

PRACTICE EXAM 10: RACM RED SEAL SIMULATION (125 QUESTIONS)

1. A technician is recovering R-410A from a system into a recovery cylinder. The cylinder's internal pressure climbs rapidly and the recovery machine's high-pressure cutout trips. The ambient temperature is 32°C. What is the most probable cause?
- A. The recovery cylinder is overfilled or too warm, raising saturation pressure above the cutout setpoint
 - B. The recovery machine compressor reed valves have failed in the open position
 - C. The cylinder service valve is closed on the liquid port preventing any vapour flow
 - D. The recovery hoses are rated for R-22 and cannot handle R-410A pressures
2. While brazing copper tubing overhead, a technician notices the flame repeatedly blowing back with a sharp popping sound at the torch tip. What does this most likely indicate?
- A. The acetylene cylinder is nearly empty and delivering insufficient gas
 - B. The tip orifice is too large for the selected line pressure
 - C. The work surface is reflecting excessive radiant heat onto the tip
 - D. The tip is overheated or partially clogged, causing flashback at the orifice
3. A WHMIS 2015 label on a refrigerant container shows a flame pictogram and the signal word "Warning." What does this combination communicate to the technician?
- A. The product is an oxidizer requiring isolation from all fuel sources
 - B. The product is flammable and presents a less severe hazard than one labelled "Danger"
 - C. The product is acutely toxic by inhalation and requires respiratory protection
 - D. The product is corrosive and will damage metal containers over time
4. A technician measures 0.4 mA of leakage current to ground on a portable recovery machine using a clamp meter. The machine's nameplate is unreadable and no GFCI is present. What is the correct interpretation?

- A. The reading is within normal capacitive coupling and no action is required
- B. The leakage exceeds safe limits for a handheld tool and the machine must be removed from service
- C. The clamp meter is reading induced current from adjacent conductors only
- D. The value confirms the equipment ground conductor is intact and effective

5. Two technicians must lift a 180 kg condensing unit onto a rooftop curb using a single-leg sling rated at 200 kg vertical. The lift requires a two-leg bridle at 60° from horizontal. What is the most accurate assessment?

- A. The lift is safe because each leg carries half the load, well under the rating
- B. The sling capacity is reduced at the angle, so the configuration must be reassessed before lifting
- C. The vertical rating applies directly since the unit is rigid and balanced
- D. A 60° angle increases each leg's capacity above the vertical rating

6. A technician using a nitrogen cylinder for pressure testing finds the regulator outlet gauge reads zero even with the cylinder valve fully open and the cylinder gauge showing 9,000 kPa. What is the most probable cause?

- A. The cylinder is actually empty despite the high-pressure gauge reading
- B. The downstream test hose has a complete blockage at the fitting
- C. The high-pressure side of the regulator has frozen due to rapid expansion
- D. The regulator adjusting screw is backed fully out, keeping the seat closed

7. During confined-space work in a mechanical room, a technician's four-gas monitor alarms on low oxygen (19.0%) with no other gas elevated. What is the correct immediate action?

- A. Exit the space and ventilate before re-entry, treating the low reading as an oxygen-deficient atmosphere
- B. Continue working since 19.0% is only marginally below the 20.9% norm
- C. Recalibrate the monitor in place to confirm the sensor is accurate

D. Switch to a single-gas oxygen sensor for a more precise secondary reading

8. A technician finds a flexible cord on a vacuum pump with the outer jacket cracked and one conductor's insulation visible but intact. What is the correct disposition?

A. Remove the tool from service until the cord is replaced, as the jacket no longer provides protection

B. Wrap the damaged section with electrical tape and continue using the pump

C. The tool is safe to use because the conductor insulation is still intact

D. Use the pump only on a GFCI-protected circuit without repairing the cord

9. A torch strikes a flame but the inner cone is long, ragged, and yellow-tipped rather than sharp and blue. Which adjustment most directly corrects this?

A. Reduce the fuel gas pressure at the regulator until the flame extinguishes

B. Increase oxygen to the flame until a sharp neutral inner cone forms

C. Move the tip closer to the work to concentrate the heat

D. Replace the tip with the next larger orifice size

10. A technician needs the Safety Data Sheet for a refrigerant oil before handling it. Which section provides the required personal protective equipment?

A. Section 4, First-Aid Measures

B. Section 8, Exposure Controls / Personal Protection

C. Section 9, Physical and Chemical Properties

D. Section 14, Transport Information

11. A pressure-relief device on a receiver discharges suddenly during a hot afternoon shutdown. The system was correctly charged that morning. What is the most probable cause?

A. Liquid refrigerant trapped between closed valves expanded thermally with no vapour space

- B. The relief device setpoint drifted permanently lower over the season
- C. The receiver was undersized for the original charge calculation
- D. A non-condensable gas pocket formed during the morning operation

12. A technician must enter a refrigerated cold room to service an evaporator. Before entry, what is the most important safety verification specific to this space?

- A. That the floor has been swept clear of packaging debris
- B. That an internal release mechanism allows exit if the door latches behind them
- C. That the lighting meets the minimum lux level for detailed work
- D. That the room temperature logbook has been signed for the shift

13. A clamp ammeter on a 230 V single-phase compressor reads 0 A on the common conductor while the unit hums and trips on overload after a few seconds. What does this most strongly indicate?

- A. The compressor is running normally but the meter jaws are not fully closed
- B. The compressor is failing to start, likely a seized rotor or open start circuit
- C. The supply voltage has dropped below the contactor pull-in threshold only
- D. The overload is defective and tripping despite normal current

14. When manually lifting a 25 kg compressor from floor level, which technique most reduces lower-back injury risk?

- A. Keep the legs straight and bend at the waist to reach the unit
- B. Lift quickly with a single smooth pull to minimize strain time
- C. Bend the knees, keep the load close, and lift with the legs while keeping the back straight
- D. Twist toward the destination while lifting to save a second movement

15. A technician notices a faint, sweet chemical odour in a plant room and a refrigerant leak alarm has not sounded. The sensor was last calibrated 18 months ago. What is the most appropriate conclusion?

- A. No leak exists because the fixed sensor has not alarmed
- B. The odour is unrelated since refrigerants are odourless
- C. The sensor may be out of calibration; investigate the leak independently with a separate detector
- D. The alarm threshold is correctly set so only minor seepage is present

16. A technician is assigned to work on a system containing R-717 (ammonia). Which PPE consideration is most critical and specific to this refrigerant?

- A. Cut-resistant gloves to prevent contact with sharp tubing edges
- B. Hearing protection due to compressor noise levels
- C. Anti-static footwear to prevent ignition of the refrigerant
- D. Eye/face protection and a respirator rated for ammonia due to its toxicity and reactivity

17. Before energizing a newly installed rooftop unit, a technician must verify the disconnect lockout. The lock is applied but a co-worker has a second lock on the same hasp. What does this signify?

- A. The second lock is redundant and may be removed to simplify the work
- B. Only the first technician's lock is legally required for the task
- C. Multiple workers are protected; the equipment stays locked until every lock is removed by its owner
- D. The hasp is overloaded and the locks should be consolidated to one

18. A technician reviews a job hazard analysis that omits any mention of working at height, yet the task is on a 4 m rooftop. What is the correct action?

- A. Proceed since the rooftop has a parapet that provides passive protection
- B. Begin work and add fall protection only if the parapet proves inadequate
- C. Defer the height portion until a supervisor is available, working the ground portions first
- D. Stop and revise the hazard analysis to address fall protection before any rooftop work begins

19. A brazed joint on a suction line shows a bright copper ring with a band of black scale on the inside of the tube after assembly. Nitrogen was not flowed during brazing. What does the black scale indicate?

- A. Excessive filler metal drawn into the joint by capillary action
- B. Flux residue that was not cleaned before assembly
- C. Cupric oxide formed inside the tube from heating without an inert purge
- D. Carbon deposited from an oxidizing torch flame on the exterior

20. During evacuation, a micron gauge pulls to 480 microns, the pump is valved off, and the reading climbs steadily and continuously without leveling off. What does this rise pattern indicate?

- A. A leak in the system or vacuum connections allowing atmosphere to enter
- B. Residual moisture boiling off that will level out shortly
- C. The micron gauge sensor is contaminated with oil
- D. Normal pressure equalization that requires no further action

21. A technician pressurizes a new line set to 1,000 kPa with nitrogen for leak testing. Over 30 minutes the pressure drops to 940 kPa with no audible leak found. The shop temperature dropped 5°C during the test. What is the most likely explanation?

- A. The pressure drop is consistent with the temperature decrease, not necessarily a leak
- B. A definite leak exists and must be located with bubble solution immediately
- C. The nitrogen regulator is bleeding back into the cylinder
- D. The gauge is faulty and reading low at this pressure range

22. When flowing nitrogen through tubing during brazing, the correct flow rate is described as a gentle, low-pressure purge. What happens if the flow is set too high?

- A. The joint will cool too slowly, weakening the braze
- B. Turbulence can blow molten filler metal out of the joint and create pinholes

- C. The nitrogen will react with the copper to form scale
- D. The flux will ignite prematurely before the joint reaches temperature

23. A swaged copper joint repeatedly leaks at low pressure after brazing. Inspection shows the filler metal only wetted the outer edge and did not flow into the fitting. What is the most probable cause?

- A. The filler alloy melting point was too low for copper-to-copper joints
- B. Excessive nitrogen pressure cooled the joint
- C. The joint was overheated, oxidizing the surfaces so the filler could not flow in by capillary action
- D. The tubing was annealed before assembly

24. A technician measures the depth a tube is inserted into a fitting socket and finds it bottomed out hard against the stop with no gap. For a properly brazed joint, why is this a concern?

- A. A small clearance is needed for capillary action to draw filler into the joint
- B. Bottoming out guarantees the strongest possible mechanical joint
- C. The tube must be flared rather than socketed in this case
- D. No clearance is ideal because it prevents filler waste

25. After a deep evacuation, a system holds at 300 microns when valved off and stays flat for 10 minutes, then a technician introduces refrigerant. Within a week the compressor fails with acid present in the oil. What earlier step most likely failed?

- A. The micron level should have been pulled below 50 microns regardless of stability
- B. The leak test before evacuation was skipped
- C. The system was not adequately decontaminated of moisture/non-condensables despite the stable reading, or the holding value was too high
- D. The refrigerant charged was contaminated at the cylinder

26. A flared joint on a 3/8" line weeps oil at the flare nut after several months. The flare looks concentric and undamaged. What is the most probable cause?

- A. The flare nut was either over- or under-torqued, distorting or failing to seat the flare
- B. The tubing wall was too thin for a flare connection
- C. The flare was cut at too steep an angle for the fitting
- D. The line carries liquid and flares are prohibited on liquid lines

27. A technician must join dissimilar metals: a copper line to a steel valve body. Which process is most appropriate?

- A. Soft soldering with 50/50 tin-lead alloy
- B. Welding the copper directly to the steel
- C. Brazing with a flux suited to dissimilar metals and an appropriate filler alloy
- D. A compression fitting only, since the metals cannot be joined thermally

28. During a standing pressure test with nitrogen, a technician adds a trace of refrigerant to use an electronic leak detector. Under current environmental practice, what is the concern with this method?

- A. The refrigerant trace will contaminate the nitrogen cylinder
- B. Electronic detectors cannot sense refrigerant mixed with nitrogen
- C. Trace refrigerant raises the test pressure unpredictably
- D. Intentionally releasing refrigerant for leak detection is a regulated emission and trace gases must be used per regulation

29. A copper-to-copper brazed joint is being made with a phosphorus-bearing filler rod. Why does this filler not require a separate flux on copper?

- A. The joint clearance is too small for flux to enter
- B. The phosphorus acts as a self-fluxing agent that reduces copper oxides
- C. The nitrogen purge replaces the need for flux entirely

D. Copper does not form oxides at brazing temperature

30. A micron gauge reads 1,200 microns and will not pull lower despite a known-good two-stage pump running for an hour on a small system. What should the technician suspect first?

A. A large quantity of moisture or a leak is preventing deep vacuum

B. The system is fully evacuated and the gauge is misreading

C. The pump oil is fresh and clean, ruling out the pump

D. The hoses are too large in diameter for this system

31. A technician notices that a long horizontal suction line was installed dead level with no slope. Over time the compressor shows signs of oil starvation. How does the line relate to the symptom?

A. A level line increases refrigerant velocity excessively

B. A level line causes refrigerant to subcool prematurely

C. A horizontal suction line should slope slightly toward the compressor to aid oil return; a dead-level run can trap oil

D. The slope has no effect on oil return in suction lines

32. When silver-brazing a valve with a Teflon seat, what precaution most directly prevents seat damage?

A. Wrap the valve body in a wet rag or use a heat sink and direct the flame away from the seat

B. Increase the filler metal quantity to seal faster

C. Braze with the valve in the fully closed position

D. Use a larger torch tip to finish the joint quickly

33. After cutting copper tubing with a tubing cutter, a technician brazes without deburring. What downstream symptom is most likely?

A. The braze joint will not reach proper temperature

- B. The flare nut will not thread onto the tube
- C. Restricted flow and possible turbulence/erosion at the burr, plus filings entering the system
- D. The tube will crack along the cut line during heating

34. A line set is being routed through a wall sleeve. The installer leaves the suction and liquid lines tightly taped together with no insulation between them. What problem does this create?

- A. The lines will vibrate and fatigue the brazed joints
- B. The liquid line will freeze and block flow
- C. Mechanical abrasion will wear through both tubes immediately
- D. Heat transfer between the warm liquid and cold suction line reduces system efficiency

35. A system using a TXV shows low suction pressure, high superheat at the evaporator outlet, and normal subcooling at the condenser. What does this combination most strongly point to?

- A. An overcharge of refrigerant
- B. A flooded evaporator from an overfeeding valve
- C. A starved evaporator from a restricted or underfeeding metering device
- D. A non-condensable gas in the condenser

36. A technician measures 12°C of subcooling (normal is ~5°C) along with high head pressure and normal-to-high superheat on a TXV system. What is the most probable cause?

- A. Refrigerant overcharge backing liquid up into the condenser
- B. A restricted liquid line starving the evaporator
- C. A failed TXV power head leaking charge
- D. A dirty evaporator coil reducing load

37. On a fixed-orifice (piston) system, suction pressure is high, head pressure is low, and superheat is near zero with liquid returning to the compressor. What does this indicate?

- A. Refrigerant undercharge
- B. A restricted metering device
- C. A dirty condenser coil
- D. Overcharge or low evaporator load causing a flooded coil

38. A TXV-equipped system hunts: suction pressure and superheat swing up and down rhythmically every 30–60 seconds. What is the most probable cause?

- A. A non-condensable gas in the high side
- B. The TXV is oversized or the bulb is poorly mounted, causing it to overcorrect
- C. The compressor valves are leaking
- D. The condenser fan is short-cycling

39. A compressor is drawing high amperage on all phases, head pressure is elevated, and the condenser coil is clean with the fan running. What should the technician check next?

- A. The suction line filter-drier for restriction
- B. The evaporator airflow for excessive load
- C. The metering device for overfeeding
- D. Refrigerant overcharge or non-condensables in the condenser

40. Superheat at the compressor is very high but evaporator-outlet superheat is normal. The suction line is long and uninsulated through a hot space. What is the most probable cause?

- A. The TXV is overfeeding the evaporator
- B. The compressor is internally leaking
- C. The condenser is overcharged
- D. Heat gain in the uninsulated suction line is raising suction superheat downstream of the coil

41. A capillary-tube system runs with a frosted, partly-iced cap tube inlet and low capacity. What does the frost at the cap tube inlet most likely indicate?

- A. A restriction at the cap tube inlet (debris or wax) causing a pressure drop and localized cooling
- B. The system is correctly charged and operating normally
- C. The condenser is undersized for the load
- D. The compressor is short of oil

42. A scroll compressor runs but produces almost no pressure differential between suction and discharge. What internal fault does this most strongly suggest?

- A. A seized crankshaft bearing
- B. An open motor winding
- C. A locked rotor condition
- D. A broken or damaged scroll set / internal leakage path

43. A reciprocating compressor shows discharge pressure that rises normally but suction pressure that will not pull down below a high value, with the compressor running continuously. What internal fault fits best?

- A. A blocked discharge service valve
- B. Leaking or broken suction reed valves allowing backflow
- C. A seized piston
- D. An open run winding

44. A condenser fan motor runs but the head pressure climbs far above normal on a hot day. The coil is clean and airflow path is clear. What should be checked next?

- A. The fan rotation direction and blade pitch, since reversed or wrong-pitch blades move little air
- B. The metering device sizing
- C. The suction line insulation
- D. The compressor oil level

45. A flooded-type chiller evaporator shows a refrigerant level far below the sight glass center and reduced capacity, with stable superheat control on a float valve. What does the low level most likely indicate?

- A. Refrigerant undercharge or a float valve underfeeding the evaporator
- B. An overcharge backing liquid into the condenser
- C. A fouled condenser water side
- D. A failed compressor unloader

46. A TXV system's superheat will not adjust no matter how the valve stem is turned, and the bulb is correctly mounted and insulated. What is the most probable cause?

- A. The evaporator coil is oversized for the load
- B. The TXV power element has lost its charge, leaving the valve in a fixed position
- C. The liquid line is undersized
- D. The condenser is overcharged

47. A system's sight glass shows steady bubbles at full load with normal subcooling readings taken at the condenser outlet. The bubbles persist after adding charge. What should the technician investigate?

- A. A definite undercharge requiring more refrigerant
- B. A faulty sight glass giving a false indication
- C. A liquid-line restriction (e.g., partially plugged drier) flashing the liquid before the sight glass
- D. An overcharge condition

48. An air-cooled condenser has the first two rows of fins warm and the remaining rows near ambient, with high subcooling. What does this temperature profile indicate?

- A. A refrigerant undercharge
- B. A non-condensable gas trapped at the top of the condenser

- C. An overcharge flooding the lower condenser rows with subcooled liquid
- D. A failed condenser fan

49. A hermetic compressor trips on its internal overload repeatedly, restarts after cooling, and the run capacitor tests within tolerance. Suction pressure is normal. What is the next most logical check?

- A. The metering device superheat setting
- B. The start components and winding resistance for a hard-starting or shorted winding
- C. The condenser water flow rate
- D. The receiver liquid level

50. A system shows normal pressures but poor cooling, and the suction line is sweating heavily right up to a warm compressor with frost forming at one point near the evaporator outlet. What does the localized frost suggest?

- A. The system is overcharged
- B. The condenser fan has failed
- C. A liquid floodback or a localized restriction at the evaporator outlet allowing liquid to persist
- D. The compressor is short-cycling on pressure

51. A receiver-equipped system has the king valve front-seated (closed) while the compressor runs to "pump down." Suction pressure pulls into a deep vacuum and the low-pressure control trips. What is occurring?

- A. Normal pump-down isolating the charge in the receiver; the LP control correctly stops the compressor
- B. A leak is pulling the system into vacuum
- C. The metering device has failed open
- D. The compressor reed valves are leaking

52. During pump-down, the suction pressure refuses to drop below 200 kPa even after several minutes with the liquid line valve closed. What is the most probable cause?

- A. The receiver is too small
- B. The condenser fan is off
- C. The discharge valve is closed
- D. A leaking liquid-line solenoid or metering device allowing refrigerant back into the low side

53. A compressor short-cycles on its high-pressure switch in hot weather. Head pressure spikes just before each trip. The condenser is clean. What is the most probable cause?

- A. Low refrigerant charge
- B. A stuck-closed metering device
- C. Insufficient condenser airflow (failing fan/motor or recirculation) or overcharge raising head pressure
- D. A faulty low-pressure switch

54. A liquid-line filter-drier is noticeably cold to the touch (cooler than the rest of the liquid line) with a measurable temperature drop across it. What does this indicate?

- A. The drier is new and functioning ideally
- B. A pressure drop across the drier from restriction, causing localized flashing/cooling
- C. The liquid line is correctly subcooled
- D. The condenser is overcharged

55. A system with a hot-gas defrost cycle fails to clear frost from the evaporator. During defrost, the suction pressure barely rises and the coil stays cold. What component is the prime suspect?

- A. The evaporator fan relay
- B. The defrost termination thermostat
- C. The hot-gas solenoid valve failing to open or open insufficiently

D. The crankcase heater

56. A compressor runs hot with high discharge temperature, normal pressures, and adequate charge. The suction superheat at the compressor is around 40°C. What is the most probable cause?

A. Excessive suction superheat starving the compressor of cooling and oil return

B. A flooded evaporator

C. A non-condensable in the condenser

D. An undersized liquid line

57. A TXV bulb is found loosely strapped to the top of a horizontal suction line rather than at the 4 or 8 o'clock position. What symptom would this most likely cause?

A. Persistent low superheat and floodback

B. No effect; bulb position is not critical

C. Erratic or falsely high superheat readings causing the valve to misfeed

D. Permanent valve closure

58. A water-cooled condenser shows rising head pressure and a small temperature rise across the water side compared to design. What does the small water-side temperature rise indicate?

A. Reduced water flow or fouling limiting heat rejection

B. The compressor is undercharged

C. The metering device is oversized

D. The evaporator is flooded

59. A reciprocating compressor knocks audibly on startup and the sound diminishes once running. Oil level is normal. What is the most probable cause?

A. A non-condensable gas pocket

B. The metering device hunting

- C. The condenser fan bearing
- D. Liquid refrigerant slugging into the cylinders at start (floodback during off-cycle migration)

60. A system's discharge line is much hotter than normal and the compressor cycles on its internal overload. Suction superheat is high and charge is confirmed low. How are these linked?

- A. Low charge raises superheat and discharge temperature, overheating the compressor
- B. Low charge floods the evaporator
- C. Low charge raises subcooling excessively
- D. Low charge has no effect on discharge temperature

61. An evaporator coil is half-frosted: the bottom circuits frost heavily while the top circuits stay warm. What does this uneven frosting pattern most likely indicate?

- A. The condenser is overcharged
- B. The compressor reed valves are leaking
- C. Uneven refrigerant distribution, often a faulty distributor or partially blocked feeder tube
- D. The thermostat is set too low

62. A heat-reclaim or multi-circuit system shows one circuit with normal operation and another with high superheat and low capacity sharing the same compressor. What is the most logical first check on the faulty circuit?

- A. The shared compressor's valves
- B. The common discharge line
- C. The condenser fan
- D. That circuit's individual metering device and liquid feed for restriction or underfeeding

63. A single-phase PSC compressor will not start, hums, and trips the overload. The run capacitor tests good. Measuring the run capacitor's microfarad value across terminals shows it open. How do these reconcile?

- A. The compressor windings are open
- B. The contactor is welded closed
- C. The capacitor previously tested under a stale/charged condition; an open run capacitor starves the start torque, matching the symptom
- D. The supply voltage is too high

64. A contactor's line-side voltage reads 240 V but the load side reads 0 V with the coil energized and the contactor audibly pulled in. What is the most probable cause?

- A. The control transformer has failed
- B. The thermostat is open
- C. Pitted or burned contactor contacts not making the circuit despite pulling in
- D. The capacitor is shorted

65. A three-phase motor runs but draws unequal currents on the three legs (e.g., 18 A, 18 A, 11 A). What does the low leg most strongly suggest?

- A. Normal phase imbalance within tolerance
- B. An overcharged system
- C. A failing capacitor
- D. A high-resistance connection or partial open on the low-reading phase

66. A 24 V control circuit blows its fuse the instant the thermostat calls for cooling. What is the most efficient first diagnostic step?

- A. Replace the thermostat

- B. Replace the contactor coil
- C. Increase the fuse rating to hold the load
- D. Isolate the circuit section by section to find the short, starting at the contactor coil and field wiring

67. A compressor's start (auxiliary) winding measures infinite resistance while the run winding reads a normal low value. What does the open start winding mean for operation?

- A. The compressor cannot develop starting torque and will hum and trip on overload
- B. The compressor will run but at reduced capacity only
- C. The compressor will start normally but not run
- D. No effect, as the start winding is only for diagnostics

68. A potential relay's normally-closed contacts fail to open after the compressor reaches speed, leaving the start capacitor in the circuit continuously. What is the likely result?

- A. The start capacitor overheats and fails, and the start winding may overheat
- B. The compressor runs more efficiently
- C. The run capacitor is bypassed safely
- D. No effect since the relay only matters at startup

69. A defrost timer-controlled system never goes into defrost and the evaporator ices over. The timer motor is found not advancing. What is the most probable cause?

- A. The defrost timer motor has failed or lost power, so the cycle never initiates
- B. The hot-gas valve is stuck open
- C. The compressor is undersized
- D. The TXV bulb is loose

70. A technician measures 208 V between L1 and L2 on a unit nameplated for 230 V. The compressor runs but trips intermittently on overload in hot weather. How does the voltage relate?

- A. The voltage is too high and must be reduced
- B. The voltage is within range and unrelated to the trips
- C. Low supply voltage increases current draw under load, contributing to overload trips
- D. Low voltage reduces current draw, so it cannot cause trips

71. A pressure switch wired as a low-pressure control opens and stops the compressor. Suction pressure measured at the moment of trip is well above the cut-out setting. What does this indicate?

- A. Normal operation; the switch is doing its job
- B. The suction pressure is genuinely too low
- C. The high-pressure switch tripped instead
- D. The low-pressure switch is faulty (contacts opening early) or miswired

72. A condenser fan motor with a run capacitor spins slowly and overheats. The capacitor reads 2.5 μF against a rated 7.5 μF . What is the relationship?

- A. The motor bearings have seized
- B. A weak/degraded run capacitor reduces motor torque and causes overheating
- C. The supply frequency is wrong
- D. The motor is correctly sized and the capacitor value is irrelevant

73. A thermostat calls for cooling, 24 V is present at the contactor coil terminals, but the contactor does not pull in. What is the most probable cause?

- A. The compressor windings are open
- B. An open contactor coil despite voltage being present across it
- C. The run capacitor is shorted
- D. The high-pressure switch is closed

74. A three-phase compressor was just serviced and now runs but with reduced capacity and a slightly higher-pitched sound; suction pressure is high and head pressure is low. What is the most probable cause?

- A. The metering device was left closed
- B. The condenser fan is reversed
- C. Two supply phases were swapped, reversing rotation (relevant for scroll/screw compressors)
- D. The thermostat differential is too wide

75. A control transformer's secondary reads 24 V with no load but drops to 9 V when the contactor coil is energized. What does the voltage sag indicate?

- A. The thermostat is open
- B. The contactor is functioning perfectly
- C. The supply voltage is too high
- D. A shorting or overloaded coil, or an undersized/failing transformer

76. A hard-start kit (start capacitor and relay) was added to a struggling single-phase compressor. It now starts but the start relay chatters and the start capacitor fails within days. What is the most probable cause?

- A. The compressor is now oversized
- B. The run capacitor is too large
- C. A mismatched start relay (wrong pickup/dropout voltage) for the compressor
- D. The supply voltage is too low for any start kit

77. A defrost heater circuit shows 240 V applied but the heater stays cold and the element measures open. What does the open element mean?

- A. The defrost thermostat is shorted

- B. The element is burned out and must be replaced; no current can flow
- C. The timer is advancing too quickly
- D. The element is fine and the meter is wrong

78. A compressor's common-to-run and common-to-start resistances are normal, but common-to-ground reads 50 ohms. What does the ground reading indicate?

- A. A winding-to-ground short (insulation breakdown) requiring compressor replacement
- B. A normal, healthy compressor
- C. An open start winding
- D. A shorted run capacitor

79. A reversing valve solenoid on a heat pump is energized for cooling, but the valve will not shift and the system stays in heating. The solenoid coil tests good and clicks. What is the most probable cause?

- A. The thermostat is wired for heating only
- B. The compressor is undersized
- C. Insufficient pressure differential to shift the slide valve, or a stuck valve body
- D. The defrost board has failed

80. A unit's low-pressure switch is bypassed (jumpered) by a previous technician. The compressor now runs into a deep vacuum during a refrigerant loss and the windings overheat. What does this illustrate?

- A. The bypass removed a critical safety, allowing the compressor to run without low-side protection
- B. The bypass improved reliability
- C. The low-pressure switch was unnecessary
- D. The overheating is unrelated to the bypass

81. A staged electric heat sequencer is supposed to bring on three heat strips in sequence, but all three energize simultaneously and trip the breaker. What is the most probable cause?

- A. A failed sequencer closing all contacts at once instead of staging
- B. The thermostat is set too low
- C. The blower motor is undersized
- D. The strips are wired in series

82. A microprocessor control board displays a high-pressure fault but the measured head pressure is normal. The high-pressure transducer wiring is intact. What should be checked next?

- A. The compressor oil level
- B. The evaporator airflow
- C. The metering device
- D. The transducer itself for drift/failure or a connector issue feeding a false signal

83. A 240 V heating element circuit reads 120 V to ground on each leg but only 0 V across the element terminals. What does this indicate?

- A. The element is shorted to the frame
- B. The supply is single-phase 120 V only
- C. Both legs are at the same potential at the element — a likely open switch/contact upstream feeding both sides equally, so no voltage difference drives current
- D. The element is operating normally at full output

84. A capacitor-start motor on a pump starts but the centrifugal switch fails to disconnect the start winding, and the start winding burns out. What does this fault chain show?

- A. The run capacitor was too small
- B. The supply voltage was too high
- C. A stuck centrifugal switch keeps the start winding energized continuously, overheating it
- D. The motor was undersized

85. An ECM blower motor ramps up and down erratically and the system airflow surges. The motor module communicates with the control board via a low-voltage signal. What is a logical first check?

- A. The control signal/programming and module connections feeding the ECM
- B. The compressor windings
- C. The metering device
- D. The condenser coil cleanliness

86. A three-phase contactor chatters rapidly and will not stay pulled in, with 24 V present at the coil. What is the most probable cause?

- A. The compressor is overcharged
- B. The metering device is restricted
- C. The supply phases are reversed
- D. Low/fluctuating control voltage under load or a damaged coil/contact surface preventing solid pull-in

87. A psychrometric reading shows return air at 24°C dry bulb / 17°C wet bulb and supply air at 13°C dry bulb / 12°C wet bulb across a cooling coil. The dry-bulb drop is large but the wet-bulb drop is small. What does this indicate about the coil?

- A. The coil is removing excessive latent heat only
- B. The coil is oversized for the airflow
- C. The coil is providing mostly sensible cooling with little dehumidification
- D. The coil is frosting internally

88. Airflow across an evaporator is measured well below design CFM, the coil is clean, and the filter is new. The blower runs at full speed. What should be checked next?

- A. The refrigerant charge
- B. The metering device

- C. The thermostat setpoint
- D. Duct restrictions, closed dampers, or a slipping/incorrect blower drive reducing airflow

89. A space served by a VAV system is consistently too warm even with the VAV box damper fully open. Supply air temperature at the box is correct. What is the most probable cause?

- A. The thermostat is in cooling lockout
- B. The reheat coil is stuck on
- C. The refrigerant is overcharged
- D. Insufficient duct static or airflow to the box, so the open damper still cannot deliver enough air

90. A technician measures total external static pressure of 0.9 in. w.c. on a furnace rated for 0.5 in. w.c. maximum. The blower is straining. What does the high static indicate?

- A. The duct system is oversized
- B. Excessive system resistance (undersized/restricted ductwork or dirty components) overloading the blower
- C. The blower is too large
- D. Normal operation at high speed

91. Supply registers in the farthest rooms deliver weak airflow while rooms near the air handler are over-conditioned. What does this distribution pattern most likely indicate?

- A. The compressor is undersized
- B. The duct system is unbalanced and needs damper adjustment/balancing
- C. The refrigerant is low
- D. The thermostat is faulty

92. A direct-drive blower wheel is found caked with dust and debris. Airflow has dropped over time. How does the buildup affect performance?

- A. It increases airflow by adding blade surface
- B. It has no measurable effect
- C. It reduces the wheel's effective geometry and airflow, lowering capacity and possibly icing the coil
- D. It improves efficiency by smoothing airflow

93. A building has positive pressure issues: doors are hard to open inward and exhaust fans struggle. What does this indicate about the ventilation balance?

- A. Exhaust airflow exceeds supply airflow
- B. Supply (outdoor/makeup) air exceeds exhaust air, over-pressurizing the space
- C. The space is perfectly balanced
- D. The economizer is closed

94. An economizer is supposed to bring in outdoor air for free cooling but the outdoor air damper stays closed on a mild day. The actuator receives a signal but does not move. What is the most probable cause?

- A. A failed actuator/linkage or a binding damper preventing movement
- B. The compressor is short-cycling
- C. The refrigerant is overcharged
- D. The supply fan is reversed

95. A return-air filter has a high pressure drop across it (measured with a manometer) far exceeding its clean rating, and airflow has dropped. What does the high pressure drop indicate?

- A. The filter is brand new and clean
- B. The duct is oversized
- C. The blower is too powerful
- D. The filter is loaded/clogged and must be replaced to restore airflow

96. Condensation drips from supply diffusers in a humid space. Supply air is cold and the diffuser surfaces are below the room dew point. What is the most probable cause?

- A. The refrigerant is overcharged
- B. Inadequate diffuser insulation or supply air far below room dew point with high indoor humidity
- C. The compressor is short-cycling
- D. The metering device is oversized

97. A bathroom exhaust fan runs but removes little air; the duct run is long with several sharp elbows and a partially crushed flex section. What does this most likely cause?

- A. Excessive duct resistance reducing the fan's effective airflow
- B. The fan motor is oversized
- C. The fan is spinning backward
- D. The damper is fully open

98. A makeup-air unit's discharge temperature is much colder than its setpoint on a cold day, and the modulating gas valve is at minimum fire. The space is uncomfortably cold. What is the most logical check?

- A. The control signal and the gas valve/burner staging for a stuck-low or failed modulation
- B. The refrigerant charge
- C. The evaporator superheat
- D. The condenser fan

99. A duct smoke detector trips the air handler off intermittently with no visible smoke. The detector is several years old and dusty. What is the most probable cause?

- A. A real fire in the duct
- B. The compressor is overheating

- C. The thermostat is miswired
- D. A dirty/contaminated smoke detector giving false trips, needing cleaning or replacement

100. A technician measures supply airflow with an anemometer and finds it 25% above design, with the space overcooling and high noise at registers. What is the most probable cause?

- A. The blower speed tap is set too high or the drive is over-speeding the wheel
- B. The filter is clogged
- C. The refrigerant is low
- D. The ductwork is undersized

101. Stale air complaints persist in a tightly sealed office with a constant-volume system and no dedicated outdoor-air intake adjustment. CO₂ levels are elevated. What does this indicate?

- A. The refrigerant is undercharged
- B. The cooling coil is fouled
- C. Insufficient outdoor-air ventilation rate for the occupancy
- D. The blower is oversized

102. A humidifier on an air handler floods the duct floor with water and never satisfies the humidistat. The water solenoid is stuck open. How does this fault present?

- A. The duct stays dry and humidity climbs
- B. The humidistat reads correctly and shuts off
- C. Continuous water feed without proper evaporation, flooding the duct while humidity may still read low
- D. The blower stops automatically

103. A rooftop unit's outdoor-air and return-air dampers are both stuck at 50%, and the space cannot hold setpoint in extreme weather. What does this fixed-damper position cause?

- A. Perfect economizer operation
- B. No effect on conditioning load
- C. The blower to overspeed
- D. A constant high outdoor-air load that the coil cannot meet in extreme conditions

104. A coil shows water carryover: droplets are blown off the coil into the duct downstream. Face velocity across the coil is measured well above design. What does the high face velocity indicate?

- A. The coil is too large
- B. Airflow is too high for the coil, entraining condensate before it drains (carryover)
- C. The refrigerant is overcharged
- D. The drain pan is oversized

105. An air-source heat pump in heating mode delivers warm-but-weak air and the outdoor coil is heavily iced with no defrost occurring. The defrost control is a demand/pressure type. What is the most probable cause?

- A. The compressor is oversized
- B. The indoor blower is too fast
- C. The thermostat is set for cooling
- D. The defrost initiation sensor/control has failed to trigger the defrost cycle

106. A heat pump switches to defrost correctly but the indoor air blows cold during defrost with no auxiliary heat energized. The auxiliary heat relay is found open. How are these linked?

- A. The reversing valve is stuck
- B. The compressor is undersized
- C. Auxiliary heat should energize during defrost to temper supply air; the open relay prevents it, causing cold drafts
- D. The outdoor fan failed

107. A water-source heat pump shows high head pressure in cooling mode and a small temperature rise on the water loop. The loop pump runs. What does the small loop temperature rise indicate?

- A. The refrigerant is undercharged
- B. The metering device is oversized
- C. Low water flow or a fouled coaxial heat exchanger limiting heat rejection
- D. The reversing valve is leaking

108. A heat pump's reversing valve leaks internally: in heating mode, hot discharge gas bleeds to the suction side. What symptom does this internal leak produce?

- A. Reduced heating capacity and abnormally high suction temperature/pressure
- B. Excessive subcooling
- C. The outdoor coil overheating
- D. The compressor running cold

109. A chiller's evaporator approach temperature (refrigerant saturation vs. leaving water) has increased over time from 1°C to 4°C. What does the rising approach most likely indicate?

- A. The refrigerant is overcharged
- B. Fouling or scaling on the evaporator tubes reducing heat transfer
- C. The condenser fan failed
- D. The water flow is too high

110. A centrifugal chiller goes into surge: it produces a rhythmic, loud pulsing with fluctuating discharge pressure at low load. What is occurring aerodynamically?

- A. The refrigerant is leaking out
- B. The oil pump has failed
- C. The condenser is overcharged

D. Insufficient gas flow through the impeller causes flow reversal (surge) at low load/high lift

111. A glycol low-temperature system shows reduced capacity and the heat-transfer fluid is found at a higher glycol concentration than design. How does the rich glycol affect performance?

A. It improves heat transfer at low temperatures

B. It lowers the freeze point excessively with no downside

C. Higher glycol concentration raises viscosity and lowers heat-transfer capacity

D. It has no effect on capacity

112. A heat pump in cooling mode has normal pressures but the indoor coil ices up. Airflow is confirmed low because the filter is clogged. How does the low airflow cause icing?

A. Low airflow lowers coil temperature below freezing, icing the coil despite normal charge

B. Low airflow raises coil temperature

C. Low airflow overcharges the system

D. Low airflow has no effect on coil temperature

113. A multi-zone VRF system has one indoor unit not cooling while others operate normally. The faulty unit's electronic expansion valve does not respond to commands. What is the most logical check?

A. That indoor unit's EEV and its control wiring/board for a failed valve or communication fault

B. The outdoor compressor

C. The shared refrigerant charge

D. The common discharge line

114. A ground-source heat pump's loop pressure has dropped and air is suspected in the loop. Symptoms include gurgling, reduced flow, and erratic capacity. What is the most probable cause?

A. The refrigerant is overcharged

- B. The compressor is failing
- C. Air entrained in the ground loop reducing flow and heat transfer; the loop needs purging
- D. The reversing valve is stuck

115. A heat pump short-cycles in heating during very cold weather, tripping on low suction pressure. The outdoor coil is clear and the defrost works. What does the low suction pressure in extreme cold indicate?

- A. The system is operating beyond its low-ambient capacity, with suction pressure dropping below the control setting
- B. The refrigerant is overcharged
- C. The indoor blower is too fast
- D. The reversing valve is leaking

116. A cascade refrigeration system's high-stage and low-stage are linked by a cascade heat exchanger. The low-stage suction temperature is rising and capacity falling. The high-stage appears to run fine. What should be checked?

- A. The low-stage condenser fan
- B. The cascade heat exchanger and high-stage's ability to reject the low-stage's heat (charge/flow on either side)
- C. The indoor thermostat
- D. The high-stage discharge line insulation

117. A heat pump's outdoor unit runs but produces little heat, and a technician finds the reversing valve body has a large temperature difference suggesting it is partially shifted. What does the partial shift cause?

- A. Maximum heating efficiency
- B. Internal bypass of discharge gas, reducing capacity and causing abnormal suction/discharge temperatures

- C. The compressor to run cold
- D. The metering device to overfeed

118. During commissioning, a technician verifies superheat and subcooling are both within target, amperage is nominal, and airflow meets design. The system still fails to reach setpoint in the space. What should be checked next?

- A. The refrigerant charge again
- B. The compressor windings
- C. The metering device sizing
- D. The building load/heat gain vs. equipment capacity — the system may be undersized for the actual load

119. A startup checklist requires verifying compressor rotation on a three-phase scroll unit before extended running. Why is this verification critical at commissioning?

- A. Reverse rotation produces no/low pumping and can damage the scroll, so rotation must be confirmed first
- B. Rotation affects only the condenser fan
- C. Rotation has no effect on scroll compressors
- D. Reverse rotation improves cooling capacity

120. A maintenance technician records that condenser approach temperature has crept up 3°C over a year of logs while charge and airflow are unchanged. What does the trending data most likely indicate?

- A. Gradual condenser fouling reducing heat-transfer effectiveness
- B. The compressor is improving with age
- C. The refrigerant is becoming more efficient
- D. The metering device is self-cleaning

121. During a planned maintenance visit, oil analysis on a large system returns elevated acid and moisture levels. What does this result indicate about system condition?

- A. The system is in ideal condition
- B. The oil is over-additized from the factory
- C. Acid/moisture contamination is degrading the system; investigate the source and decontaminate
- D. The sample was taken incorrectly and means nothing

122. A technician commissioning a new install logs subcooling far above target with normal superheat and slightly high head pressure. What does the high subcooling at startup most likely indicate?

- A. The system is undercharged
- B. The metering device is restricted
- C. The condenser is oversized
- D. An overcharge of refrigerant backing liquid into the condenser

123. A preventive-maintenance schedule calls for checking the condensate drain on every visit. A technician finds the trap dry and the pan overflowing. What is the most probable cause?

- A. A clogged condensate drain line or trap not draining, causing overflow
- B. The refrigerant is overcharged
- C. The blower is too fast
- D. The thermostat is faulty

124. A commissioning report shows measured CFM per ton at 250 instead of the typical ~400. What does this low airflow ratio indicate and risk?

- A. The airflow is ideal and improves dehumidification safely
- B. Low airflow per ton risks coil freezing and reduced capacity; airflow must be increased
- C. The system is overcharged

D. The compressor is oversized

125. At final commissioning, a technician must document the actual refrigerant charge added against the nameplate. Why is accurate charge documentation a required deliverable?

A. It is only for warranty paperwork and has no service value

B. It lets the next technician guess the charge

C. It satisfies the manufacturer but not regulations

D. It establishes the baseline charge for leak detection, future service, and regulatory recordkeeping

Practice Exam 10: Answer Key and Explanations

1. A — A recovery cylinder gains pressure as it fills and warms because saturation pressure rises with temperature. At 32°C ambient, an overfilled or hot cylinder can exceed the recovery machine's high-pressure cutout. Slowing the fill, cooling the cylinder, or using a second cylinder relieves the condition.

2. D — A flashback or popping at the tip occurs when the tip overheats or the orifice partially clogs, disrupting smooth gas flow. The flame burns back toward the orifice rather than at the tip. Cooling and cleaning the tip restores stable combustion and prevents internal flame travel.

3. B — Under WHMIS 2015, the flame pictogram identifies a flammable hazard, and the signal word "Warning" denotes a less severe hazard category than "Danger." The signal word ranks severity within a hazard class, so the technician can gauge relative risk directly from the label. Reading pictogram and signal word together gives an immediate sense of both hazard type and degree.

4. B — Leakage current of 0.4 mA on a handheld tool with no GFCI exceeds safe limits; protective leakage on portable equipment is typically held well below this threshold to prevent shock. With no nameplate verification and no GFCI, the tool must be removed from service. Excess leakage signals insulation breakdown or a ground fault path.

5. B — A sling's rated capacity is reduced as the angle from horizontal decreases, because tension in each leg rises. At 60° the configuration must be reassessed against the angle-adjusted rating before lifting. Using the vertical rating directly would overload the sling.

6. D — If the regulator adjusting screw is backed fully out, the seat stays closed and no pressure reaches the outlet gauge despite a full cylinder. Turning the screw in opens the seat and delivers gas. This is the most common cause of zero outlet pressure with a charged cylinder.

7. A — An oxygen reading of 19.0% is below the 19.5% threshold that defines an oxygen-deficient atmosphere, and any deficiency warrants exiting and ventilating before re-entry. Oxygen displacement can worsen rapidly and impair judgment. The monitor alarm must be treated as a genuine hazard.

8. A — A cracked outer jacket no longer protects the conductors, even if individual insulation appears intact, so the tool must be removed from service until the cord is replaced. Tape is not an approved repair for the protective jacket. The jacket is a required layer of mechanical and electrical protection.

9. B — A long, ragged, yellow-tipped inner cone signals a carburizing (fuel-rich) flame; adding oxygen until a sharp neutral cone forms corrects it. The neutral flame gives the controlled heat needed for clean brazing. Reducing fuel or moving the tip does not address the oxygen deficit.

10. B — Section 8 of a Safety Data Sheet, Exposure Controls / Personal Protection, lists the required PPE for handling. Other sections cover first aid, properties, and transport but not protective equipment selection. Knowing the standardized SDS layout speeds safe handling decisions.

11. A — Liquid refrigerant trapped between two closed valves has no vapour space to absorb thermal expansion; afternoon heat raises its pressure until the relief device discharges. This hydrostatic expansion is a known hazard in liquid-full sections. Proper valving and relief placement prevent trapped-liquid pressure rise.

12. B — Cold rooms can latch from outside, so the critical entry verification is that an internal release allows exit if the door closes behind the worker. Entrapment in a cold environment is a life-threatening hazard. This control is specific to walk-in refrigerated spaces.

13. B — Zero current on the common conductor while the unit hums and trips on overload means no run current is flowing — the compressor is not starting, consistent with a seized rotor or an open start circuit. A normally running compressor would draw measurable current. The hum-and-trip pattern is the classic failed-start signature.

14. C — Bending the knees, keeping the load close, and lifting with the legs while keeping the back straight minimizes spinal loading. Bending at the waist or twisting under load sharply increases injury risk. This technique distributes force through the strong leg muscles.

15. C — A fixed sensor 18 months out of calibration cannot be trusted to alarm reliably, so a detectable odour warrants an independent investigation with a separate detector. Assuming no leak based solely on a silent, possibly drifted sensor is unsafe. Calibration drift is a common cause of missed detection.

16. D — Ammonia (R-717) is toxic and reactive, so eye/face protection and an ammonia-rated respirator are the most critical, refrigerant-specific PPE. The other items address general hazards but not ammonia's inhalation and contact dangers. Ammonia exposure can cause severe respiratory and ocular injury.

17. C — Multiple locks on one hasp mean multiple workers are protected, and the equipment stays locked until each owner removes their own lock. No one may remove another worker's lock. Group lockout ensures no one is exposed while others still work on the equipment.

18. D — A hazard analysis that omits fall protection for 4 m rooftop work is incomplete and must be revised before any rooftop work begins. Relying on a parapet or adding protection reactively does not meet planning requirements. Identifying and controlling fall hazards in advance is mandatory.

19. C — Black internal scale is cupric oxide, formed when copper is heated without an inert (nitrogen) purge during brazing. The oxide flakes into the system and contaminates components. Flowing nitrogen displaces oxygen and prevents this internal scale.

20. A — A micron reading that climbs steadily and continuously without leveling off after the pump is valved off indicates a leak admitting atmosphere. Moisture outgassing, by contrast, rises then levels at a stable value. The continuous rise distinguishes a leak from residual moisture.

21. A — A modest pressure drop accompanying a 5°C shop-temperature decrease is consistent with the gas law, not necessarily a leak. Pressure falls as gas cools at fixed volume. Temperature-corrected interpretation prevents chasing a non-existent leak.

22. B — Excessive nitrogen flow during brazing creates turbulence that can blow molten filler out of the joint, leaving pinholes. A gentle purge displaces oxygen without disturbing the braze. Correct flow balances oxide prevention against joint integrity.

23. C — When a joint is overheated, the surfaces oxidize and the filler cannot wet them or be drawn in by capillary action, so it only beads on the outer edge. Controlled heat and proper technique let filler flow into the joint. Overheating is a frequent cause of incomplete capillary fill.

24. A — A proper brazed socket joint needs a small clearance so capillary action can draw filler metal fully into the joint. A tube bottomed hard against the stop can starve the capillary gap. Correct fit-up tolerance is essential to joint strength.

25. C — A stable holding value does not guarantee adequate decontamination if the level is too high; residual moisture and non-condensables can remain and form acid in the oil. Deep evacuation to a low, stable micron level is required. Acid in the oil after startup points to inadequate dehydration.

26. A — A concentric, undamaged flare that still weeps points to a nut that was over- or under-torqued, so the flare either distorted or never seated metal-to-metal. Correct torque seats the flare face firmly against the fitting to form the seal. Improper torque is the common cause of a slow leak on an otherwise sound flare.

27. C — Joining copper to a steel valve body calls for brazing with a flux suited to dissimilar metals and an appropriate filler alloy. Soft solder lacks strength and direct welding is impractical here. The right flux and filler ensure wetting of both base metals.

28. D — Intentionally releasing refrigerant — even as a trace — for leak detection is a regulated emission, so trace gases must be used in accordance with regulation. Venting refrigerant for convenience is not permitted. Approved tracer methods comply with environmental requirements.

29. B — Phosphorus-bearing filler is self-fluxing on copper because phosphorus reduces copper oxides, eliminating the need for separate flux on copper-to-copper joints. On dissimilar metals, flux is still required. This is why phos-copper rods are standard for copper joints.

30. A — A vacuum that stalls at 1,200 microns with a known-good pump points to a large moisture load or a leak preventing deep evacuation. A properly dry, tight system pulls far lower. The stall identifies contamination or air ingress, not the pump.

31. C — A horizontal suction line should slope slightly toward the compressor to aid oil return; a dead-level run can trap oil and starve the compressor. Proper pitch keeps oil moving back. Oil-return geometry is essential to compressor lubrication.

32. A — Wrapping the valve body in a wet rag or using a heat sink and directing the flame away from the seat protects a Teflon seat from heat damage during brazing. Excess heat melts or deforms the seat. Heat management preserves valve sealing function.

33. C — Failing to deburr leaves a raised lip that restricts flow and creates turbulence/erosion at the burr, while loose filings can enter the system. Deburring restores a clean bore. This step protects both flow and component cleanliness.

34. D — Taping warm liquid and cold suction lines tightly together without insulation lets heat transfer between them, raising suction-line temperature and reducing system efficiency. Separate insulation preserves the intended thermal states. Line-set thermal isolation protects capacity.

35. C — Low suction pressure with high evaporator-outlet superheat and normal subcooling indicates a starved evaporator from a restricted or underfeeding metering device. The coil is not getting enough refrigerant to fully load it. Normal subcooling rules out an overall charge problem.

36. A — High subcooling (12°C vs. ~5°C) with high head pressure indicates an overcharge backing liquid into the condenser, reducing condensing surface and raising pressure. Excess liquid increases subcooling. Recovering charge to target restores normal readings.

37. D — High suction, low head, near-zero superheat, and liquid floodback on a fixed-orifice system indicate a flooded coil from overcharge or low evaporator load. The orifice overfeeds relative to the reduced load. Correcting charge or restoring load fixes the floodback.

38. B — Rhythmic hunting of superheat and suction pressure points to a TXV that overcorrects — often oversized or with a poorly mounted bulb. The valve chases the load and oscillates. Proper sizing and secure bulb mounting stabilize control.

39. D — High amperage on all phases with elevated head pressure and a clean, well-ventilated condenser points to a refrigerant overcharge or non-condensables in the condenser. Both raise condensing pressure and motor load. Checking and correcting charge/non-condensables resolves it.

40. D — Normal evaporator-outlet superheat but very high compressor superheat with a long uninsulated suction line through a hot space indicates heat gain in the suction line downstream of the coil. The refrigerant warms after leaving the evaporator. Insulating the line restores proper suction conditions.

41. A — Frost localized at the cap-tube inlet indicates a restriction (debris or wax) causing a pressure drop and localized cooling at that point. The flow choke reduces capacity. Clearing or replacing the cap tube/drier restores normal feed.

42. D — A scroll compressor that runs but builds almost no differential has a damaged or leaking scroll set providing an internal leakage path. The scrolls cannot compress effectively. This internal mechanical fault requires compressor replacement.

43. B — Normal discharge rise but suction that will not pull down, with continuous running, indicates leaking or broken suction reed valves allowing backflow into the cylinder. The compressor cannot evacuate the low side. Valve failure is confirmed by the inability to lower suction pressure.

44. A — A running condenser fan with abnormally high head pressure on a clean coil and clear airflow path warrants checking fan rotation direction and blade pitch, since reversed or wrong-pitch blades move little air. Inadequate airflow raises condensing pressure. Correct rotation and pitch restore heat rejection.

45. A — A refrigerant level far below the sight-glass center in a flooded evaporator with stable float control indicates an undercharge or a float valve underfeeding the evaporator. Insufficient liquid reduces capacity. Verifying charge and float operation restores level.

46. B — If superheat will not respond to stem adjustment and the bulb is correctly mounted, the TXV power element has lost its charge and the valve sits in a fixed position. With no element charge, the diaphragm cannot modulate. Replacing the power head or valve restores control.

47. C — Persistent sight-glass bubbles with normal subcooling that do not clear after adding charge point to a liquid-line restriction (e.g., partially plugged drier) flashing the liquid before the glass. The pressure drop causes flash gas. Normal subcooling rules out a simple undercharge.

48. C — Warm first rows with the rest near ambient and high subcooling indicate an overcharge flooding the lower condenser rows with subcooled liquid. The flooded section cannot reject heat as vapour. Recovering excess charge restores the normal temperature profile.

49. B — Repeated internal-overload trips with a good run capacitor and normal suction pressure direct the next check to the start components and winding resistance for a hard-starting or shorted winding. Hard starting overheats the motor. Winding and start-circuit testing isolates the fault.

50. C — Heavy suction-line sweating to a warm compressor with localized frost near the evaporator outlet suggests liquid floodback or a localized restriction at the outlet letting liquid persist. Liquid reaching the compressor risks damage. Investigating the metering/outlet condition addresses it.

51. A — Front-seating the king valve while the compressor runs isolates the charge in the receiver — a normal pump-down — and the low-pressure control correctly stops the compressor once the low side is evacuated. The deep vacuum is expected. This is the intended pump-down sequence.

52. D — During pump-down, suction that refuses to drop below 200 kPa with the liquid line closed indicates a leaking liquid-line solenoid or metering device letting refrigerant back into the low side. The continued feed prevents evacuation. Repairing the leaking valve allows proper pump-down.

53. C — High-pressure short-cycling with head spikes on a clean condenser in hot weather points to insufficient condenser airflow (failing fan/motor or recirculation) or an overcharge raising head pressure. Both push pressure to the cutout. Restoring airflow or correcting charge stops the trips.

54. B — A filter-drier noticeably colder than the rest of the liquid line with a measurable temperature drop indicates a pressure drop from restriction, causing localized flashing and cooling. A clean drier shows little temperature change. The cold drier signals it needs replacement.

55. C — Failure to clear frost during hot-gas defrost, with suction barely rising and the coil staying cold, points to the hot-gas solenoid valve not opening or opening insufficiently. Without hot gas the coil cannot warm. Verifying and repairing the solenoid restores defrost.

56. A — A hot compressor with high discharge temperature, normal pressures, adequate charge, and ~40°C suction superheat indicates excessive superheat starving the compressor of cooling and oil return. Suction gas normally cools the motor. Reducing superheat restores proper cooling.

57. C — A bulb loosely strapped to the top of a horizontal suction line gives erratic or falsely high superheat readings, causing the valve to misfeed. The top is not in good thermal contact with the refrigerant stream. Mounting at 4 or 8 o'clock gives accurate sensing.

58. A — Rising head pressure with only a small water-side temperature rise indicates reduced water flow or fouling limiting heat rejection on a water-cooled condenser. Less heat carried away raises condensing pressure. Restoring flow or cleaning the tubes corrects it.

59. D — A startup knock that fades once running, with normal oil level, indicates liquid refrigerant slugging into the cylinders at start from off-cycle migration. Liquid does not compress and causes the knock. A crankcase heater and proper off-cycle control prevent migration.

60. A — A very hot discharge line with overload cycling, high suction superheat, and confirmed low charge are linked: low charge raises superheat and discharge temperature, overheating the compressor. Insufficient refrigerant cannot cool the motor. Correcting the charge lowers discharge temperature.

61. C — Uneven frosting, with bottom circuits heavily frosted and top circuits warm, indicates uneven refrigerant distribution — often a faulty distributor or partially blocked feeder tube. Some circuits are starved. Correcting distribution evens the coil loading.

62. D — On a multi-circuit system where one circuit has high superheat and low capacity while another is normal, the logical first check is that circuit's individual metering device and liquid feed for restriction or underfeeding. The shared components serve both circuits normally. The fault is circuit-specific.

63. C — An earlier "good" capacitor test that now reads open reconciles with the symptom: an open run capacitor starves a PSC compressor of start torque, producing hum-and-trip. The stale reading masked the fault. Replacing the open capacitor restores starting.

64. C — Full line-side voltage but zero load-side voltage with the contactor pulled in indicates pitted or burned contacts not completing the circuit despite mechanical closure. The contacts cannot pass current. Replacing the contactor restores the load circuit.

65. D — A markedly low leg current (11 A against 18 A) on a three-phase motor most strongly suggests a high-resistance connection or partial open on that phase. Unequal current loads the windings unevenly. Tightening or repairing the connection rebalances the legs.

66. D — A 24 V fuse that blows the instant cooling is called indicates a direct short, and the efficient first step is to isolate the circuit section by section, starting at the contactor coil and field wiring. Systematic isolation finds the fault fast. Random part replacement wastes time.

67. A — An open start winding (infinite resistance) with a normal run winding means the compressor cannot develop starting torque and will hum and trip on overload. The start winding is essential to begin rotation. An open here is a terminal motor fault.

68. A — Potential-relay contacts that fail to open leave the start capacitor energized continuously, so it overheats and fails and the start winding may overheat. The start components are rated only for brief use. Correct relay dropout removes the start capacitor after startup.

69. A — A defrost timer motor that does not advance has failed or lost power, so the defrost cycle never initiates and the evaporator ices over. Without timer advance, no defrost command is issued. Repairing or replacing the timer restores defrost scheduling.

70. C — 208 V on a 230 V-nameplate unit is low supply voltage, which increases current draw under load and contributes to overload trips in hot weather. Lower voltage means higher amperage for the same power. Correcting supply voltage reduces the trips.

71. D — A low-pressure switch that opens while measured suction pressure is well above the cut-out setting is faulty — contacts opening early — or miswired. The switch is tripping outside its setpoint. Verifying calibration and wiring confirms the defect.

72. B — A run capacitor reading 2.5 μF against a 7.5 μF rating is degraded, reducing motor torque and causing the fan to spin slowly and overheat. Capacitance loss weakens the auxiliary winding's field. Replacing the capacitor restores normal speed.

73. B — With 24 V present at the coil terminals but no pull-in, the contactor coil is open despite the voltage across it. Voltage without current flow means the coil winding is broken. Replacing the contactor restores operation.

74. C — Reduced capacity, a higher-pitched sound, high suction, and low head right after service indicate two supply phases were swapped, reversing rotation. On scroll/screw compressors this prevents proper pumping. Restoring correct phasing fixes the performance.

75. D — A control transformer that holds 24 V unloaded but sags to 9 V under the coil load indicates a shorting/overloaded coil or an undersized/failing transformer. The voltage collapse under load reveals the weakness. Testing the coil and transformer isolates the cause.

76. C — A hard-start kit whose relay chatters and whose start capacitor fails quickly indicates a mismatched start relay with the wrong pickup/dropout voltage for the compressor. Improper dropout leaves the capacitor in too long or cycles it. Matching the relay to the compressor corrects it.

77. B — A defrost element that stays cold with 240 V applied and measures open is burned out, so no current can flow and no heat is produced. An open element cannot complete the circuit. Replacement restores defrost heating.

78. A — Normal winding-to-winding readings but 50 ohms common-to-ground indicates a winding-to-ground short from insulation breakdown, requiring compressor replacement. A healthy compressor reads effectively infinite to ground. The low ground reading confirms insulation failure.

79. C — A reversing-valve solenoid that is energized and clicks but cannot shift the valve points to insufficient pressure differential to move the slide, or a stuck valve body. The pilot operates but the main valve cannot complete the shift. Verifying differential and valve condition isolates the cause.

80. A — A jumpered low-pressure switch removes a critical safety, letting the compressor run into a deep vacuum during refrigerant loss and overheat the windings. The bypass defeats low-side protection. Restoring the switch prevents run-in-vacuum damage.

81. A — Three heat strips energizing simultaneously and tripping the breaker indicate a failed sequencer closing all contacts at once instead of staging them. Staging exists to limit inrush. Replacing the sequencer restores sequential energizing.

82. D — A high-pressure fault on the board while measured head pressure is normal, with intact wiring, directs the next check to the transducer for drift/failure or a connector issue feeding a false signal. The control acts on bad data. Verifying or replacing the transducer clears the false fault.

83. C — Reading 120 V to ground on each leg but 0 V across the element means both sides sit at equal potential, so no voltage difference drives current — pointing to an open switch/contact upstream feeding both sides equally. With no potential difference the element cannot heat. Locating the open device restores the circuit.

84. C — A start winding that burns out because the centrifugal switch fails to disconnect shows that a stuck switch keeps the start winding energized continuously, overheating it. The start winding is rated only for brief use. Repairing the switch protects the winding.

85. A — An ECM blower ramping erratically with surging airflow, communicating via a low-voltage signal, warrants a first check of the control signal/programming and module connections feeding the ECM. The motor follows its commanded profile. Verifying the signal isolates control faults from motor faults.

86. D — A contactor that chatters and will not stay pulled in with 24 V present indicates low/fluctuating control voltage under load or a damaged coil/contact surface preventing solid pull-in. Insufficient holding force causes the chatter. Checking voltage under load and the coil/contacts isolates it.

87. C — A large dry-bulb drop with a small wet-bulb drop across a cooling coil means the coil is providing mostly sensible cooling with little dehumidification. Wet-bulb tracks total heat, so a small change means little latent removal. This profile indicates limited moisture removal.

88. D — Below-design CFM with a clean coil, new filter, and full-speed blower directs the check to duct restrictions, closed dampers, or a slipping/incorrect blower drive reducing airflow. The air path or drive is the limiter, not the coil. Inspecting ductwork and drive restores airflow.

89. C — A VAV zone that stays warm with the box damper fully open and correct supply temperature indicates insufficient duct static or airflow to the box, so even a fully open damper cannot deliver enough air. The box is starved upstream. Restoring system static/airflow corrects it.

90. B — Total external static of 0.9 in. w.c. against a 0.5 in. w.c. rating indicates excessive system resistance — undersized/restricted ductwork or dirty components — overloading the blower. High static reduces airflow and strains the motor. Correcting duct restrictions lowers static.

91. B — Weak airflow to far rooms while near rooms over-condition indicates an unbalanced duct system needing damper adjustment/balancing. Air follows the path of least resistance to near registers. Balancing redistributes airflow to the far rooms.

92. C — A blower wheel caked with debris loses effective blade geometry, reducing airflow and capacity and possibly icing the coil. The fouled wheel cannot move design air. Cleaning the wheel restores airflow.

93. B — Doors hard to open inward and struggling exhaust fans indicate supply (outdoor/makeup) air exceeds exhaust, over-pressurizing the space. Positive pressure resists inward door swing. Rebalancing supply and exhaust corrects the pressure.

94. A — An economizer damper that stays closed despite a valid signal points to a failed actuator/linkage or a binding damper preventing movement. The command is present but motion is not. Inspecting the actuator and linkage isolates the fault.

95. D — A filter pressure drop far above its clean rating with reduced airflow indicates the filter is loaded/clogged and must be replaced to restore airflow. Loading raises resistance across the media. Replacement returns the system to design airflow.

96. B — Condensation on supply diffusers in a humid space, with surfaces below room dew point, indicates inadequate diffuser insulation or supply air far below dew point combined with high indoor humidity. The cold surface condenses moisture. Addressing insulation or humidity stops the dripping.

97. A — A long exhaust duct with sharp elbows and a crushed flex section adds excessive resistance that reduces the fan's effective airflow. The fan cannot overcome the added static. Correcting the duct path restores exhaust volume.

98. A — A makeup-air unit discharging far below setpoint with the gas valve at minimum fire directs the check to the control signal and gas valve/burner staging for a stuck-low or failed modulation. The burner is not firing up to demand. Verifying the modulation circuit isolates the fault.

99. D — A several-year-old, dusty duct smoke detector tripping intermittently with no visible smoke indicates a dirty/contaminated detector giving false trips, needing cleaning or replacement. Contamination raises sensitivity to false signals. Servicing the detector stops nuisance trips.

100. A — Airflow 25% above design with overcooling and register noise indicates the blower speed tap is set too high or the drive is over-speeding the wheel. Excess air raises velocity and noise. Lowering the speed tap returns airflow to design.

101. C — Elevated CO₂ in a tightly sealed space with no outdoor-air adjustment indicates an insufficient outdoor-air ventilation rate for the occupancy. Without fresh-air dilution, CO₂ accumulates. Increasing outdoor-air intake resolves the stale-air complaints.

102. C — A stuck-open humidifier solenoid produces continuous water feed without proper evaporation, flooding the duct while humidity may still read low. The water bypasses the evaporative process. Repairing the solenoid stops the flooding.

103. D — Outdoor- and return-air dampers stuck at 50% impose a constant high outdoor-air load that the coil cannot meet in extreme weather. The fixed mix ignores conditions. Restoring damper modulation lets the system match the load.

104. B — Water carryover with face velocity well above design means airflow is too high for the coil, entraining condensate before it can drain. Excess velocity strips droplets off the fins. Reducing face velocity stops the carryover.

105. D — A heavily iced outdoor coil with weak heating and no defrost on a demand-type control indicates the defrost initiation sensor/control failed to trigger the cycle. Without initiation, ice accumulates. Repairing the defrost control restores the cycle.

106. C — Cold supply air during defrost with the auxiliary heat relay open links directly: auxiliary heat should energize during defrost to temper the supply air, and the open relay prevents it, causing cold drafts. Defrost reverses the cycle, cooling indoor air. Restoring the relay tempers the supply.

107. C — High head pressure with a small water-loop temperature rise on a water-source heat pump indicates low water flow or a fouled coaxial heat exchanger limiting heat rejection. Less heat carried away raises head pressure. Restoring flow or cleaning the exchanger corrects it.

108. A — A reversing valve leaking hot discharge gas to the suction side in heating reduces heating capacity and raises suction temperature/pressure abnormally. The bypass short-circuits the cycle. Replacing the valve restores full heating output.

109. B — An evaporator approach rising from 1°C to 4°C over time indicates fouling or scaling on the tubes reducing heat transfer. Poorer heat transfer widens the approach. Cleaning the tubes restores design approach.

110. D — Centrifugal-chiller surge — rhythmic pulsing with fluctuating discharge pressure at low load — occurs when insufficient gas flow through the impeller causes flow reversal at low load/high lift. The compressor cannot sustain head. Raising load or adjusting controls stops the surge.

111. C — A glycol concentration higher than design raises viscosity and lowers heat-transfer capacity, reducing system capacity. Thicker fluid resists flow and transfers heat less effectively. Diluting to the design concentration restores performance.

112. A — Normal pressures but indoor-coil icing with a clogged filter shows that low airflow lowers the coil temperature below freezing, icing the coil despite normal charge. Insufficient air over the coil drops its temperature. Restoring airflow prevents icing.

113. A — A single VRF indoor unit not cooling with an unresponsive EEV while others run normally directs the check to that unit's EEV and its control wiring/board for a failed valve or communication fault. The shared system is otherwise fine. The fault is local to the affected unit.

114. C — Gurgling, reduced flow, and erratic capacity on a ground-source loop with dropping pressure indicate air entrained in the loop reducing flow and heat transfer; the loop needs purging. Air pockets disrupt circulation. Purging restores full flow.

115. A — Heating short-cycling on low suction in very cold weather with a clear coil and working defrost indicates the system is operating beyond its low-ambient capacity, with suction pressure dropping below the control setting. Cold ambient lowers available heat. Supplemental heat or balance-point management addresses it.

116. B — Rising low-stage suction temperature and falling capacity with a normal high stage on a cascade system direct the check to the cascade heat exchanger and the high stage's ability to reject the low-stage heat. The interstage link governs low-stage performance. Verifying charge/flow on either side isolates it.

117. B — A reversing valve only partially shifted, shown by a large temperature spread across the body, internally bypasses discharge gas, reducing capacity and causing abnormal suction/discharge temperatures. The incomplete shift short-circuits flow. Servicing or replacing the valve restores full operation.

118. D — When superheat, subcooling, amperage, and airflow are all on target yet the space won't reach setpoint, the next check is the building load/heat gain versus equipment capacity — the system may be undersized. Correct refrigerant-side readings point away from the equipment. A load-vs-capacity mismatch is the remaining explanation.

119. A — Verifying scroll-compressor rotation at commissioning is critical because reverse rotation produces no or low pumping and can damage the scroll. Three-phase scrolls are direction-sensitive. Confirming rotation before extended running prevents damage.

120. A — A condenser approach creeping up 3°C over a year with unchanged charge and airflow indicates gradual condenser fouling reducing heat-transfer effectiveness. Trended data isolates slow degradation. Cleaning the condenser restores the approach.

121. C — Oil analysis showing elevated acid and moisture indicates contamination degrading the system; the source must be investigated and the system decontaminated. Acid and moisture attack components and insulation. Acting on the analysis prevents compressor failure.

122. D — High subcooling with normal superheat and slightly high head pressure at startup indicates an overcharge backing liquid into the condenser. Excess liquid raises subcooling and pressure. Recovering charge to target corrects the readings.

123. A — A dry trap with an overflowing pan indicates a clogged condensate drain line or trap not draining, causing the overflow. Water cannot exit the pan. Clearing the drain and priming the trap restores drainage.

124. B — Measured 250 CFM per ton against the typical ~400 indicates low airflow per ton, which risks coil freezing and reduced capacity; airflow must be increased. Too little air over the coil drops its temperature. Correcting airflow protects capacity and prevents icing.

125. D — Documenting actual charge against the nameplate establishes the baseline for leak detection, future service, and regulatory recordkeeping. A known baseline lets later technicians spot losses. Accurate records support both service and compliance.