature
- D. Operates at the lowest pressure, with the warmer coil using an EPR to hold its pressure up

94. A refrigerant cylinder should never be filled beyond 80% of its volume because:

- A. The refrigerant becomes chemically unstable above that level
- B. Liquid expansion with temperature rise could overpressurize and rupture the cylinder
- C. The cylinder valve cannot seal above 80%
- D. Recovery machines cannot pump past that level

95. A blocked condenser airflow on an air-cooled system produces:

- A. Low head pressure and high subcooling
- B. Low suction pressure and frosted evaporator
- C. Normal head pressure with reduced capacity
- D. High head pressure and elevated discharge temperature

96. The function of an oil separator installed on the discharge line is to:

- A. Capture oil carried with discharge gas and return it to the compressor
- B. Cool the discharge gas before the condenser
- C. Filter moisture from the high-side refrigerant
- D. Regulate the head pressure during low ambient

97. A digital scroll or variable-capacity compressor controls capacity by:

- A. Adding refrigerant from a reserve receiver
- B. Switching between two fixed-orifice metering devices
- C. Cycling the condenser fan on and off rapidly
- D. Modulating the scroll engagement or motor speed to match load

98. When recovering refrigerant from a system into a recovery cylinder, the technician must:

- A. Mix different refrigerants in one cylinder to save space
- B. Use a clean, dedicated recovery cylinder for that refrigerant type and not overfill it
- C. Recover into a disposable refrigerant cylinder
- D. Vent the first portion to clear contaminants

99. A "TXV bulb charge" that is "liquid-charged" rather than "gas-charged" provides:

- A. Faster response but risk of bulb migration to a cold spot
- B. No superheat control capability at all
- C. Operation only in low-temperature applications
- D. Consistent control with the valve body warmer than the bulb (no MOP limiting)

100. A motor's locked-rotor amperage (LRA) compared to its running amperage is:

- A. Lower than running amperage
- B. Several times higher than running amperage at start
- C. Equal to the running amperage
- D. Unrelated to running amperage entirely

101. A condenser fan cycling control (fan cycling for head pressure) is used to:

- A. Reduce noise during night operation only
- B. Maintain adequate head pressure in low ambient conditions
- C. Increase evaporator superheat in summer
- D. Prevent the compressor from short-cycling on low pressure

102. The primary danger of a refrigerant leak in an unventilated, enclosed equipment room is:

- A. Oxygen displacement and risk of asphyxiation
- B. Spontaneous combustion of the refrigerant
- C. Corrosion of all metal surfaces within minutes
- D. Immediate freezing of the room's atmosphere

103. A compressor that will not unload (capacity control valve stuck) on a multi-cylinder reciprocating compressor will result in:

- A. Reduced capacity at all times
- B. The inability to start under any load
- C. Full capacity regardless of load, possibly overcooling and short-cycling
- D. Permanent valve plate damage on start-up

104. When measuring three-phase voltage, an imbalance between phases greater than the allowable percentage will cause:

- A. Higher efficiency due to balanced loading
- B. No effect on a three-phase motor
- C. Faster motor speed on the high-voltage phase
- D. Excessive heating and reduced motor life

105. A liquid line that is warmer than ambient but the system has poor cooling and high superheat suggests:

- A. An overcharge of refrigerant
- B. A restriction or undercharge starving the evaporator
- C. A flooded evaporator condition
- D. Excessive condenser subcooling

106. The reason a refrigeration system uses a receiver-to-condenser equalizer line is to:

- A. Allow liquid to drain freely from the condenser into the receiver
- B. Prevent oil from collecting in the condenser
- C. Bypass refrigerant during defrost
- D. Provide a path for non-condensables to escape

107. A refrigerant recovery is considered complete when the system reaches:

- A. Atmospheric pressure exactly
- B. A positive pressure of 10 psig
- C. The required recovery vacuum level specified by regulation for the system type
- D. A clear sight glass with no bubbles

108. A compressor with liquid refrigerant present in the crankcase on start-up may experience:

- A. Improved lubrication and cooling
- B. Higher volumetric efficiency
- C. Reduced discharge temperature with no harm
- D. Oil foaming, loss of lubrication, and possible valve or bearing damage

109. A technician connects gauges to a properly charged R-410A air conditioner and a properly charged R-22 system operating side by side under identical outdoor conditions. Why does the R-410A system read a higher condensing (head) pressure?

- A. R-410A has a lower saturation pressure than R-22 at the same temperature
- B. R-410A and R-22 share identical pressure-temperature relationships
- C. R-410A reaches a higher saturation pressure than R-22 at the same temperature
- D. R-410A pressures depend only on charge weight, not on temperature

110. A flare fitting that leaks despite proper torque most likely has:

- A. Too much pipe dope applied to the threads
- B. A cracked, scored, or improperly formed flare cone
- C. An undersized flare nut
- D. The wrong refrigerant type in the system

111. A thermostatic expansion valve responds to three pressures: bulb pressure (opening), and two closing pressures, which are:

- A. Discharge pressure and condenser pressure
- B. Evaporator pressure and spring (superheat) pressure
- C. Suction pressure and ambient pressure
- D. Receiver pressure and liquid line pressure

112. When a refrigeration oil shows an acid test indicating high acidity, the technician should:

- A. Continue operation since acid is normal in oil
- B. Add fresh oil on top of the contaminated oil
- C. Change the oil and install acid-removing filter driers
- D. Increase the superheat to burn off the acid

113. A compressor with reversed rotation on a three-phase system can be corrected by:

- A. Replacing the compressor immediately
- B. Reversing the direction of the metering device
- C. Increasing the supply voltage
- D. Swapping any two of the three line connections

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

- A. Regulate the superheat at the indoor coil
- B. Prevent refrigerant from over-pressurizing the receiver
- C. Direct refrigerant flow through the correct metering device depending on operating mode
- D. Bypass hot gas during defrost only

115. A technician finds an evaporator that frosts unevenly, with part of the coil frosted and part clear. This most likely indicates:

- A. An overcharge of refrigerant
- B. Excessive condenser subcooling
- C. High head pressure from a dirty condenser
- D. Uneven refrigerant distribution, possibly from a faulty distributor or metering device

116. The recommended action when a sealed system contains a refrigerant that is no longer commercially available is to:

- A. Recover the existing refrigerant and retrofit to an approved alternative with compatible oil
- B. Top off with any similar refrigerant available
- C. Vent the old refrigerant and recharge with R-22
- D. Operate the system until it fails completely

117. A motor protected by a thermal overload relay trips repeatedly on a hot day with no electrical fault found. The most likely cause is:

- A. High ambient temperature reducing motor cooling and raising current
- B. A short in the start winding
- C. A grounded compressor shell
- D. An open run capacitor

118. A refrigeration system charged with a zeotropic blend that develops a leak should be:

- A. Topped off with the same blend through the vapor port
- B. Topped off with the same blend through the liquid port and run
- C. Recovered fully and recharged with virgin blend to restore correct composition
- D. Left undercharged since the blend self-corrects

119. The purpose of a "MOP" (maximum operating pressure) charge in a TXV is to:

- A. Increase the valve opening force during pull-down
- B. Hold the valve fully open at all evaporator pressures
- C. Limit suction pressure during pull-down to protect the compressor motor
- D. Prevent the valve from ever closing fully

120. A condenser subcooling reading that is unusually high combined with high head pressure indicates:

- A. A refrigerant undercharge
- B. A starved evaporator from a restriction
- C. Non-condensables in the low side
- D. An overcharge of refrigerant backing liquid into the condenser

121. When working with a refrigerant that is mildly flammable (A2L classification), the technician must:

- A. Treat it identically to a non-flammable A1 refrigerant
- B. Vent it freely since it burns off harmlessly
- C. Follow A2L-specific handling, leak detection, and ignition-source precautions
- D. Use only oxygen for pressure testing the system

122. A liquid receiver equipped with a fusible plug is designed to:

- A. Indicate the liquid level inside the receiver
- B. Relieve pressure by melting if the receiver overheats, preventing rupture
- C. Allow refrigerant to be charged into the receiver
- D. Drain oil from the bottom of the receiver

123. A compressor drawing normal amps but with low capacity and the suction and discharge pressures tending toward each other (suction high, head low) indicates:

- A. A refrigerant overcharge
- B. A plugged liquid line drier
- C. Internal compressor valve leakage (worn valves or blown gasket)
- D. A stuck-closed TXV

124. The reason refrigerant tubing ends should be kept capped until installation is to:

- A. Prevent the refrigerant from escaping the tubing
- B. Keep out moisture, dirt, and contaminants that cause system damage
- C. Maintain the factory holding charge of nitrogen
- D. Prevent oxidation of the copper exterior

125. A system's TXV is replaced but the new valve causes low suction pressure and high superheat even at full open. The most likely error is:

- A. The valve is correct but the bulb is over-insulated
- B. The system was overcharged during the repair
- C. The replacement valve is undersized for the system tonnage
- D. The condenser fan is running in reverse

Practice Exam 17: Answer Key and Explanations

1. B — An overcharge or overfeeding metering device floods the evaporator with liquid that boils all the way to the compressor. Excess liquid carries cold past the coil, frosting the suction line completely while the liquid line stays only mildly warm. This points to too much refrigerant reaching the low side rather than a starvation fault.

2. A — A pressure-relief device protects the system from exceeding its design working pressure. If pressure climbs dangerously (fire, overcharge, blocked condenser), the device relieves to prevent vessel rupture. This life-safety function is why CSA B52 mandates relief protection on refrigeration vessels.

3. B — Capillary tube systems are critically charged with no receiver to buffer charge variation, so the nameplate weight-in is the only reliable method. Sight glasses and pressures shift with ambient load on a cap-tube system. Weighing in the exact specified charge guarantees correct refrigerant mass.

4. D — High evaporator superheat with normal condenser subcooling means liquid is reaching the condenser fine but not enough is being fed into the evaporator. An underfeeding metering device starves

the coil, so refrigerant fully boils and superheats early. The fault lies at the metering device, not the charge.

5. B — A pump-down cycle closes a liquid-line solenoid so the compressor pulls remaining refrigerant into the condenser/receiver before the low-pressure control stops it. This stores refrigerant on the high side, preventing migration to the compressor crankcase during the off cycle and avoiding floodback on restart.

6. C — Balanced three-phase windings should draw equal current; high amperage on two legs with low current on the third signals a high-resistance connection or an open winding on that phase. The motor attempts to run single-phase, overloading the healthy legs. This requires checking connections and winding resistance.

7. D — Latent heat of vaporization is the heat absorbed when a refrigerant boils from liquid to vapor at constant temperature. This is the core of the refrigeration effect—large heat absorption with no temperature change. It distinguishes latent (phase-change) heat from sensible (temperature-change) heat.

8. D — Recovery slows when the cylinder pressure rises to match the system, killing the differential. Warming the recovery system or cooling the cylinder restores the pressure gradient that drives refrigerant transfer. Never use open flame; controlled cooling of the cylinder is the safe accepted practice.

9. A — A leaking flare must be disassembled so the seat and cone can be inspected and reformed if damaged, then remade. Over-tightening cracks the flare and tape or sealant only masks the defect. Proper repair restores a leak-free metal-to-metal seal.

10. A — Horizontal movement left on a psychrometric chart holds moisture content (grains) constant while dry-bulb temperature falls. With no moisture removed, this is pure sensible cooling. Latent cooling only occurs once the air reaches saturation and moisture condenses.

11. D — An external equalizer ports evaporator outlet pressure to the underside of the TXV diaphragm, compensating for pressure drop across the coil. Without it, the valve senses inlet pressure and controls superheat inaccurately on coils with significant drop. This keeps superheat control precise.

12. D — R-410A operates at roughly 50–70% higher pressures than R-22, so service gauges, hoses, and recovery equipment must be rated for it. Using R-22-rated equipment risks rupture and inaccurate readings. R-410A also requires POE oil, not mineral oil.

13. A — Subcooling lowers liquid temperature below its saturation point, guaranteeing a solid liquid column reaches the metering device. This prevents premature flashing (flash gas) in the liquid line that would reduce capacity and feed vapor to the valve. Proper subcooling ensures full liquid feed.

14. A — A hum-and-trip with a good run capacitor indicates the motor cannot break away from rest, pointing to the start components. A PSC or CSIR motor relies on the start relay and start capacitor to develop starting torque. Testing these is the logical next step.

15. B — POE (polyolester) oil is strongly hygroscopic, absorbing atmospheric moisture quickly when exposed. This is why POE systems demand minimal open time, fresh oil, and good evacuation. Moisture combines with refrigerant to form acids that damage the system.

16. A — A small water-side temperature rise with high head pressure means the water is not absorbing heat from the refrigerant—scale or fouling is insulating the tubes. The condenser cannot reject heat, so head pressure climbs. Cleaning or de-scaling restores heat transfer.

17. D — Refrigerant must be recovered and the system purged with dry nitrogen before brazing, because heating residual refrigerant produces toxic and corrosive decomposition products (such as phosgene and acids). Nitrogen also prevents internal oxide scale. This protects both the technician and the system.

18. A — Flowing dry nitrogen displaces oxygen inside the tubing during brazing, preventing the cupric oxide scale that forms when copper is heated in air. That scale flakes off and circulates, clogging metering devices and screens. Nitrogen purging keeps the interior clean.

19. A — If the defrost heater has continuity but the coil never clears, the defrost termination thermostat may be stuck open, never closing to energize the heater circuit during defrost. The timer initiates defrost but no heat is applied. Checking the termination thermostat is the key step.

20. C — In normal operation the evaporator saturation (coil) temperature runs roughly 15–20°F below the return air temperature to drive heat transfer into the refrigerant. This "design split" produces effective cooling and dehumidification. A much larger or smaller split signals a fault.

21. A — A receiver stores the variable refrigerant charge as a TXV modulates flow with changing load, holding the surplus during low-demand periods. This buffer lets the metering device feed properly across conditions. Cap-tube systems lack a receiver and are therefore critically charged.

22. C — Non-condensables raise condensing pressure above the saturation pressure for the actual liquid line temperature. Comparing measured head pressure to the P-T saturation value at that temperature reveals the excess caused by trapped air. A higher-than-saturation reading confirms non-condensables.

23. D — A three-phase scroll compressor running in reverse turns but cannot compress, so it makes a loud noise and builds no pressure differential. On three-phase equipment this is corrected by swapping any two line leads to restore correct phase sequence. Prolonged reverse running overheats and damages the compressor, so rotation must be verified at start-up.

24. D — The oil pressure safety (differential) switch monitors net oil pressure (pump output minus crankcase pressure) and shuts the compressor down if lubrication is lost. This protects bearings and the crankshaft from oil starvation. It is standard on compressors equipped with oil pumps.

25. B — A vacuum that holds then rises and stabilizes at an elevated level after isolation indicates moisture off-gassing, not a leak. Trapped water boils under deep vacuum, raising pressure until equilibrium. A true leak would cause the pressure to rise continuously toward atmospheric.

26. D — A TXV's defining advantage is maintaining constant superheat as load varies, modulating flow to keep the evaporator efficiently full. Fixed orifices cannot adjust and lose efficiency off-design. This adaptability optimizes performance across operating conditions.

27. B — Low evaporator airflow removes less heat, so refrigerant cannot fully boil; suction pressure drops and the coil can ice. The reduced heat load starves the evaporator of the temperature it needs to vaporize refrigerant. Restoring airflow corrects the low-pressure, icing condition.

28. B — After lockout, the technician must verify zero energy by testing for the absence of voltage with a meter before touching conductors. A lock prevents re-energizing but does not prove the circuit is dead. "Test before touch" is a core electrical-safety rule.

29. A — Volumetric efficiency falls as compression ratio rises, because the re-expansion of gas left in the clearance volume occupies more of the cylinder, reducing the fresh charge drawn in. Higher head or lower suction pressure both raise the ratio. This reduces pumping capacity.

30. A — Compressing a gas raises its temperature, because the work of compression adds energy and the molecules are forced closer with greater collision energy. This is why discharge gas leaves the compressor hot. Understanding compression heating explains high discharge temperatures.

31. C — Bubbles that return after a clear sight glass momentarily appeared indicate flash gas forming from a liquid-line restriction, such as a partially plugged drier, not a true undercharge. The restriction drops pressure and flashes liquid to vapor. The drier should be checked and replaced.

32. D — An open winding is found by measuring resistance across each winding pair (C-R, C-S, R-S) and comparing to expected values; an open reads infinite resistance. This isolates the failed winding precisely. Applying voltage or guessing risks further damage.

33. B — Evaporator pressure regulators hold a minimum pressure on warmer evaporators in a multi-coil system, preventing their pressure (and temperature) from dropping too low when sharing a compressor. This lets different coils run at different temperatures. The EPR throttles the warmer coil's suction.

34. A — Near-azeotropic and zeotropic blends must be charged as liquid from the cylinder so all components transfer in their correct proportion. Vapor charging would draw off the more volatile component first, shifting the blend composition. Liquid charging preserves the designed mixture.

35. D — Cooling tower approach is the difference between the leaving water temperature and the entering air wet-bulb temperature, indicating how closely the tower approaches the theoretical limit. Wet-bulb sets the lowest achievable water temperature. A smaller approach means a more effective tower.

36. C — Heat pump defrost is initiated by sensing outdoor coil temperature combined with elapsed time, ensuring defrost runs only when frost has actually accumulated. Pure time clocks waste energy defrosting unnecessarily. Demand-based sensing is more efficient and reliable.

37. A — Hot gas defrost diverts the compressor's hot discharge vapor into the evaporator to melt frost from the inside, using the system's own heat. Electric defrost instead relies on external resistance elements. Hot gas defrost is faster and more energy-efficient.

38. D — TXV hunting appears as superheat swinging up and down as the valve repeatedly overshoots and corrects, unable to settle. Causes include oversizing, erratic bulb response, or low load. Stable superheat is the goal; oscillation signals a control problem.

39. B — A suction-line accumulator traps liquid refrigerant before it can slug into the compressor, metering it back slowly as vapor with controlled oil return. This protects the compressor during floodback events like defrost or low load. It safeguards the valves and bearings.

40. D — Power factor is the ratio of true (real) power to apparent power, reflecting how effectively current does useful work. A low power factor means more current for the same real power. It is central to motor and electrical-system efficiency.

41. C — Worn discharge valves let high-pressure gas leak back into the cylinder, so the compressor cannot build head pressure or pull suction down—head stays low, suction stays high, capacity drops. Pressures tend toward each other. This is a classic worn-valve signature.

42. B — Venting HFC refrigerant to atmosphere during service is prohibited; it must be recovered using approved equipment. Regulations protect the environment regardless of ozone-depletion potential, since HFCs are potent greenhouse gases. Recovery is mandatory before opening a system.

43. C — Dew point is the temperature at which air becomes saturated and moisture begins to condense as it is cooled at constant pressure. Below this point, water leaves the air as liquid. It is fundamental to dehumidification and condensation control.

44. B — A purge unit on a low-pressure centrifugal chiller removes air and water vapor that leak in because much of the system operates below atmospheric pressure. Without purging, non-condensables raise head pressure and reduce efficiency. The purge maintains performance.

45. D — Applying 240 V to a 24 V coil drives roughly ten times the rated voltage across it, causing massive current and rapid overheating that burns out the coil. Coils are voltage-specific. Correct control-voltage matching is essential.

46. C — During a long off cycle, refrigerant migrates to and condenses in the cold compressor crankcase, mixing with oil. On start-up this liquid flashes violently, causing oil foaming and slugging. Crankcase heaters prevent this migration.

47. D — The crankcase heater keeps the oil warm during the off cycle to drive refrigerant out of solution, preventing dilution and the foaming/slugging that occurs when diluted oil flashes at start-up. Warm oil holds less dissolved refrigerant. This protects lubrication on restart.

48. A — For a pure refrigerant, each pressure corresponds to one specific saturation temperature, the basis of the pressure-temperature relationship used in charging and diagnostics. Blends with glide show a range instead. Pure refrigerants have a single, predictable saturation point.

49. C — A neutral oxy-acetylene flame (balanced fuel and oxygen) is used to evenly heat the copper base metal so a copper-phosphorus rod flows into the joint. Oxidizing flames burn the metal; carburizing flames carbonize it. The base metal, not the rod, should melt the filler.

50. A — With a clean condenser and working fan, repeated high-pressure trips on a hot day point to an overcharge raising condensing pressure. Excess refrigerant backs into the condenser, reducing effective surface and elevating head pressure. Recovering to correct charge resolves it.

51. C — Net refrigeration effect is the heat absorbed in the evaporator per pound of refrigerant circulated, the useful cooling produced. It excludes condenser heat rejection and compressor work. This value measures the cooling capacity of the refrigerant per unit mass.

52. C — A thermistor is verified by measuring its resistance and comparing it to the manufacturer's temperature/resistance chart at the known temperature. Thermistors change resistance with temperature, so this confirms calibration. Voltage or continuity tests alone cannot validate it.

53. B — In a zeotropic blend, glide means the boiling and condensing temperatures change across a range during phase change at constant pressure, rather than staying fixed. This affects charging, superheat, and subcooling measurements. Technicians use mid-point or dew/bubble values accordingly.

54. C — After confirming adequate charge, short-cycling on the low-pressure control points to control differential/cut-in settings or a dirty evaporator reducing load and dropping suction quickly. Either causes premature cutout and rapid restart. Checking the control and airflow resolves it.

55. A — An undersized suction line creates excessive pressure drop, lowering pressure at the compressor inlet and reducing compressor capacity and efficiency. The compressor must work harder for less mass flow. Proper line sizing balances pressure drop against oil return.

56. B — Front-seating the king (receiver outlet) valve isolates the receiver, trapping liquid refrigerant inside and eventually starving the system of feed to the metering device. This is the basis of a manual pump-down. Cooling stops as liquid supply is cut off.

57. C — On a TXV system the most reliable charge check is measuring condenser subcooling and comparing it to the manufacturer's target, since the TXV controls superheat and masks charge by the sight glass. Correct subcooling confirms proper liquid charge. Sight-glass charging is unreliable here.

58. D — A 1000 W heater drawing only 250 W at rated voltage means its resistance has risen sharply (power falls as resistance rises at fixed voltage), indicating partial element failure or a poor connection. The element is degrading. It should be replaced.

59. C — A restriction between evaporator and compressor causes pressure to back up (rise) in the evaporator while the compressor suction pressure drops below the restriction. The two readings diverge across the blockage. This split locates the restriction in the suction line.

60. B — A single-phase motor that runs but won't start under load typically has a failed start capacitor or start relay, since these provide the starting torque. Once running, the run winding sustains it, but it cannot break away loaded. Testing the start components confirms it.

61. B — The drier's directional arrow must point with refrigerant flow so the desiccant and filter media contact and trap moisture and debris properly in the designed direction. Reversed installation can release trapped contaminants. Correct orientation ensures effective filtration.

62. A — A heat pump stuck in cooling when heating is called for points to a failed reversing valve or its solenoid/pilot, which redirects refrigerant flow between modes. If the valve doesn't shift, the system stays in the prior mode. Checking the solenoid and valve is the first step.

63. A — On a fixed-orifice system, charging by superheat means adjusting the charge until measured superheat matches the target from the manufacturer's charging chart for the current indoor and outdoor conditions. This compensates for the orifice's lack of modulation. It is the standard method.

64. B — A liquid-suction heat exchanger subcools the liquid line while superheating the suction vapor, improving capacity and ensuring no liquid reaches the compressor. The heat swap boosts efficiency and protects against floodback. Both effects benefit the cycle.

65. C — Pitted, burned contactor contacts add resistance that causes voltage drop and heat, reducing voltage to the compressor and triggering overload trips from high current. The compressor struggles to run on degraded power. Replacing the contactor restores reliable operation.

66. D — Hot discharge, overload cycling, low suction, and high superheat together indicate a refrigerant undercharge or a restriction starving the system. Too little refrigerant means little mass to cool the motor, so the discharge runs hot. Locating the undercharge or restriction is essential.

67. C — Ammonia (R-717) corrodes copper and copper alloys in the presence of moisture, so steel piping is used instead. The corrosion would foul and weaken the system. This is why ammonia plants are built with iron and steel components.

68. D — Two-stage compression with intercooling reduces discharge temperatures and improves efficiency when the overall compression ratio is high, by cooling the gas between stages. This prevents overheating and oil breakdown. It is common in low-temperature applications.

69. B — At 100% relative humidity the air is saturated, so the dry-bulb and wet-bulb temperatures are equal—no evaporative cooling can occur on the wet-bulb sensor. The dew point also equals both. This identity defines saturation conditions.

70. D — Low ambient causes low head pressure, reducing the pressure difference across the TXV so it cannot feed enough refrigerant, starving the evaporator. Head-pressure controls (fan cycling, flooding) maintain adequate condensing pressure in cold weather. This ensures proper valve operation.

71. A — Correct commissioning after evacuation is to release the holding charge, weigh in the nameplate charge, then verify with superheat and subcooling readings. Weighing ensures the precise mass; verification confirms proper operation. Starting before charging risks damage.

72. A — An oversized evaporator relative to the condensing unit runs at higher suction pressure and a warmer coil, which reduces dehumidification because the coil surface stays above heavy condensing temperatures. The system cools but removes less moisture. Balance affects comfort.

73. B — Piercing (bullet) valves are discouraged because they create a chronic leak point and restrict refrigerant flow through the small pierced hole. They are unreliable for permanent service. Proper brazed or Schrader access fittings are preferred.

74. C — On a single-phase hermetic compressor, terminals C, S, and R identify the Common, Start, and Run windings. Correct identification is essential for wiring the start components and testing windings. Misidentification can damage the motor.

75. B — The Joule-Thomson (throttling) effect causes a high-pressure refrigerant to cool as it expands through a metering device without doing external work. This temperature drop produces the cold low-pressure mixture entering the evaporator. It is fundamental to the refrigeration cycle.

76. C — A grounded compressor is confirmed by measuring resistance between each motor terminal and the compressor shell (ground); a low reading indicates winding insulation has failed to ground. Terminal-to-terminal tests check windings, not grounds. This isolates a ground fault.

77. D — In heating mode the outdoor coil of a heat pump acts as the evaporator, absorbing heat from outdoor air even in cold weather. The reversing valve makes the indoor coil the condenser. This is how a heat pump extracts heat from cold outdoor air.

78. C — Rapid short-cycling with normal pressures and adequate charge points to a faulty control or one with too-narrow a differential, such as a thermostat or pressure control cutting out and in too quickly. The refrigeration side is healthy. The control or its settings need correction.

79. A — Sloping the horizontal suction line toward the compressor lets gravity assist oil return, preventing oil from pooling in the line and starving the compressor of lubrication. Proper slope and traps maintain oil circulation. This protects the compressor.

80. A — A pressure-relief valve that has lifted and reseated should be replaced, because such valves often fail to reseat tightly and will leak refrigerant afterward. Their reliability is compromised once actuated. Replacement ensures continued protection and prevents loss.

81. C — A hot-gas bypass valve maintains a minimum evaporator load by feeding discharge gas into the low side, preventing the suction pressure from dropping so low that the coil ices at light load. It artificially loads the evaporator. This stabilizes low-load operation.

82. D — A run capacitor reading well below its rated microfarads weakens the motor's running torque, so a PSC evaporator fan motor runs hot, slow, or fails to reach speed. The phase shift it provides is insufficient. The capacitor should be replaced.

83. B — In a standard manifold gauge set, the red hose connects to the high (discharge/liquid) side and the blue to the low (suction) side, with yellow as the center service hose. Correct color use prevents misconnection. Red always signals the high side.

84. B — Superheat is measured by taking the suction line temperature at the bulb location and subtracting the saturation temperature corresponding to the suction pressure. The difference is the superheat. Both the temperature and the matching pressure are required.

85. A — In a flooded evaporator chiller, a float valve maintains a constant liquid refrigerant level in the evaporator, keeping the tubes submerged for maximum heat transfer. The float meters liquid to match boil-off. This sustains efficient flooded operation.

86. C — After a compressor burnout, the system is contaminated with acid and debris, so the technician must clean the system and install suction-line filter driers to capture contaminants and protect the replacement compressor. Skipping this causes repeat failures. Thorough cleanup is essential.

87. B — The wet-bulb temperature is always equal to or lower than the dry-bulb temperature, because evaporation from the wet wick cools the bulb; they are equal only at saturation. Drier air produces a larger depression. This relationship underlies psychrometrics.

88. A — A TXV bulb loosely attached to the suction line reads warmer than the true line temperature, sensing false high superheat and driving the valve to overfeed the evaporator. Good thermal contact and insulation are essential. A poor bulb mount causes flooding.

89. C — A liquid-line solenoid valve that won't open when energized should first be checked for coil continuity and proper voltage, then for a stuck or debris-blocked seat. An open coil or jammed plunger prevents opening. These are the primary suspects.

90. A — Nitrogen pressure testing pressurizes the system above its operating pressure to reveal leaks before evacuation and charging, using an inert, dry gas. Higher test pressure exposes leaks that operating pressure might not. It verifies integrity safely.

91. C — Retrofitting to R-134a requires changing the oil to POE (polyolester), which is compatible with HFC refrigerants, because mineral oil does not circulate properly with R-134a. Oil compatibility ensures lubrication returns to the compressor. Correct oil is mandatory.

92. A — A compressor cycling on overload with high amperage but normal refrigerant pressures indicates a mechanical fault—tight bearings or a failing motor—rather than a refrigerant-side problem. The pressures rule out charge and airflow issues. The mechanical condition causes the overcurrent.

93. D — When two evaporators share a compressor, the colder coil operates at the lowest suction pressure, and the warmer coil uses an evaporator pressure regulator to hold its pressure (and

temperature) higher. This lets each coil maintain its own temperature. The EPR throttles the warmer coil.

94. B — A refrigerant cylinder is never filled beyond 80% liquid because refrigerant expands as temperature rises; without vapor space the hydraulic expansion could overpressurize and rupture the cylinder. The 20% headspace absorbs expansion. This is a critical safety limit.

95. D — Blocked condenser airflow prevents heat rejection, so head pressure climbs and discharge temperature rises sharply. The refrigerant cannot condense at the design pressure. Restoring airflow lowers head pressure and protects the compressor.

96. A — An oil separator on the discharge line captures oil entrained in the hot discharge gas and returns it to the compressor crankcase, ensuring lubrication isn't lost into the system. This is vital in low-temperature and long-line systems. It maintains oil balance.

97. D — A digital scroll or variable-capacity compressor controls capacity by modulating scroll engagement or motor speed to match the cooling load. This provides smooth capacity control and energy savings versus simple cycling. It matches output to demand precisely.

98. B — Refrigerant must be recovered into a clean, dedicated recovery cylinder for that refrigerant type, never overfilled, and never mixed with other refrigerants. Mixing ruins reclamation and disposable cylinders are not rated for recovery. Proper cylinders ensure safe, reusable refrigerant.

99. D — A liquid-charged TXV bulb provides consistent superheat control as long as the valve body stays warmer than the bulb, and it does not lose control (no MOP cutoff) at high pressures. The bulb never fully empties to a cold spot. This gives stable, reliable operation.

100. B — Locked-rotor amperage is several times higher than running amperage—typically five to seven times—because at the instant of start the motor has no back-EMF to limit current. As it accelerates, current falls to running levels. This inrush stresses contacts and supply.

101. B — A condenser fan cycling control maintains adequate head pressure in low ambient conditions by cycling the fan off to let the condenser warm up. Without it, head pressure drops too low for the TXV to feed properly. It stabilizes winter operation.

102. A — The primary danger of a refrigerant leak in an enclosed, unventilated room is oxygen displacement leading to asphyxiation, since most refrigerants are heavier than air and pool at floor level. They are not flammable in most cases but suffocate. Ventilation and detection are essential.

103. C — A multi-cylinder compressor with a stuck capacity-control (unloader) valve cannot unload, so it runs at full capacity regardless of load, which can overcool the space and cause short-cycling. The unloader normally reduces output at low demand. Full output mismatches light loads.

104. D — Voltage imbalance between phases above the allowable percentage causes uneven current and excessive heating in a three-phase motor, drastically shortening its life. A small voltage imbalance produces a much larger current imbalance. Balanced supply is critical for motor longevity.

105. B — A warm liquid line with poor cooling and high superheat indicates a restriction or undercharge starving the evaporator of refrigerant. Too little liquid reaches the coil, so it boils off early and superheats. Locating the restriction or correcting charge solves it.

106. A — A receiver-to-condenser equalizer line allows liquid to drain freely from the condenser into the receiver by equalizing vapor pressure between them. Without it, vapor pressure could trap liquid in the condenser. The equalizer ensures proper liquid drainage.

107. C — Recovery is complete when the system reaches the required recovery vacuum level specified by regulation for that system type and size. This ensures the mandated percentage of refrigerant has been removed. Pressure or sight-glass criteria do not meet the legal standard.

108. D — Liquid refrigerant in the crankcase at start-up causes oil foaming as it flashes, leading to loss of lubrication and possible valve or bearing damage. The foaming oil cannot lubricate properly. Crankcase heaters and pump-down prevent this condition.

109. C — R-410A has a higher saturation pressure than R-22 for any given temperature, so at the same condensing temperature it reads a higher head pressure on the gauges. This is a fixed property of the refrigerant's pressure-temperature relationship, not a variable of the equipment. Because of these elevated pressures, R-410A requires service gauges, hoses, and components rated for its higher operating range.

110. B — A flare that leaks despite proper torque most likely has a cracked, scored, or improperly formed cone—a mechanical defect in the flare itself. More torque won't seal a damaged seat. Re-forming or remaking the flare is required.

111. B — A TXV balances three forces: bulb pressure opens the valve, while evaporator pressure and the superheat spring pressure work together to close it. The balance sets the operating superheat. These opposing pressures govern valve modulation.

112. C — High acidity in refrigeration oil signals contamination, so the technician must change the oil and install acid-removing filter driers to neutralize and capture the acid. Leaving acid in circulation attacks windings and metals. Cleanup prevents compressor failure.

113. D — Reversed rotation on a three-phase compressor is corrected by swapping any two of the three line connections, which reverses the phase sequence and the motor direction. This is a simple wiring change. Verifying correct rotation prevents compressor damage.

114. C — A check valve in a heat pump directs refrigerant through the correct metering device for the current operating mode, bypassing one device in heating and the other in cooling. It routes flow based on direction. This enables proper metering in both modes.

115. D — Uneven evaporator frosting—partly frosted, partly clear—indicates uneven refrigerant distribution, often from a faulty distributor or metering device feeding some circuits more than others. Even distribution gives uniform frost. The distributor or valve should be inspected.

116. A — When a system contains a refrigerant no longer commercially available, the proper action is to recover it and retrofit to an approved alternative with compatible oil. Topping off with substitutes or venting is improper and often illegal. Retrofitting restores serviceability legally.

117. A — Repeated thermal-overload trips on a hot day with no electrical fault are most likely caused by high ambient temperature reducing motor cooling and raising operating current. The motor overheats from the environment, not a defect. Improving cooling or ventilation resolves it.

118. C — A zeotropic blend that has leaked has shifted composition, so it must be fully recovered and recharged with virgin blend to restore the correct proportions. Topping off leaves the mixture off-spec. Only a complete recharge guarantees proper performance.

119. C — A MOP (maximum operating pressure) charge limits suction pressure during pull-down by closing the TXV once evaporator pressure reaches a set point, protecting the compressor motor from overload. It caps the load on initial start. This prevents motor overcurrent.

120. D — High subcooling combined with high head pressure indicates an overcharge backing excess liquid into the condenser, reducing effective condensing surface. The pooled liquid raises subcooling and pressure together. Recovering refrigerant to the correct charge corrects it.

121. C — A2L mildly flammable refrigerants require A2L-specific handling, leak detection, and ignition-source precautions to manage the flammability risk safely. They cannot be treated like non-flammable A1 refrigerants. Following the specific procedures protects against ignition.

122. B — A fusible plug on a liquid receiver relieves pressure by melting at a set temperature if the receiver overheats (such as in a fire), preventing a dangerous rupture. It is a one-time, temperature-activated safety device. This protects against overpressure from heat.

123. C — A compressor with normal amps but low capacity and suction and discharge pressures drifting toward each other (high suction, low head) indicates internal valve leakage—worn valves or a blown head gasket. Gas leaks internally instead of being pumped. This is a worn-compressor signature.

124. B — Refrigerant tubing ends are kept capped until installation to keep out moisture, dirt, and contaminants that would otherwise cause acid formation, restrictions, and compressor damage. A clean, dry interior is essential. Capping protects system integrity.

125. D — If a newly replaced TXV gives low suction and high superheat even at full open, the most likely error is an undersized valve that cannot feed enough refrigerant for the system tonnage. It is flow-limited regardless of adjustment. Correct sizing restores proper feed.