PRACTICE EXAM 24: RACM RED SEAL SIMULATION (125 QUESTIONS)

1. A technician must lift a 90 kg condenser using a sling at a 60° angle from horizontal. As the sling angle decreases toward horizontal, the tension in each leg does what?

A. Increases, raising the load on each sling leg

B. Decreases, lowering the load on each sling leg

C. Remains constant regardless of the sling angle

D. Drops to zero once the load leaves the ground

2. An SDS lists a refrigerant with an ASHRAE safety classification of A2L. What do the "2L" characters specifically indicate?

A. Lower toxicity and no flammability at all

B. Lower toxicity and lower flammability with low burning velocity

C. Higher toxicity and high flammability hazard

D. Lower toxicity and high explosive potential

3. A nitrogen regulator shows 2,200 kPa cylinder pressure and is set to deliver 700 kPa for a pressure test. What does the higher gauge reading represent?

A. The delivery pressure to the system under test

B. The pressure drop across the regulator diaphragm

C. The atmospheric pressure surrounding the cylinder

D. The remaining pressure stored in the supply cylinder

4. A lockout procedure requires verifying zero energy before service. After applying the lock, what step confirms the equipment is truly de-energized?

A. Reading the nameplate voltage rating on the unit

B. Testing the circuit with a meter and attempting a start

C. Checking that the breaker handle is labelled correctly

D. Confirming the lock colour matches the company standard

5. A technician's electronic scale must weigh in 1.8 kg of refrigerant accurately. Before charging, the most important check on the scale is to:

A. Confirm the scale matches the refrigerant cylinder colour

B. Verify the maximum capacity exceeds the cylinder weight only

C. Zero (tare) the scale and confirm it is calibrated

D. Place the scale on a soft surface to absorb vibration

6. Two technicians must communicate hand signals during a crane lift of rooftop equipment. Why is a single designated signaller used?

A. To reduce the number of workers required for the lift

B. To allow the operator to choose which signals to follow

C. To prevent conflicting signals that could cause an accident

D. To satisfy the equipment manufacturer's warranty terms

7. A torch flame burning with a long, feathery secondary cone and a sooty tip indicates which condition?

A. A neutral flame correctly balanced for brazing

B. A carburizing flame with excess acetylene

C. An oxidizing flame with excess oxygen

D. A flashback condition inside the torch body

8. A technician calculates that a job requires 14 m of 1/2-inch copper plus 10% for fittings and waste. How much should be ordered?

A. About 15.4 m of tubing

B. About 14.1 m of tubing

C. About 24 m of tubing

D. About 12.6 m of tubing

9. When organizing a multi-day installation, why is a sequenced work plan prepared before starting?

A. To increase the total refrigerant charge required

B. To set the colour coding of the control wiring

C. To determine the resale value of the equipment

D. To coordinate trades and material delivery efficiently

10. A digital manifold reads 0 kPa gauge while connected to a system known to hold pressure. What is the most likely cause?

A. The system has been fully evacuated to a deep vacuum

B. A closed valve or faulty hose is blocking the reading

C. The refrigerant has condensed entirely in the receiver

D. The gauge is reading absolute instead of gauge pressure

11. A technician works in an equipment room measured at 95 dBA and wears earmuffs. Using the simplified derating where real-world protection is taken as the full NRR minus 7 dB, then halved, an NRR 25 muff reduces exposure by approximately:

A. 9 dB, lowering the exposure to about 86 dBA

B. 25 dB, lowering the exposure to about 70 dBA

C. 0 dB, since earmuffs provide no real reduction

D. 50 dB, doubling the rated NRR value

12. Why must a fire extinguisher rated for the correct class be available during brazing operations?

A. Brazing flux is the only fire risk in the work area

B. Hot work can ignite nearby combustibles, requiring suppression

C. The extinguisher cools the brazed joint after completion

D. Building code requires it only for outdoor work sites

13. A technician interprets a wiring diagram and finds a component labelled "C" on the run capacitor terminal. On a typical single-phase motor, terminal "C" connects to:

A. The start winding only, bypassing the run winding

B. The ground conductor of the supply circuit

C. The common point shared by the line and windings

D. The neutral bus of the main electrical panel

14. A technician brazes a joint and wants the filler to flow fully into the gap. The ideal capillary clearance for a silver-brazed copper joint is approximately:

A. 0.5 to 1.0 mm for the strongest possible joint

B. Zero clearance with the surfaces pressed together

C. 0.04 to 0.20 mm to allow proper capillary action

D. Over 2 mm to give the filler room to pool

15. During work-site preparation, a technician must protect a sprinkler head near the brazing area. The correct measure is to:

A. Remove the sprinkler head temporarily during the work

B. Spray the head with water to keep it cool during brazing

C. Increase the brazing temperature to finish faster

D. Shield the head and avoid directing heat toward it

16. A copper tube is cut and the reamed bore measures slightly smaller than expected. The most likely reason is that the:

A. Tubing cutter wheel rolled an inward burr that was reamed

B. Tube was annealed and expanded during cutting

C. Reamer enlarged the inside diameter excessively

D. Copper work-hardened and shrank after cutting

17. A technician swages a 7/8-inch tube to join an equal-diameter tube. The swage depth should be approximately:

A. One-quarter of the tube diameter for clearance

B. About one tube diameter for adequate joint overlap

C. Three tube diameters to maximize strength

D. Only the wall thickness, just enough to seat it

18. When purging with nitrogen during brazing, a low continuous flow is used rather than high pressure because high flow would:

A. Cool the joint too slowly to allow filler flow

B. Increase oxide formation inside the tubing

C. Create back-pressure that blows out molten filler

D. Reduce the strength of the brazed connection

19. A black-iron gas pipe joint is threaded and assembled. To check for leaks after pressurizing, the technician applies:

A. An open flame near the joint to detect escaping gas

B. An approved leak-detection solution to watch for bubbles

C. A megohmmeter across the threaded connection

D. A refrigerant electronic leak detector to the joint

20. A soft-copper line set must be routed around a beam with a smooth radius. The correct tool is a:

A. Lever-type tube bender sized for that tubing

B. Pair of channel-lock pliers to form the bend

C. Hammer and block to shape the bend gradually

D. Heat gun to soften and bend the tube freehand

21. A technician fabricating a duct transition must reduce 600 mm to 400 mm over a short length. The concern with too abrupt a transition is:

A. Increased turbulence and static pressure loss

B. Reduced refrigerant velocity in the duct

C. Excessive subcooling at the condenser coil

D. Higher compressor discharge temperature

22. Why is a deburring/reaming step critical after cutting tube for a system that will run high refrigerant velocity?

A. It increases the outside diameter for brazing fit

B. It work-hardens the tube to resist vibration

C. It cleans the exterior surface for flux application

D. A burr causes turbulence, restriction, and oil trapping

23. A technician applies brazing flux when joining copper to brass. The flux is required here because:

A. Brass joints need flux to prevent oxide and aid wetting

B. Copper-to-brass joints are self-fluxing with phos-copper

C. Flux lowers the melting point of the brass base metal

D. Flux is only cosmetic and improves joint appearance

24. A pressure test holds 3,100 kPa overnight but reads 2,950 kPa the next morning at a lower ambient temperature. The most likely explanation is:

A. The pressure dropped because temperature dropped, not a leak

B. A significant leak developed during the night

C. The nitrogen reacted with the copper tubing

D. The gauge failed and must be replaced immediately

25. When routing a suction line across a flat roof, the line is supported on blocks rather than laid directly on the membrane to:

A. Increase refrigerant velocity through the line

B. Reduce the refrigerant charge in the system

C. Lower the suction pressure entering the compressor

D. Protect the roof membrane and allow drainage

26. A technician must connect copper tubing to a steel header. The appropriate filler for this dissimilar-metal joint is:

A. Phos-copper without any flux applied

B. 50/50 tin-lead soft solder with rosin flux

C. Pure tin solder rated for potable water

D. Silver brazing alloy with the correct flux

27. During site preparation, the technician confirms the structural capacity of a rooftop location before placing equipment because:

A. The roof colour affects condenser heat rejection

B. Structural rating sets the refrigerant charge limit

C. The unit weight could exceed the roof's load rating

D. The roof slope determines the duct sizing required

28. A flare connection on a 3/8-inch line is made and the flare nut is torqued to spec. If no torque wrench is available, the risk of guessing is:

A. The flare will always seal regardless of torque

B. Torque has no effect once threads engage

C. Under-torque strengthens the flare connection

D. Over-torque cracks the flare; under-torque leaks

29. When fabricating refrigerant piping, a trap is placed at the base of a long suction riser primarily to:

A. Drain condensate from inside the suction line

B. Act as a vibration isolator at the riser base

C. Reduce the refrigerant charge in the riser

D. Collect oil so velocity can carry it up the riser

30. A technician calculates pipe expansion: a 20 m copper line will rise 30°C. With copper expanding ~0.017 mm/m·°C, the approximate growth is:

A. About 10 mm of linear expansion in the run

B. About 1 mm of linear expansion in the run

C. About 100 mm of linear expansion in the run

D. About 0.5 mm of linear expansion in the run

31. When threading and assembling steel pipe for a refrigeration relief discharge line, the joints must be:

A. Sealed with an approved compound rated for the service

B. Left loose to allow pressure relief at the threads

C. Brazed with silver alloy at every connection

D. Coated only with refrigeration oil on the threads

32. A technician notices a copper line will contact a galvanized strut directly. To prevent galvanic corrosion, the correct action is to:

A. Braze the copper line directly to the strut

B. Use an isolating material between the dissimilar metals

C. Paint the strut the same colour as the copper

D. Leave a small air gap and run the line loose

33. A system rejects 18 kW at the condenser while absorbing 14 kW at the evaporator. The compressor work input is approximately:

A. About 32 kW added to the refrigerant

B. About 14 kW equal to the evaporator load

C. About 18 kW equal to the condenser load

D. About 4 kW, the difference between the two

34. When planning a liquid line that rises 12 m vertically, the designer must account for the static pressure loss because it can cause:

A. Oil to accumulate at the top of the liquid riser

B. Flash gas at the metering device from pressure drop

C. The liquid line to require larger diameter than suction

D. Refrigerant to flash due to gravity assistance upward

35. A psychrometric calculation shows entering air at 24°C DB / 17°C WB and leaving at 13°C DB / 12°C WB. The sensible cooling corresponds to the:

A. Change in wet-bulb temperature across the coil

B. Change in dew point across the cooling coil

C. Change in dry-bulb temperature across the coil

D. Change in enthalpy along the saturation curve

36. A TXV must be selected for a 10 kW evaporator at a specific pressure drop. Selecting a valve rated for 18 kW at that condition would likely cause:

A. The valve to starve the evaporator continuously

B. The oversized valve to hunt and overfeed the coil

C. No effect because larger valves self-adjust

D. The condenser to subcool excessively at all loads

37. When planning duct sizing using the equal-friction method, the designer maintains a constant:

A. Air velocity in every section of the duct system

B. Cross-sectional area throughout the duct run

C. Volume of air in each branch regardless of load

D. Friction loss per unit length across the system

38. A heat-load estimate for a server room must treat the IT equipment load as:

A. A latent load requiring heavy dehumidification

B. A negligible load that can be ignored in sizing

C. A sensible heat load nearly equal to the electrical input

D. A load only present during occupied hours

39. When planning refrigerant pipe sizing, undersizing the suction line will primarily cause:

A. Excessive subcooling at the condenser outlet

B. Reduced head pressure at the compressor discharge

C. Increased refrigerant charge in the system

D. High pressure drop and reduced compressor capacity

40. A control plan specifies a low-ambient control on an air-cooled condenser. Its purpose is to maintain:

A. Adequate head pressure for proper TXV operation in cold weather

B. The correct refrigerant charge during summer operation

C. A constant suction pressure regardless of load

D. The supply-air temperature at the diffuser

41. A circuit draws 12 A at 240 V single phase. The apparent power is approximately:

A. About 2,880 VA for the circuit

B. About 20 VA for the circuit

C. About 252 VA for the circuit

D. About 28,800 VA for the circuit

42. When planning a condensate drain for a coil under negative pressure (draw-through), the trap must be deep enough to:

A. Increase the airflow across the cooling coil

B. Reduce the refrigerant charge in the system

C. Prevent oil from entering the drain line

D. Overcome the negative pressure and let water drain

43. A designer selects conductor size for a circuit with a 30 A continuous load. Code generally requires sizing conductors and protection to at least:

A. 125% of the continuous load, about 37.5 A

B. 80% of the load, about 24 A

C. Exactly 100% of the load, 30 A

D. 50% of the load, about 15 A

44. When planning a system with a temperature-glide blend, the design must reference performance using:

A. The midpoint or appropriate dew/bubble temperature for the blend

B. A single fixed saturation temperature like an azeotrope

C. The critical temperature of the blend only

D. The colour code of the refrigerant cylinder

45. A liquid line is sized for low pressure drop because excessive pressure drop in the liquid line can:

A. Increase subcooling and improve capacity

B. Cause flashing before the metering device

C. Raise the suction pressure at the compressor

D. Reduce the condenser heat rejection rate

46. A technician plans the location of a refrigerant detector in a machinery room per CSA B52 for a system using a refrigerant that is heavier than air. The detector should be placed:

A. At the highest point of the ceiling above the equipment

B. Outside the room, next to the entry door

C. Near the supply-air diffuser serving the room

D. Low in the room, where the heavier-than-air refrigerant settles

47. A designer specifies an oversized return-air grille. The benefit at the planned airflow is:

A. Lower face velocity, reducing noise and pressure drop

B. Higher refrigerant subcooling at the condenser

C. Increased static pressure on the supply side

D. Reduced compressor amperage during operation

48. When planning a multi-evaporator system on one compressor, an evaporator pressure regulator (EPR) is used to:

A. Increase the suction pressure to all coils equally

B. Meter liquid refrigerant into each evaporator

C. Lower the head pressure at the condenser

D. Maintain a higher pressure on a warmer evaporator

49. A heat-pump design must size the supplementary electric heat to cover the:

A. Cooling load on the hottest design day

B. Defrost cycle energy requirement only

C. Heating shortfall below the balance point

D. Latent load during the dehumidification cycle

50. When planning a piping run, the designer adds the equivalent length of valves and fittings to the straight length to correctly calculate:

A. The total refrigerant charge weight required

B. The structural support spacing for the pipe

C. The total pressure drop for line sizing

D. The ambient heat gain into the line

51. A technician installs a TXV with an external equalizer. The equalizer line is connected to the:

A. Liquid line ahead of the valve inlet

B. Suction line just past the sensing bulb

C. Discharge line at the compressor outlet

D. Receiver outlet on the high-pressure side

52. During installation, a scroll compressor must rotate in the correct direction. After wiring three-phase power, reverse rotation will:

A. Improve the compressor pumping efficiency

B. Have no effect on a scroll-type compressor

C. Produce no pumping and loud operation, risking damage

D. Reverse the condensate drain flow direction

53. A filter drier installed in the liquid line must have its arrow pointing toward the:

A. Compressor suction inlet for protection

B. Condenser inlet to trap discharge debris

C. Receiver to filter the stored liquid

D. Metering device, matching liquid flow direction

54. A technician installs vibration isolators under a rooftop unit. If the isolators are bottomed out (fully compressed), the result is:

A. Improved vibration isolation from the structure

B. Vibration transmitted directly to the building

C. Lower compressor amperage during operation

D. Increased refrigerant subcooling at the coil

55. When installing a long line set, the additional refrigerant beyond the factory charge is determined by:

A. The colour of the suction line insulation jacket

B. The voltage supplied to the condensing unit

C. The ambient temperature at installation time

D. The line length and the manufacturer's charge chart

56. A technician installs a sight glass in the liquid line. Its correct location is:

A. In the liquid line downstream of the filter drier

B. In the suction line near the compressor inlet

C. In the discharge line after the compressor

D. In the equalizer line of the expansion valve

57. When installing the TXV sensing bulb on a 7/8-inch horizontal suction line, it is clamped at the:

A. 6 o'clock bottom position for accuracy

B. 12 o'clock top position for fast response

C. 10 or 2 o'clock upper-side position

D. Any position as long as it is taped on

58. A technician makes electrical connections and must protect a 24 V control transformer from a secondary short. The correct protection is:

A. A high-pressure refrigerant cutout in the circuit

B. The compressor contactor wired in series

C. An inline fuse or built-in thermal protection

D. A larger primary conductor on the 240 V side

59. During installation, a refrigerant line passes through a fire-rated assembly. The penetration must be:

A. Left open to allow pressure equalization

B. Firestopped with an approved system maintaining the rating

C. Insulated only and left otherwise unsealed

D. Doubled in pipe diameter at the wall

60. A technician installs a condensate pump below a coil. The high-water safety float should be wired to:

A. Increase the compressor speed on high water

B. Shut off cooling when the water level is high

C. Reverse the condensate pump motor direction

D. Sound an alarm without stopping the equipment

61. When installing an accumulator on a heat pump, it is placed in the:

A. Suction line to catch liquid before the compressor

B. Liquid line to meter refrigerant to the coil

C. Discharge line to separate oil from gas

D. Equalizer line of the metering device

62. A technician charges a system with a 410-type refrigerant blend. The charge must be added as:

A. Vapour from the top of an upright cylinder

B. Either phase, since the blend is azeotropic

C. Liquid, to maintain correct blend composition

D. A shaken mixture poured into the suction port

63. During installation, conductors entering a metal panel must pass through a connector or bushing to:

A. Increase the conductor current-carrying capacity

B. Prevent abrasion of insulation on the metal edge

C. Reduce the voltage drop along the conductor

D. Shield the wiring from refrigerant exposure

64. A technician installs a crankcase heater. It must be energized during:

A. Only the active cooling cycle of the system

B. The defrost cycle of a heat pump only

C. Compressor running periods to warm the oil

D. Off-cycles to prevent refrigerant migration to the crankcase

65. When installing ductwork, a flexible connector is used at the air handler to:

A. Increase the supply-air static pressure delivered

B. Filter particulates from the supply airstream

C. Isolate fan vibration from the duct system

D. Reduce the duct cross-sectional area at the unit

66. A three-phase unit nameplate shows MCA 28 A and MOCP 45 A. The conductor must be sized to carry at least:

A. 45 A, matching the maximum protection rating

B. 14 A, half of the minimum circuit ampacity

C. 90 A, double the overcurrent protection

D. 28 A, the minimum circuit ampacity value

67. When installing a heat pump's reversing valve, the technician confirms it can redirect flow to:

A. Switch the system between heating and cooling

B. Meter refrigerant into the indoor coil

C. Separate oil from the discharge gas

D. Regulate the condenser fan motor speed

68. A technician installs refrigerant piping and torques flare connections. Correct torque matters because:

A. More torque always produces a tighter seal

B. Torque only affects electrical terminal connections

C. Over-torque cracks the flare while under-torque leaks

D. Hand-tight is sufficient for any flare joint

69. When mounting a horizontal evaporator coil and drain pan, the pan must slope toward the drain or:

A. The refrigerant charge will be incorrect

B. The cooling capacity will increase sharply

C. The airflow will reverse across the coil

D. Standing water will accumulate and overflow

70. A technician installing an oil separator on a low-temperature system places it in the:

A. Suction line to trap returning liquid

B. Liquid line ahead of the metering device

C. Discharge line to return oil to the compressor

D. Equalizer line of the expansion valve

71. When installing line-voltage conductors, the technician sizes them to ampacity because undersized conductors:

A. Overheat under load and create a fire hazard

B. Reduce the system's refrigeration capacity

C. Lower the control circuit voltage supplied

D. Increase the refrigerant flow through the line

72. A split system's outdoor unit sits below the indoor coil with a tall suction riser. The technician installs an oil-return feature because:

A. The liquid line needs additional subcooling

B. The condenser requires more airflow at height

C. The discharge line must be insulated for the rise

D. Oil must be carried up the vertical suction riser

73. During installation, a technician must verify three-phase rotation before full startup primarily to protect the:

A. Condensate drain from flowing backward

B. Control transformer from a secondary short

C. Sight glass from clouding during operation

D. Compressor from damage due to reverse rotation

74. When installing tubing outdoors with insulation, UV-resistant jacketing is applied because:

A. UV light raises refrigerant pressure in the line

B. UV exposure improves insulation appearance

C. UV degrades unprotected insulation over time

D. UV light increases the insulation R-value

75. A technician installs a hard-start kit on a single-phase compressor. Its purpose is to:

A. Boost starting torque to help a hard-starting compressor

B. Reduce the running amperage during normal operation

C. Lower the head pressure at the condenser coil

D. Meter additional refrigerant during startup

76. When installing a packaged gas/electric rooftop unit, the gas heat section requires:

A. A completely sealed cabinet with no openings

B. Reduced gas pressure below the manifold rating

C. Adequate combustion air and proper flue venting

D. Insulation packed tightly around the burners

77. During commissioning, a technician measures liquid-line temperature of 38°C against a condensing temperature of 47°C. The subcooling is:

A. 47°C, the condensing temperature itself

B. 9°C, the difference between the two values

C. 85°C, the sum of both temperatures

D. 38°C, the liquid-line temperature alone

78. A technician reads suction pressure equivalent to 5°C saturation and a suction-line temperature of 12°C at the bulb. The superheat is:

A. 17°C, the sum of both temperature values

B. 5°C, the saturation temperature alone

C. 7°C, the difference between the two values

D. 12°C, the suction-line temperature alone

79. During commissioning, the micron gauge is valved off and the reading slowly climbs and then stabilizes at a high level. This indicates:

A. The system is dry and completely leak-free

B. Moisture remains, off-gassing into the vacuum

C. A leak admitting atmosphere continuously

D. The vacuum pump oil needs replacement now

80. A technician commissions a TXV system and finds 1°C of superheat with the bulb correctly mounted. The valve is most likely:

A. Starving the evaporator of refrigerant flow

B. Operating correctly within the target range

C. Restricted by a clogged liquid-line drier

D. Overfeeding, risking liquid floodback to the compressor

81. During commissioning, voltage measured across three legs reads 480 V, 478 V, and 462 V. The percent imbalance from the 473 V average is closest to:

A. About 2.3%, exceeding the typical 2% limit

B. About 0.2%, well within acceptable limits

C. About 18%, indicating a severe single-phase fault

D. About 0%, since all legs are effectively equal

82. A commissioning check shows airflow of 320 CFM per ton against a target near 400 CFM per ton. The low airflow will tend to:

A. Raise the coil temperature and reduce dehumidification

B. Increase the head pressure at the condenser sharply

C. Have no effect on the system operation at all

D. Lower the coil temperature, risking icing of the coil

83. During commissioning, the technician confirms the high-pressure cutout by inducing high pressure. The control should:

A. Modulate the compressor speed proportionally

B. Close the circuit when pressure reaches setpoint

C. Energize the reversing valve for defrost

D. Open the circuit and stop the compressor at setpoint

84. A system is commissioned with subcooling of 11°C (target 6°C) and elevated head pressure. The most likely cause is:

A. A low refrigerant charge in the system

B. An overcharge of refrigerant in the system

C. A restricted suction line near the compressor

D. A failed indoor blower motor capacitor

85. During airflow commissioning, total external static pressure measures well above design. A likely cause is:

A. Oversized ductwork throughout the system

B. All supply registers fully open and clear

C. The fan running below its rated speed

D. A dirty filter or closed dampers restricting flow

86. A heat pump is commissioned in heating mode and the technician verifies the defrost termination. Defrost should end based on:

A. Coil temperature or time, clearing the frost

B. The indoor thermostat setpoint being reached

C. The condensate pump float switching off

D. The crankcase heater reaching temperature

87. During commissioning, the technician records compressor amperage at 32 A against an RLA of 24 A. This high reading suggests:

A. The refrigerant charge is precisely correct

B. Overload, possibly high head or mechanical issue

C. The condensate drain slope is incorrect

D. The suction line insulation is missing

88. A fixed-orifice system is commissioned using the manufacturer's charging chart. The primary reading used is:

A. Superheat referenced to indoor and outdoor conditions

B. Subcooling at the condenser outlet only

C. Discharge line temperature at the compressor

D. The condensate temperature at the drain pan

89. During commissioning, the technician verifies the low-pressure control setpoint, which protects against:

A. Operation at unsafely low suction pressures

B. Excessive condensing temperature at the coil

C. Overvoltage in the control transformer

D. Reverse rotation of the compressor motor

90. A balancing damper is adjusted during commissioning. The setting is confirmed by measuring:

A. The subcooling at the condenser outlet

B. The airflow in CFM at the diffuser

C. The line voltage at the air handler

D. The discharge pressure of the compressor

91. During commissioning of a glide blend, the charge is weighed in and the readings interpreted using:

A. A single saturation temperature like an azeotrope

B. The critical pressure of the blend components

C. The colour code printed on the cylinder label

D. The appropriate dew or bubble point for the blend

92. A commissioning record shows low subcooling, high superheat, and low head pressure together. The most likely cause is:

A. A low refrigerant charge in the system

B. An overcharge of refrigerant in the system

C. A restricted liquid-line filter drier

D. Non-condensable gases in the high side

93. During commissioning, baseline readings of pressures, temperatures, and amperages are recorded to:

A. Set the warranty colour coding scheme

B. Provide a reference for future service diagnostics

C. Calculate the brazing temperature for repairs

D. Determine the equipment resale value

94. A multi-stage cooling system is commissioned. Correct staging is confirmed when:

A. All stages energize at once on the first call

B. Stages alternate randomly during operation

C. Each stage energizes in sequence with rising load

D. Only the last stage operates at any load

95. During commissioning, the technician pours water into the condensate pan to:

A. Measure the refrigerant charge level present

B. Confirm the trap and drain carry water away

C. Set the thermostat differential for cooling

D. Verify the supply-air temperature at the diffuser

96. A walk-in freezer is commissioned and the defrost cycle verified. The defrost cycle's purpose is to:

A. Increase refrigeration capacity at startup

B. Recover refrigerant from the evaporator

C. Lower suction pressure for a colder box

D. Remove ice accumulation from the evaporator coil

97. During commissioning, the technician weighs in charge on a TXV system rather than charging by pressure because:

A. Weighing to spec gives the precise correct charge

B. Pressure charging is always more accurate

C. Weighing removes the need for gauges entirely

D. The TXV requires removal before charging

98. During service, a dirty condenser coil is found. The direct operating symptom is:

A. Lower head pressure with excessive subcooling

B. Higher head pressure and reduced efficiency

C. Reduced suction pressure with high superheat

D. Increased refrigerant charge in the receiver

99. A technician measures motor winding resistance and finds infinite ohms across one winding. This indicates:

A. A shorted winding drawing excess current

B. A grounded winding shorted to the shell

C. An open winding with a broken circuit path

D. A normal winding within specification

100. During service, a megohmmeter reads very low resistance from a winding to the compressor shell. This means:

A. The windings are in perfect condition

B. The run capacitor needs replacement only

C. The motor insulation has failed to ground

D. The refrigerant charge is slightly low

101. A system shows frosting of the suction line back to the compressor. The most likely cause is:

A. A dirty condenser coil restricting heat rejection

B. A flooding or low-load condition carrying liquid back

C. A failed crankcase heater drawing excess current

D. An open high-pressure cutout stopping the unit

102. During service, refrigerant must be recovered. Regulations require that the refrigerant be:

A. Vented to atmosphere if under one kilogram

B. Mixed with other types in one cylinder

C. Recovered into an approved cylinder, never vented

D. Released slowly to reduce its impact

103. A technician finds non-condensable gases in a system. The typical symptom is:

A. Lower head pressure than the condensing temperature suggests

B. A vacuum forming in the high side during running

C. Higher head pressure than the condensing temperature suggests

D. Excessive subcooling with frosting at the evaporator

104. During service, a run capacitor measures far below its rated microfarads. The motor will:

A. Run faster than its rated nameplate speed

B. Improve its operating efficiency noticeably

C. Operate with no change to performance

D. Fail to start or run with reduced torque

105. A TXV is suspected of having lost its bulb charge. The confirming symptom is:

A. The valve closes and starves the evaporator

B. The valve floods the evaporator completely

C. The subcooling drops far below normal

D. The head pressure rises far above normal

106. During service, a contactor's contacts are pitted and burned. The correct action is to:

A. File the contacts smooth and return to service

B. Apply dielectric grease to the burned contacts

C. Replace the contactor rather than filing contacts

D. Increase the control voltage to compensate

107. A technician services a system with normal subcooling, high superheat, and low suction pressure. This points to:

A. A severe overcharge of refrigerant present

B. A restriction such as a clogged drier or starved TXV

C. A failed condenser fan causing high head pressure

D. Excessive oil circulating through the system

108. During service, a three-phase motor hums but will not start, and one leg reads no current. The fault is:

A. Single-phasing from a blown fuse or open leg

B. An overcharge of refrigerant blocking startup

C. A stuck condensate pump float switch

D. A crankcase heater consuming all the current

109. A technician measures evaporator coil icing on an AC system with confirmed adequate airflow. The next cause to investigate is:

A. An overcharge of refrigerant in the condenser

B. A low refrigerant charge dropping coil temperature

C. A failed crankcase heater on the compressor

D. A blocked condensate drain at the trap

110. During service, the most sensitive method for locating a small refrigerant leak is:

A. An electronic leak detector calibrated for the refrigerant

B. A visual inspection of the joints with a light

C. Listening for hissing near the connections

D. Soap bubbles applied to accessible joints only

111. A technician opens a sealed system for repair and must replace the liquid-line drier because:

A. The old drier may be saturated and cannot protect the system

B. A new drier is required only for appearance

C. The old drier improves flow when reused

D. The old drier increases the cooling capacity

112. A heat pump is stuck in defrost and will not return to heating. The component to check first is:

A. The indoor blower motor run capacitor

B. The liquid-line sight glass for bubbles

C. The condensate pan float switch

D. The defrost control board and termination sensor

113. During service, an oversized drive pulley is found on a belt-driven blower. Increasing blower speed will:

A. Decrease airflow and motor amperage draw

B. Have no effect on airflow or amperage

C. Reverse the direction of the airflow

D. Increase airflow and motor amperage draw

114. A technician finds oil logging in a commercial evaporator. This typically indicates:

A. The condenser is rejecting excessive heat

B. Poor oil return, often from low velocity or piping

C. The system has excessive subcooling at the coil

D. The high-pressure cutout is set too high

115. During service, a recovery cylinder must not be overfilled because:

A. Overfilling improves the recovery machine efficiency

B. Overfilling reduces the cylinder's internal pressure

C. Liquid expansion with no vapour space risks rupture

D. Overfilling has no safety consequence at all

116. A compressor cycles repeatedly on its internal overload. After ruling out high head pressure, the technician checks:

A. Low voltage, a weak capacitor, or a mechanical bind

B. The colour of the suction line insulation

C. The slope of the condensate drain line

D. The brand printed on the refrigerant cylinder

117. During service, why are both superheat and subcooling measured when diagnosing a charge problem?

A. Subcooling measures only the airflow across the coil

B. Superheat alone identifies every charge fault reliably

C. Subcooling is irrelevant to refrigerant charge

D. Together they isolate charge versus metering problems

118. A technician services an A2L flammable refrigerant system. The required additional precaution is to:

A. Use any standard recovery machine without changes

B. Braze with an open flame near the charge port freely

C. Eliminate ignition sources and ensure ventilation

D. Skip leak detection since A2L is only mildly flammable

119. During service, a hot, discoloured discharge line with a burnt odour indicates:

A. The system is operating well within normal limits

B. Excessive discharge temperature, possibly low charge or restriction

C. The refrigerant charge is slightly above target

D. The condensate drain is overflowing the cabinet

120. A cooling-tower condenser-water loop is serviced. The most important water-treatment concern is:

A. Increasing water flow to raise condensing temperature

B. Reducing airflow across the tower fill material

C. Controlling scale, corrosion, and biological growth

D. Eliminating the makeup water supply entirely

121. A system has lost its entire refrigerant charge with no obvious leak. Before recharging, the technician must:

A. Recharge immediately and watch for another drop

B. Add extra refrigerant to offset the expected loss

C. Pressure-test with nitrogen, repair the leak, then evacuate

D. Install a larger receiver to hold more reserve

122. During service, a technician documents refrigerant compliance. The most important data to record is:

A. The colour of the equipment cabinet and location

B. The type and quantity of refrigerant added or recovered

C. The brand of tools used during the service call

D. The ambient temperature in the parking lot

123. A technician finds a compressor with a tripped internal overload that resets when cooled. After confirming charge, the next likely cause is:

A. The colour code of the discharge line insulation

B. The slope of the condensate drain line at the trap

C. The brand of the replacement filter drier installed

D. Poor cooling, low voltage, or a failing capacitor

124. During maintenance, why is a TXV sensing bulb checked for proper clamping and insulation?

A. Loose clamping increases the refrigerant charge

B. Poor contact gives false superheat and misfeeds the coil

C. The bulb sets the condenser subcooling value

D. The bulb regulates the compressor amperage draw

125. A technician services a system and measures a 14°C dry-bulb drop across the evaporator coil. For comfort cooling this value is:

A. Far too low, indicating a severe overcharge

B. Impossible on any refrigeration system

C. Within the normal expected operating range

D. A clear sign of a completely failed compressor

Practice Exam 24: Answer Key and Explanations

1. A — As a sling angle decreases from vertical toward horizontal, the tension in each leg increases for the same load, because more of the force acts along the sling rather than straight up. This is why low sling angles can overload a sling rated for the weight. Always account for the angle reduction factor when rigging.

2. B — In the ASHRAE refrigerant safety system, "A" denotes lower toxicity and "2L" denotes lower flammability with a low burning velocity. A2L refrigerants are mildly flammable but burn slowly, which affects charge limits and ignition-source controls. Knowing this classification governs the safe-handling precautions required.

3. D — The higher cylinder-pressure gauge shows the pressure remaining stored in the supply cylinder, while the regulated gauge shows delivery pressure. The regulator steps the high supply pressure down to the working test pressure. Reading both confirms adequate supply and correct delivery.

4. B — Zero-energy verification requires testing the circuit with a meter and attempting to start the equipment after lockout. This confirms the isolation actually removed power rather than relying on the lock alone. "Try" testing prevents working on a circuit that is still live.

5. C — A charging scale must be zeroed (tared) and confirmed calibrated before weighing in refrigerant, so the displayed mass reflects only the refrigerant added. An untared or uncalibrated scale produces charging errors. Accurate charge is critical for proper system performance.

6. C — A single designated signaller prevents conflicting hand signals that could cause the operator to move a load unsafely. One clear line of communication eliminates ambiguity during a lift. This is a fundamental rigging-safety practice.

7. B — A long, feathery secondary cone with a sooty tip indicates a carburizing flame with excess acetylene. This flame adds carbon and lacks the balanced heat of a neutral flame used for brazing. Adjusting oxygen to remove the feather produces the neutral flame needed.

8. A — Adding 10% to 14 m gives $14 \times 1.10 = 15.4$ m of tubing to cover fittings and waste. Ordering the calculated allowance prevents running short mid-job. Material take-offs always include a waste factor for practical installation.

9. D — A sequenced work plan coordinates trades and material delivery so the installation proceeds efficiently without conflicts or delays. Planning the order of operations avoids rework and idle time. Good organization is a core occupational skill on multi-day jobs.

10. B — A zero reading on a system known to hold pressure usually means a closed valve or faulty hose is blocking the gauge from sensing system pressure. The reading reflects the hose, not the system. Checking valve positions and hoses is the first troubleshooting step.

11. A — Applying the stated derating, $(NRR - 7) \div 2 = (25 - 7) \div 2 = 9$ dB of real-world protection, lowering 95 dBA to about 86 dBA. Laboratory NRR overstates field performance, so this derating gives a realistic exposure estimate. The result confirms whether the chosen protection is adequate for the noise level.

12. B — Hot work such as brazing can ignite nearby combustibles, so a correctly rated extinguisher must be available to suppress a fire quickly. Fire watch and suppression are required hot-work controls. This protects both the worker and the building.

13. C — On a single-phase motor, terminal "C" is the common point shared by the line connection and the start and run windings. The run capacitor connects between start and run terminals, while common ties the circuit together. Correct terminal identification is essential for wiring and testing.

14. C — A capillary clearance of roughly 0.04 to 0.20 mm allows the brazing filler to be drawn into the joint by capillary action. Too tight blocks flow and too wide prevents capillary draw, both weakening the joint. Proper fit-up is essential for sound brazed connections.

15. D — A sprinkler head near brazing must be shielded and heat kept away, because excess heat can trigger the head or damage it. Spraying or removing it creates other hazards. Shielding protects the fire-suppression system while allowing the work to proceed.

16. A — A tubing cutter rolls material inward, creating a burr that reduces the effective bore until it is reamed out. The slightly smaller reading reflects that rolled-in edge. Reaming restores the full inside diameter for proper flow.

17. B — A swage depth of about one tube diameter gives enough overlap for a strong brazed joint between equal-diameter tubes. Too shallow provides insufficient bonding surface. Matching depth to diameter is the standard field rule.

18. C — Excessive nitrogen flow during brazing creates back-pressure that can blow molten filler out of the joint before it solidifies. A low, steady purge displaces oxygen without disturbing the filler. Controlled flow prevents both oxidation and joint defects.

19. B — A threaded gas joint is leak-checked with an approved leak-detection solution, watching for bubbles at the connection. An open flame is dangerous and electronic detectors are for refrigerants. Bubble testing safely confirms a gas-tight joint.

20. A — A lever-type tube bender sized for the tubing produces a smooth bend without kinking soft copper. Pliers, hammers, or freehand heating collapse or deform the tube. The correct bender preserves the bore through the radius.

21. A — An abrupt duct transition creates turbulence and increases static pressure loss as air struggles to follow the sharp change. Gradual transitions keep airflow smooth and efficient. Proper transition angles reduce energy loss and noise.

22. D — A burr left after cutting causes turbulence, flow restriction, and a point where oil can be trapped, which is especially harmful at high refrigerant velocity. Deburring restores a clean full-bore path. This protects flow and oil return.

23. A — Joining copper to brass requires flux to prevent oxide formation and promote wetting, because phos-copper is not self-fluxing on brass. The flux cleans the surfaces so the filler bonds. Without it the joint will not wet properly.

24. A — A pressure drop matching a temperature drop overnight is expected, since gas pressure falls as temperature falls per the gas law, not because of a leak. A true leak would show a loss beyond what cooling explains. Always correlate pressure change with temperature before declaring a leak.

25. D — Supporting a suction line on blocks protects the roof membrane from abrasion and chemical contact and allows water to drain beneath the line. Direct contact damages the roof and traps water. Proper support preserves both the line and the roof.

26. D — Joining copper to a steel header requires a silver brazing alloy with the correct flux for the dissimilar metals. Soft solders lack the strength and temperature rating, and phos-copper is not suitable here without flux. Silver brazing with flux makes a sound, strong joint.

27. C — Structural capacity must be confirmed because the unit weight could exceed the roof's load rating, risking structural failure. Verifying the rating before placement is a safety requirement. Roof colour and slope do not govern load capacity.

28. D — Without a torque wrench, guessing risks over-torque that cracks the flare or under-torque that leaks. Correct torque produces a reliable metal-to-metal seal. Manufacturer torque values exist precisely to avoid both failures.

29. D — A trap at the base of a suction riser collects oil so refrigerant velocity can carry accumulated slugs up the vertical run. This ensures oil returns to the compressor on tall risers. It is not for condensate or vibration.

30. A — Copper expansion of 0.017 mm/m·°C over 20 m and 30°C gives $0.017 \times 20 \times 30 \approx 10.2$ mm of growth. This linear expansion must be accommodated with offsets or loops. Ignoring it stresses joints and supports.

31. A — A relief discharge line of threaded steel pipe must be sealed with an approved compound rated for the service to be gas-tight and code-compliant. Loose or oil-only joints leak, and brazing is not used for threaded steel here. Proper sealant ensures integrity.

32. B — Preventing galvanic corrosion between copper and galvanized steel requires an isolating material between the dissimilar metals. Direct contact in the presence of moisture creates a corrosion cell. Isolation breaks the galvanic circuit.

33. D — By energy balance, condenser heat rejection (18 kW) equals evaporator load (14 kW) plus compressor work, so the work input is $18 - 14 = 4$ kW. The compressor adds the heat of compression to the absorbed load. This balance is fundamental to the refrigeration cycle.

34. B — A tall liquid-line lift causes static pressure loss that can drop the refrigerant below its saturation pressure, producing flash gas at the metering device. Flash gas reduces feed and capacity. The lift loss, not gravity or oil, is the design concern.

35. C — Sensible cooling corresponds to the change in dry-bulb temperature across the coil, which represents the removal of sensible heat. Latent (moisture) removal shows as a wet-bulb or dew-point change. Separating the two is key to load analysis.

36. B — An oversized TXV tends to hunt and overfeed the evaporator because it cannot modulate precisely at the lower actual load. Overfeeding lowers superheat and risks floodback. Valves are matched to load and pressure drop to operate stably.

37. D — The equal-friction duct method maintains a constant friction loss per unit length throughout the system, sizing each section accordingly. This balances the design without calculating every branch separately. It is a standard duct-sizing approach.

38. C — IT equipment load is essentially sensible heat nearly equal to the electrical power input, since the energy used becomes heat. Server rooms therefore need high sensible cooling capacity. This drives the cooling design and airflow.

39. D — An undersized suction line creates high pressure drop, lowering suction pressure at the compressor and reducing capacity. The added resistance penalizes performance. Correct line sizing limits pressure drop to acceptable levels.

40. A — A low-ambient control maintains adequate head pressure in cold weather so the TXV has enough pressure differential to feed properly. Without it, low head pressure starves the evaporator. This keeps the system operating in winter.

41. A — Apparent power for a single-phase circuit is voltage times current: 240 × 12 = 2,880 VA. This is the volt-ampere product before any power-factor adjustment. It sets conductor and protection requirements.

42. D — A draw-through coil sits under negative pressure, so the condensate trap must be deep enough to overcome that negative pressure and let water drain instead of being held back. An inadequate trap allows water to back up and overflow. Trap depth is matched to the fan's negative static.

43. A — Code requires conductors and overcurrent protection for a continuous load to be sized at not less than 125% of that load, so 30 A × 1.25 = 37.5 A. The margin accounts for sustained heating under continuous operation. This prevents conductor overheating.

44. A — A glide blend is referenced using the midpoint or the appropriate dew/bubble temperature rather than a single saturation value, because its components boil over a temperature range. Using the correct reference gives accurate superheat and subcooling. This is essential for charging and diagnosis.

45. B — Excessive liquid-line pressure drop can drop the refrigerant below saturation and cause flashing before the metering device. Flash gas reduces the valve's liquid feed and capacity. Liquid lines are sized for low pressure drop to keep the refrigerant subcooled.

46. D — A refrigerant heavier than air settles toward the floor on a leak, so CSA B52 calls for the detector to be mounted low in the machinery room where the gas accumulates. Matching detector height to the refrigerant's density relative to air ensures the leak is sensed early. A ceiling-mounted sensor would miss a heavier-than-air accumulation.

47. A — An oversized return grille lowers the face velocity at the planned airflow, which reduces noise and pressure drop. Lower velocity means quieter, more efficient return airflow. Grille sizing balances velocity against space and cost.

48. D — An evaporator pressure regulator maintains a higher pressure (and temperature) on a warmer evaporator sharing one compressor, preventing it from being pulled down to the lowest coil's pressure. This allows multiple temperatures on one system. The EPR throttles the suction from that coil.

49. C — Supplementary electric heat is sized to cover the heating shortfall below the balance point, where the heat pump alone cannot meet the load. Below that outdoor temperature the backup makes up the difference. This ensures comfort on the coldest days.

50. C — Adding the equivalent length of fittings and valves to the straight pipe length gives the total effective length used to calculate total pressure drop for line sizing. Each fitting adds resistance equal to a length of pipe. Accurate equivalent length prevents undersizing.

51. B — A TXV external equalizer connects to the suction line just past the sensing bulb, sensing evaporator-outlet pressure to compensate for coil pressure drop. This lets the valve hold correct superheat. Wrong placement defeats its function.

52. C — A scroll compressor run in reverse produces no pumping and runs loudly, and sustained reverse rotation can damage it. Correct three-phase rotation is essential before operation. Rotation must be verified at startup.

53. D — A liquid-line filter drier is installed with its arrow toward the metering device, matching liquid flow direction, so it traps moisture and debris before the TXV or orifice. Reversed installation defeats protection. Flow-direction orientation is critical.

54. B — Vibration isolators that are bottomed out transmit vibration directly into the structure because they can no longer flex. Proper isolators must be free to deflect under load. Correct selection and installation prevent structure-borne noise.

55. D — Additional refrigerant for a long line set is determined by the line length and the manufacturer's charge chart, which specifies grams per metre beyond the pre-charge. The extra tubing volume requires this added charge. Following the chart ensures correct charge.

56. A — A liquid-line sight glass is placed in the liquid line downstream of the filter drier, where it can show a full liquid column and any bubbles indicating low charge or restriction. Its position after the drier reflects true liquid condition. This aids charging and diagnosis.

57. C — A sensing bulb on a larger horizontal suction line is clamped at the 10 or 2 o'clock upper-side position to avoid sensing oil pooled at the bottom. Good contact at this position gives an accurate temperature. The 6 o'clock position reads false low.

58. C — A 24 V control transformer is protected from a secondary short by an inline fuse or built-in thermal protection that opens before the windings burn. Pressure cutouts and contactors do not protect the transformer. Overcurrent protection safeguards the secondary.

59. B — A refrigerant line through a fire-rated assembly must be firestopped with an approved system that maintains the wall's rating at the penetration. Leaving it open or merely insulated breaches the fire separation. Firestopping preserves life-safety compartmentation.

60. B — A condensate pump's high-water safety float is wired to shut off cooling when the water level rises, preventing overflow and water damage if the pump fails. Disabling the cooling stops further condensate production. This is a standard protective interlock.

61. A — An accumulator is installed in the suction line to catch liquid refrigerant before it reaches the compressor, protecting it from slugging during events like heat-pump defrost. It traps liquid and meters it back slowly. This prevents compressor damage.

62. C — A 410-type blend must be charged as liquid to maintain the correct blend composition, since the components would fractionate if charged as vapour. Liquid removal preserves the intended mix. Charging is done with a metering device to avoid slugging.

63. B — Conductors entering a metal panel pass through a connector or bushing to prevent the sharp edge from abrading the insulation. Abraded insulation can short or ground. The bushing protects the wiring at the entry point.

64. D — A crankcase heater is energized during off-cycles to keep the oil warm and prevent refrigerant from migrating and condensing in the crankcase. Cold oil saturated with refrigerant causes a startup slug and oil dilution. The heater protects the compressor.

65. C — A flexible connector at the air handler isolates fan vibration from the duct system, preventing structure-borne noise. It does not raise static pressure, filter air, or reduce duct area. Vibration isolation is its sole purpose here.

66. D — Conductors must be sized to carry at least the minimum circuit ampacity (MCA), which is 28 A here, while MOCP sets the maximum protective device. MCA defines the conductor's required ampacity. Using MCA prevents undersized wiring.

67. A — A reversing valve redirects discharge and suction flow so the indoor and outdoor coils swap roles, switching the heat pump between heating and cooling. This flow reversal lets one system both heat and cool. Other components handle metering and oil.

68. C — Over-torquing a flare can crack it while under-torquing leaves it leaking, so manufacturer torque values produce a reliable seal. More torque is not always better. Correct torque ensures a leak-tight metal-to-metal flare.

69. D — A drain pan must slope toward the drain, or standing water will accumulate and overflow, causing damage and microbial growth. Proper slope empties the pan completely. Pan slope does not affect charge, capacity, or airflow direction.

70. C — An oil separator is installed in the discharge line to capture oil and return it to the compressor, which is important on low-temperature systems where oil return is difficult. It keeps the compressor lubricated. It does not remove moisture or meter refrigerant.

71. A — Undersized line-voltage conductors overheat under load and create a fire hazard, so conductors are sized to their ampacity. Proper sizing keeps conductor temperature safe. Wire size does not change capacity, control voltage, or refrigerant flow.

72. D — An oil-return feature is needed on a tall suction riser to carry oil up the vertical run back to the compressor, since the outdoor unit sits below the indoor coil. Traps or proper velocity ensure oil return. Without it, oil logs and starves the compressor.

73. D — Three-phase rotation is verified before full startup to protect the compressor from damage caused by reverse rotation, which prevents pumping in scroll types. Confirming rotation avoids immediate harm. This is a required commissioning step.

74. C — UV exposure degrades unprotected pipe insulation over time, so outdoor insulation is jacketed with UV-resistant covering. Degraded insulation crumbles and loses R-value. UV protection preserves the insulation's performance.

75. A — A hard-start kit boosts starting torque to help a compressor that struggles to start, typically using a start capacitor and relay. It addresses hard starting, not running amperage or head pressure. It is a starting aid for marginal compressors.

76. C — A gas heat section requires adequate combustion air and proper flue venting for safe, complete combustion and removal of flue gases. Without them, carbon monoxide and incomplete combustion result. Sealing the cabinet or restricting gas pressure is unsafe.

77. B — Subcooling is the difference between condensing temperature and liquid-line temperature: 47 − 38 = 9°C. It indicates how much the liquid is cooled below its saturation point. Subcooling is a key charge and condenser-performance indicator.

78. C — Superheat is the suction-line temperature minus the saturation temperature: 12 − 5 = 7°C. It measures how much the vapour is heated above its boiling point at the evaporator outlet. Superheat confirms proper evaporator feed.

79. B — When the micron gauge is valved off and the reading climbs then stabilizes at a high level, moisture is off-gassing into the evacuated system. A continuous rise without stabilizing signals a leak. Stabilization at a high level points to trapped moisture.

80. D — Only 1°C of superheat means the TXV is overfeeding the evaporator, risking liquid floodback to the compressor. Very low superheat indicates too much refrigerant entering the coil. The valve setting or condition needs correction.

81. A — Using the maximum-deviation method, the worst leg deviates 11 V from the 473 V average, giving 11 ÷ 473 ≈ 2.3%, which exceeds the typical 2% limit. Voltage imbalance above 2% causes motor overheating. This reading warrants investigation before operation.

82. D — Low airflow per ton lowers the coil temperature because less heat reaches the coil, which can drive it below freezing and cause icing. Restricted airflow starves the coil of load. Correcting airflow restores normal coil temperature.

83. D — A high-pressure cutout should open the circuit and stop the compressor when pressure reaches its setpoint, protecting the system. Verifying it trips at the correct point confirms the safety works. It is a protective open-on-rise device.

84. B — High subcooling (11°C versus 6°C) with elevated head pressure indicates an overcharge, as excess liquid backs up in the condenser. The extra refrigerant raises both subcooling and head pressure. A low charge would produce the opposite.

85. D — Higher-than-design external static pressure points to a dirty filter or closed dampers restricting airflow. The added resistance raises static pressure. Oversized ducts or low fan speed would lower it instead.

86. A — A defrost cycle terminates based on coil temperature or a time limit once the frost is cleared, returning the heat pump to heating. Termination sensors and timers govern this. Proper termination prevents wasted energy and short heating loss.

87. B — Amperage of 32 A against a 24 A RLA signals overload, possibly from high head pressure or a mechanical problem in the compressor. High current is a direct sign of excessive loading. This must be diagnosed before the motor is damaged.

88. A — A fixed-orifice system is charged using superheat referenced to indoor and outdoor conditions on the manufacturer's chart, because the orifice does not control superheat. Superheat becomes the charging indicator. Subcooling is the primary method on TXV systems instead.

89. A — A low-pressure control protects the compressor from operating at unsafely low suction pressures, which signal loss of charge or restricted flow. Low suction causes overheating and oil-return problems. The control stops the compressor to protect it.

90. B — A balancing damper is set by measuring airflow in CFM at the diffuser until the design value is reached. Airflow measurement confirms correct balancing. Subcooling, voltage, and discharge pressure are unrelated to air balance.

91. D — A glide blend's readings are interpreted using the appropriate dew or bubble point, because the blend evaporates and condenses over a temperature range. Using the correct reference gives accurate superheat and subcooling. A single saturation value would mislead.

92. A — Low subcooling, high superheat, and low head pressure together indicate a low refrigerant charge. Insufficient refrigerant under-fills both the condenser and evaporator. The combined readings confirm undercharge rather than a restriction or overcharge.

93. B — Recording baseline pressures, temperatures, and amperages provides a reference for diagnosing future performance changes. Technicians compare later readings against the baseline. This documentation supports ongoing service.

94. C — Correct multi-stage operation is confirmed when each stage energizes in sequence as the load increases, matching capacity to demand. Simultaneous, random, or single-stage operation indicates a fault. Staged sequencing is the expected behaviour.

95. B — Pouring water into the condensate pan confirms the trap and drain line carry water away without backing up. A blocked trap or drain shows immediately. This verifies proper drainage at commissioning.

96. D — The defrost cycle removes ice accumulation from the evaporator coil so it can maintain airflow and heat transfer. Iced coils lose capacity. Defrost is not for adding capacity, recovering refrigerant, or lowering suction pressure.

97. A — On a TXV system the charge is weighed in to the manufacturer's specification because the valve maintains superheat across conditions, making pressure-only charging unreliable. Weighing gives the precise correct charge. This is the accurate charging method for TXV systems.

98. B — A dirty condenser coil restricts heat rejection, raising head pressure and reducing efficiency. The compressor works harder against higher discharge pressure. This is the classic dirty-condenser symptom.

99. C — Infinite ohms across a winding indicates an open winding with a broken circuit path, so no current can flow. An open winding renders the motor inoperative. Resistance testing identifies the open circuit.

100. C — Very low resistance from a winding to the shell on a megohmmeter means the motor insulation has failed to ground. A grounded hermetic compressor cannot be repaired and must be replaced. Insulation testing reveals this fault.

101. B — Suction-line frosting back to the compressor indicates a flooding or low-load condition carrying liquid back. Unboiled liquid chills the line below freezing. This floodback risks compressor damage and must be corrected.

102. C — Regulations require refrigerant to be recovered into an approved cylinder and never vented to atmosphere, regardless of quantity. Venting and mixing types are prohibited. Proper recovery protects the environment and complies with law.

103. C — Non-condensable gases such as air raise the head pressure above what the condensing temperature alone would indicate, because the air adds partial pressure in the condenser. This abnormally high head pressure is the telltale symptom. Purging or recovery and evacuation correct it.

104. D — A run capacitor far below its rated microfarads provides insufficient phase shift, so the motor may fail to start or run with reduced torque. The capacitor is essential to proper operation. A weak capacitor degrades performance.

105. A — A TXV that has lost its bulb charge cannot open, so it closes and starves the evaporator of refrigerant. Loss of sensing pressure removes the opening force. The result is starvation and high superheat.

106. C — Pitted, burned contactor contacts should be addressed by replacing the contactor, not filing the contacts, since filing removes plating and shortens life. The contactor is a low-cost wear item. Replacement restores reliable switching.

107. B — Normal subcooling with high superheat and low suction pressure points to a restriction such as a clogged drier or starved TXV. The restriction limits refrigerant to the evaporator while condenser charge stays normal. This signature isolates a flow restriction.

108. A — A three-phase motor that hums but will not start with one leg showing no current is single-phasing from a blown fuse or open leg. Loss of one phase removes starting torque. The fault is electrical phase loss.

109. B — With airflow confirmed adequate, a coil icing over most likely has a low refrigerant charge driving the coil temperature below freezing. Low charge lowers evaporator pressure and temperature. The next step is to check charge.

110. A — An electronic leak detector calibrated for the refrigerant is the most sensitive method for finding small leaks, detecting trace concentrations beyond sight, sound, or bubbles. It locates leaks the other methods miss. It is the preferred precision tool.

111. B — A filter drier is replaced after opening a sealed system because the old drier may be saturated and can no longer protect against moisture and acids. A spent drier offers no protection. A fresh drier safeguards the repaired system.

112. D — A heat pump stuck in defrost should have its defrost control board and termination sensor checked first, since these govern entering and exiting defrost. A failed sensor or board prevents normal termination. These components control the defrost sequence.

113. D — Installing an oversized drive pulley raises blower speed, increasing both airflow and motor amperage draw. More air moved means more work and current. It does not decrease airflow, leave it unchanged, or reverse it.

114. B — Oil logging in an evaporator indicates poor oil return, commonly from low refrigerant velocity or improper piping. The oil collects instead of returning to the compressor. Correcting velocity or piping restores oil return.

115. C — A recovery cylinder must not be overfilled because liquid refrigerant with no vapour space expands with temperature and can cause a hydrostatic rupture. Cylinders are filled only to a safe percentage. This is a serious safety requirement.

116. A — A compressor cycling on its overload, once high head is ruled out, should be checked for low voltage, a weak capacitor, or a mechanical bind, all of which overload the motor. These cause excessive current that trips the protector. Insulation colour and drain slope are irrelevant.

117. D — Measuring both superheat and subcooling isolates whether a problem is charge or metering, because each reflects a different part of the cycle. Superheat reflects evaporator feed and subcooling reflects condenser liquid. Together they pinpoint the fault.

118. C — Servicing an A2L flammable refrigerant requires eliminating ignition sources and ensuring ventilation to prevent ignition of leaked gas. Mild flammability still poses a real risk. These precautions are mandatory for A2L work.

119. B — A hot, discoloured discharge line with a burnt odour indicates excessive discharge temperature, often from a low charge or a restriction. High discharge heat degrades oil and refrigerant. This is a fault requiring diagnosis.

120. C — Cooling-tower and condenser-water maintenance centres on controlling scale, corrosion, and biological growth in the loop. Untreated water fouls heat transfer and promotes Legionella. Water treatment protects the system and health.

121. C — A system that has lost its full charge must be pressure-tested with nitrogen to find and repair the leak, then evacuated before recharging. Recharging without repair wastes refrigerant and violates good practice. Locate, repair, evacuate, then charge is the correct order.

122. B — For refrigerant compliance, the most important record is the type and quantity of refrigerant added or recovered during the service. This supports regulatory tracking and leak management. Cabinet colour, tool brand, and outdoor temperature are not compliance data.

123. D — A compressor tripping on its overload and resetting when cooled, after charge is confirmed, points next to poor cooling, low voltage, or a failing capacitor. These cause overheating and overload trips. Each overloads the motor and triggers the protector.

124. B — A TXV sensing bulb must be properly clamped and insulated because poor contact gives a false superheat reading and causes the valve to misfeed the coil. Accurate bulb temperature is essential for correct metering. Good contact and insulation ensure proper feed.

125. C — A 14°C dry-bulb drop across an evaporator coil falls within the normal comfort-cooling range of roughly 8–14°C. It indicates the coil is removing heat as designed. This value does not signal overcharge, failure, or an impossible condition.