

PRACTICE EXAM 25: RACM RED SEAL SIMULATION (125 QUESTIONS)

1. A technician is selecting a metering device for a system with a widely varying evaporator load. Which device best maintains constant superheat across that load range?

- A. A fixed-bore capillary tube sized for peak load
- B. A high-side float maintaining condenser liquid level
- C. A hand expansion valve set at the average load point
- D. A thermostatic expansion valve with external equalizer

2. A walk-in freezer evaporator must be defrosted on a system running at -20°F coil temperature. Which defrost method is generally most suitable for this low-temperature application?

- A. Off-cycle air defrost relying on box air temperature
- B. Ambient defrost with the fans left running continuously
- C. Electric or hot-gas defrost with a termination control
- D. Manual defrost performed by the operator each morning

3. When designing a suction line with a long vertical riser on a low-temperature system, the technician should:

- A. Oversize the riser to minimize the line pressure drop
- B. Install a properly sized riser and trap for oil return
- C. Slope the riser downward toward the compressor inlet

D. Use the largest diameter tube available in the shop

4. A system will use a zeotropic blend with significant glide. When charging this system, the technician should:

A. Charge vapour from the top of the cylinder slowly

B. Charge until the cylinder empties to avoid any waste

C. Add refrigerant only after the system reaches full load

D. Charge liquid to preserve the blend's composition

5. A technician must braze a suction line connection. To produce a clean internal joint free of oxidation scale, the correct procedure is to:

A. Apply extra flux inside the tube before heating fully

B. Quench the joint with water immediately after brazing

C. Flow dry nitrogen through the line while brazing the joint

D. Use a carburizing flame to consume the internal oxygen

6. A condensing unit located where winter ambient falls well below freezing needs reliable operation. The best provision for stable head pressure is:

A. A larger condenser to reject more heat in winter

B. A head pressure control such as fan cycling or flooding

C. A smaller compressor to reduce the winter capacity

D. Removing refrigerant charge during the cold season

7. A technician is choosing overload protection for a hermetic compressor. The protection should be selected to:

- A. Trip only at the locked-rotor amperage threshold value
- B. Allow indefinite operation at any current draw level
- C. Trip at exactly half of the rated full-load amperage
- D. Protect the motor near its FLA per the manufacturer

8. A multi-evaporator rack system runs cases at different temperatures off one suction main. To hold a warmer case at its proper temperature, the technician installs:

- A. A check valve in that case's branch suction line
- B. A larger TXV to overfeed that particular evaporator
- C. An evaporator pressure regulator on that case outlet
- D. A crankcase pressure regulator at the compressor inlet

9. A system frequently floods liquid back to the compressor during startup after long off-cycles. The most appropriate corrective addition is:

- A. A suction-line accumulator to trap and meter liquid
- B. A larger liquid-line filter drier to slow the flow
- C. A discharge muffler to dampen the startup surge
- D. An oil separator to return oil during the surge

10. When recovering refrigerant before opening a system, the primary regulatory and environmental purpose is to:

- A. Prevent the release of refrigerant to the atmosphere
 - B. Preserve the refrigerant purely for resale at a profit
 - C. Reduce the time required to evacuate the system later
 - D. Maintain the cylinder pressure for the next charging job
11. A technician must protect a refrigerant receiver from overpressure. The pressure relief device must be selected and set according to:

- A. The normal suction pressure of the operating system
- B. The discharge superheat measured at full system load
- C. The municipal water supply pressure to the building
- D. The maximum allowable working pressure of the vessel

12. A system shows good airflow and correct charge yet the evaporator coil freezes during long low-load run cycles. The best design-level correction is to:

- A. Increase the refrigerant charge above the nameplate value
- B. Reduce the condenser airflow to raise the head pressure
- C. Replace the compressor with a larger-capacity model
- D. Add capacity control or cycling to match light loads

13. A technician selects refrigeration oil for a system using an HFC refrigerant. The correct oil type is generally:

- A. A polyolester (POE) oil compatible with HFC refrigerants
- B. A mineral oil as used with older CFC refrigerant systems
- C. Any available oil since refrigerant and oil are independent
- D. An alkylbenzene oil specified only for ammonia systems

14. A liquid line must rise 25 ft from the condenser to the evaporator. The technician must ensure adequate subcooling because the vertical lift will:

- A. Increase the liquid pressure as it rises up the line
- B. Reduce liquid pressure and risk flash gas at the top
- C. Have no effect on the liquid pressure in the riser
- D. Raise the condensing temperature at the unit outlet

15. A parallel-compressor rack shares a common suction header. To keep each compressor properly lubricated, the system requires:

- A. A single large oil charge dumped into the suction main
- B. A check valve in each compressor's suction connection
- C. An oil management system with separators and regulators
- D. A crankcase heater on only the lead compressor unit

16. A technician must leak-test a new installation before charging. The recommended pressure-test medium is:

- A. The system refrigerant itself at full operating pressure

- B. Compressed shop air drawn through the standard regulator
- C. Dry nitrogen, with the test pressure limited by the weakest component
- D. Oxygen, because it detects leaks faster than inert gases

17. A system uses a TXV with an external equalizer. The equalizer line must be connected to:

- A. The liquid line just downstream of the receiver outlet
- B. The compressor discharge service port at the head
- C. The top of the condenser inlet header connection point
- D. The suction line just past the bulb at the coil outlet

18. A technician is commissioning a heat pump and must confirm correct refrigerant flow direction in both modes. The component that reverses the cycle is the:

- A. Four-way reversing valve controlled by a solenoid
- B. Bi-flow filter drier installed in the liquid line
- C. Suction-line accumulator on the compressor inlet
- D. Thermostatic expansion valve at the indoor coil

19. A technician must size conductors for a continuous-duty heater circuit. Per the common rule, the conductor and breaker should be sized so the continuous load does not exceed:

- A. 100% of the breaker rating for continuous-duty loads
- B. 80% of the breaker rating to prevent nuisance tripping

- C. 50% of the breaker rating for any continuous load
- D. 125% of the breaker rating to allow for surge current

20. A flooded evaporator chiller maintains a liquid level around its tubes. This design is chosen primarily because it provides:

- A. A smaller refrigerant charge than a DX coil of equal size
- B. Elimination of any need for oil-return management
- C. Superior heat transfer from fully wetted tube surfaces
- D. Simpler controls with no liquid-level regulation needed

21. A technician finds acidic oil after a hermetic compressor burnout. The correct cleanup procedure for the replacement compressor includes:

- A. Installing a suction filter drier and acid-testing afterward
- B. Adding extra refrigerant charge to flush out the acid
- C. Disabling the high-pressure safety to allow operation
- D. Reusing the contaminated oil after a single filtering pass

22. A technician must select a contactor for a 240 V compressor with a 24 V control circuit. The contactor coil voltage must match the:

- A. Line voltage applied to the compressor load terminals
- B. Control circuit voltage that energizes the coil itself
- C. Full-load amperage rating of the condenser fan motor
- D. Discharge pressure switch differential setting value

23. A system using R-410A must be charged accurately because the refrigerant operates at higher pressures. The recommended charging method is:

- A. Vapour charging from the cylinder top until pressures rise
- B. Charging by weight or a superheat/subcooling chart
- C. Adding refrigerant until the sight glass clears of bubbles only
- D. Topping off by feel until the suction line frosts over

24. A technician must return oil reliably on a low-temperature system with long line runs. The best provision is:

- A. A larger compressor crankcase to hold more reserve oil
- B. A bypass line returning oil directly to the evaporator
- C. Eliminating all vertical risers from the suction piping
- D. An oil separator in the discharge line with a float return

25. A technician is selecting a refrigerant for a new system and must consider both ozone and climate impact. The most environmentally responsible choice generally has:

- A. A high ozone depletion potential but low cost per pound
- B. A high global warming potential but easy availability
- C. A moderate toxicity rating with no flammability concern
- D. A low ozone depletion potential and low global warming potential

26. A technician installs a liquid-line solenoid valve for pump-down control. On a satisfied thermostat, the solenoid:

- A. Opens to flood the evaporator with extra liquid refrigerant
- B. Closes so the compressor pumps the low side down before stopping
- C. Modulates to maintain a constant superheat at the coil
- D. Bypasses hot gas to the suction line for capacity control

27. A technician must select tubing for a refrigerant line. The correct material and preparation is:

- A. Refrigeration-grade (ACR) copper, cleaned and capped dry
- B. Standard plumbing copper with residual water inside
- C. Galvanized steel pipe sealed with pipe-thread compound
- D. Soft aluminum tubing joined with standard plumbing solder

28. A technician finds that a TXV system hunts, with suction pressure swinging widely. After confirming charge and airflow, the most likely cause is:

- A. An oversized liquid line reducing refrigerant velocity
- B. A completely blocked condenser coil restricting airflow
- C. A discharge valve leaking inside the compressor head
- D. A sensing bulb that is loose, mislocated, or uninsulated

29. A technician must evacuate a system thoroughly after a moisture-related failure. The most effective method is:

- A. A single deep vacuum held briefly before charging quickly
- B. Pressurizing with refrigerant then venting several times
- C. Blowing the system out with dry shop air under pressure
- D. Triple evacuation with dry-nitrogen breaks between pulls

30. A technician must choose between a semi-hermetic and a fully hermetic compressor for an application needing field-serviceable valves and motor. The semi-hermetic is preferred because it:

- A. Requires no electrical motor inside the compressor shell
- B. Has bolted access covers allowing in-place servicing
- C. Operates without any oil in the crankcase assembly

D. Eliminates the need for refrigerant in the system entirely

31. A technician must protect a soft, non-metallic valve seat while brazing a nearby joint. The correct practice is to:

- A. Remove the valve internals or apply a wet heat-sink wrap
- B. Apply maximum heat quickly before the seat can soften
- C. Pack the valve body with extra flux to absorb the heat
- D. Leave the seat in place since it resists brazing heat well

32. A technician is commissioning a system and wants to verify the charge on a TXV-equipped unit. The most reliable charging reference for a TXV system is:

- A. The subcooling measured at the condenser outlet line
- B. The superheat measured at the evaporator outlet coil
- C. The discharge line temperature at the compressor head

D. The amperage drawn by the condenser fan motor only

33. A technician selects a defrost termination method for a commercial freezer. The most reliable arrangement initiates defrost on time and terminates on:

- A. A fixed elapsed time identical to the initiation interval
- B. The compressor amperage falling below a set threshold
- C. The suction pressure rising above a preset gauge value
- D. Coil temperature reaching a set point, with backup time

34. A technician must select a refrigerant detector for an A2L mildly flammable refrigerant. The correct detector is one that is:

- A. Specifically rated and intrinsically safe for that refrigerant
- B. A standard halide torch with an open detection flame
- C. Designed only for CFC refrigerants from older systems
- D. A soap-bubble solution applied while under deep vacuum

35. A technician must size a suction line to balance two competing needs. Those two needs are:

- A. Adequate oil-return velocity and minimal pressure drop
- B. Maximum pressure drop and maximum refrigerant velocity
- C. Lowest possible velocity and highest possible pressure drop
- D. Returning liquid refrigerant and trapping all the oil

36. A technician selects a head pressure control for a low-ambient air-cooled condenser. A flooding-type control maintains head pressure by:

- A. Cycling the compressor off whenever pressure drops too far
- B. Increasing the evaporator superheat during cold weather
- C. Backing liquid into the condenser to reduce active surface
- D. Venting refrigerant to atmosphere as the ambient falls

37. A technician must choose a refrigerant-line filter drier for a bi-directional heat pump. The correct drier is a:

- A. Standard one-way liquid drier installed in either direction
- B. Suction drier rated only for the heating mode operation
- C. Bi-flow drier that filters and dries in both flow directions
- D. Loose-fill drier with no internal check or flow direction

38. A technician installs a sight glass with a moisture indicator in the liquid line. Its primary purpose is to:

- A. Reveal flash-gas bubbles and indicate moisture in the system
- B. Measure the exact refrigerant charge weight in the system
- C. Regulate the refrigerant flow to the metering device inlet
- D. Separate oil from the liquid refrigerant before the valve

39. A technician is designing oil return on a suction riser. The function of a properly sized P-trap at the base is to:

- A. Drain condensate from the evaporator coil to the floor
- B. Reduce pressure drop along the vertical riser section
- C. Collect oil so gas velocity can carry it up the riser
- D. Prevent liquid refrigerant from entering the evaporator

40. A technician must select the correct refrigerant handling credential to purchase and service systems in Canada. The required credential is:

- A. A municipal business operating permit for the trade
- B. An ozone depletion prevention / refrigerant handling certification
- C. A manufacturer-specific equipment training certificate
- D. A provincial gas-fitter licence covering fuel appliances

41. A technician must lock out and tag out a compressor before servicing. After applying the lock and tag, the next required step is to:

- A. Verify zero energy with a meter before touching conductors
- B. Re-energize briefly to confirm the lockout is effective
- C. Remove the run capacitor without discharging it first
- D. Reconnect meter leads to check the motor rotation direction

42. A technician selects a crankcase heater for a compressor in a cold location. Its purpose during the off-cycle is to:

- A. Prevent refrigerant from migrating and condensing in the oil
- B. Raise the discharge superheat at the moment of startup
- C. Maintain the evaporator temperature through the defrost
- D. Keep the discharge line warm to prevent its condensation

43. A technician must choose between charging by weight and charging by superheat for a fixed-orifice system. The superheat method is appropriate because it:

- A. Ignores indoor and outdoor conditions during the charging
- B. Accounts for load and ambient to fine-tune the charge
- C. Requires no temperature or pressure readings at all
- D. Applies only to TXV-equipped systems with subcooling

44. A technician finds a system with high superheat and low subcooling. Before adding refrigerant, the technician should first:

- A. Replace the compressor assuming an internal valve leak
- B. Increase the condenser airflow to raise the subcooling
- C. Reduce the evaporator airflow to lower the superheat
- D. Leak-check the system to find why the charge is low

45. A technician selects an expansion device for a system with a stable, predictable load and tight cost constraints. The most appropriate choice is a:

- A. Thermostatic expansion valve with an external equalizer

- B. Electronic expansion valve with a stepper-motor control
- C. Low-side float maintaining the evaporator liquid level
- D. Capillary tube sized for the system's fixed operating point

46. A technician must confirm correct rotation on a three-phase scroll compressor before extended running because reverse rotation will:

- A. Slightly improve the compressor's volumetric efficiency
- B. Have no measurable effect on scroll compressor output
- C. Fail to pump and can damage the compressor quickly
- D. Cause the crankcase heater to draw excessive current

47. A technician installs a discharge-line oil separator on a long-line low-temperature system. Its function is to:

- A. Cool the discharge gas before it enters the condenser coil
- B. Add fresh makeup oil to the refrigerant on each cycle
- C. Trap moisture and acid before the condenser inlet header
- D. Return entrained oil to the compressor crankcase

48. A technician must select the correct fill limit when transferring liquid refrigerant into a recovery cylinder. The cylinder must not be filled beyond:

- A. About 80% capacity to allow for liquid thermal expansion
- B. 100% capacity to maximize the recovery efficiency

- C. 95% capacity since vapour space is unnecessary
- D. 50% capacity to keep the cylinder light for transport

49. A technician installs an evaporator pressure regulator on a higher-temperature case in a multi-case system. The EPR works by:

- A. Increasing flow to the lowest-temperature case on the rack
- B. Equalizing discharge pressure across both system condensers
- C. Throttling the case outlet to hold a minimum coil pressure
- D. Preventing the compressor from short-cycling on the high side

50. A technician must select a relief-valve discharge location under CSA B52. The relief must discharge to:

- A. The nearest interior floor drain in the machinery room
- B. A manifold tied into the building's sanitary stack
- C. A safe location, typically outdoors away from occupants

D. The low-pressure side through an internal check valve

51. A technician must select the correct gauge connection for normal operation on a service valve. During running operation, the service valve should be:

- A. Front-seated to isolate the gauge from the system flow
- B. Removed entirely to allow direct system pressure reading
- C. Capped with no gauge connected during the running test
- D. Mid-seated (cracked) to allow both flow and a gauge reading

52. A technician designs a system that must avoid liquid floodback during defrost and mode reversal on a heat pump. The recommended component is:

- A. A suction-line accumulator ahead of the compressor inlet
- B. A larger liquid-line drier to slow the returning refrigerant
- C. A discharge muffler to absorb the reversal pressure surge
- D. A high-side float to store the liquid during the reversal

53. A technician selects insulation for a low-temperature suction line. The insulation is required primarily to:

- A. Increase the suction superheat reaching the compressor
- B. Reduce the noise transmitted from the refrigerant flow
- C. Speed the oil return by warming the suction gas slightly
- D. Prevent heat gain and condensation on the cold suction line

54. A technician must choose a compressor capacity-control method that allows continuous operation at reduced load on a reciprocating unit. A common method is:

- A. Reducing the refrigerant charge during low-load periods
- B. Lowering the supply voltage to slow the motor speed
- C. Closing the suction service valve partway during low load
- D. Cylinder unloading by holding suction valves open

55. A technician must select the correct flame setting when brazing copper refrigerant lines. The preferred oxy-acetylene flame is:

- A. A strongly oxidizing flame to clean the joint surface
- B. A neutral flame providing balanced, clean combustion
- C. A heavily carburizing flame to add carbon to the joint
- D. The smallest possible flame regardless of the joint size

56. A technician designs a secondary (brine) refrigeration loop for a supermarket. The secondary fluid is used to:

- A. Replace the primary refrigerant inside the compressor
- B. Carry cooling from a central chiller to remote display loads
- C. Increase the ozone depletion potential of the system
- D. Eliminate any need for a primary refrigerant charge at all

57. A technician selects a refrigerant for a system in an occupied space and reviews its ASHRAE safety classification. An A1 refrigerant is characterized by:

- A. Higher toxicity with a high flammability propagation rating
- B. Higher toxicity but with no flame propagation rating at all
- C. Lower toxicity and no flame propagation (nonflammable)
- D. Lower toxicity but with a mild flammability classification

58. A technician must decide where to install the TXV sensing bulb on the suction line. The correct location and mounting is:

- A. On the bottom of the line, downstream of the equalizer tap
- B. On a clean horizontal run, firmly clamped and insulated
- C. Vertically on the riser just above the compressor inlet
- D. Inside the evaporator header where flow is most turbulent

59. A technician must select a method to add artificial load and prevent low suction pressure at light load. The appropriate component is a:

- A. Crankcase pressure regulator at the compressor suction
- B. Hot-gas bypass valve feeding discharge gas to the low side
- C. Liquid-line solenoid valve closing on a satisfied thermostat
- D. High-side float metering liquid to the evaporator coil

60. A technician reviews a system with a liquid-suction heat exchanger. Its purpose is to subcool the liquid while:

- A. Superheating the suction vapour returning to the compressor
- B. Reducing the compressor displacement at a constant speed
- C. Lowering the condenser's required heat rejection directly

D. Eliminating the need for any condenser subcooling at all

61. A technician must select a charging approach for a critically charged capillary-tube system. Because there is no receiver, the technician should:

- A. Overcharge slightly to ensure a full liquid line always
- B. Add charge until the suction line frosts back fully
- C. Charge until the sight glass clears regardless of weight
- D. Charge the exact specified weight, since charge is critical

62. A technician installs a check valve in the discharge line of one compressor on a parallel rack. Its function is to:

- A. Prevent reverse flow from running compressors into an idle one
- B. Reduce the discharge pressure during peak load conditions
- C. Filter oil from the discharge gas before the condenser inlet
- D. Equalize the suction pressure between the two compressors

63. A technician must size a condenser for a hot-climate installation. To maintain a reasonable condensing temperature at high ambient, the condenser should be:

- A. Sized with adequate surface for the high-ambient design day
- B. Undersized to keep the head pressure intentionally high
- C. Selected for the coldest expected winter day instead
- D. Matched only to the compressor displacement, not ambient

64. A technician selects a TXV with a maximum operating pressure (MOP) charge for a system prone to high suction pressure on pulldown. The cross-charged or MOP bulb will:

- A. Keep the valve fully open during the entire pulldown period

- B. Eliminate the need for an external equalizer connection
- C. Increase the bulb's sensitivity to small temperature shifts
- D. Throttle the valve to cap suction pressure during pulldown

65. A technician must choose how to handle refrigerant recovered from a system with a severe burnout. The recovered refrigerant must be:

- A. Recharged directly back into the repaired system
- B. Sent for reclamation to restore it to purity standards
- C. Vented after passing it through a suction-line drier
- D. Blended with virgin refrigerant to dilute the acid content

66. A technician designs the electrical control circuit and must match the contactor coil to the transformer output. A 24 V control transformer requires:

- A. A 240 V coil matched to the compressor line voltage
- B. A 120 V coil matched to the condenser fan supply
- C. Any coil voltage since contactors self-adjust to supply
- D. A 24 V coil matched to the control-circuit voltage

67. A technician installs a defrost drain line on a low-temperature evaporator. To prevent the drain from freezing and blocking, it should be:

- A. Routed uphill to keep debris out of the coil pan
- B. Connected directly into the suction line for added heat

- C. Left fully uninsulated to absorb heat from the room
- D. Trapped and heated where it passes through freezing zones

68. A technician selects a compressor for a system and reviews volumetric efficiency. Volumetric efficiency decreases as:

- A. The suction superheat entering the compressor decreases
- B. The number of cylinders in the compressor increases
- C. The compression ratio rises, increasing clearance re-expansion
- D. The refrigerant's latent heat of vaporization increases

69. A technician must verify zero energy on a circuit after lockout. The correct tool and method is to:

- A. Touch the conductors briefly to feel for any voltage
- B. Use a properly rated meter to confirm absence of voltage
- C. Observe whether the equipment restarts on its own
- D. Rely on the lockout tag alone without further testing

70. A technician sizes a liquid line and must avoid excessive pressure drop. Excessive liquid-line pressure drop is undesirable because it can:

- A. Increase the subcooling delivered to the metering device
- B. Raise the condensing temperature at the condenser outlet
- C. Cause flash gas to form before the metering device inlet

D. Improve the refrigerant velocity for better oil return71. A technician must choose where to take a superheat measurement on a DX system. Superheat is correctly measured at the:

- A. Liquid line just downstream of the condenser outlet
- B. Discharge line at the compressor head service port
- C. Evaporator outlet, comparing line temperature to saturation
- D. Receiver outlet where the liquid leaves the storage tank

72. A technician installs a hot-gas defrost system on a freezer evaporator. The defrost heat is supplied by:

- A. Electric resistance elements clamped along the coil fins
- B. Hot discharge gas routed through the evaporator coil
- C. Warm water sprayed over the coil surface periodically
- D. Reversed condenser-fan airflow blown across the coil

73. A technician must select an oil that returns reliably to the compressor and seals running clearances. Beyond lubrication, the oil's key function is to:

- A. Act as the principal heat-transfer medium in the evaporator
- B. Absorb all of the moisture present in the refrigerant charge
- C. Lower the refrigerant's boiling point in the evaporator coil
- D. Circulate and return to the compressor, sealing clearances

74. A technician must size overload protection and reviews locked-rotor amperage. LRA is significant because it is:

- A. Equal to the normal full-load running current of the motor
- B. About half of the full-load running current at startup
- C. The current drawn only after the motor reaches full speed
- D. Several times the running current during the starting surge

75. A technician designs a pump-down control and selects the stopping condition for the compressor. The compressor stops when the:

- A. Low-pressure control opens as suction pressure falls
- B. High-pressure cutout trips on excessive discharge pressure
- C. Crankcase heater reaches its set operating temperature
- D. Defrost termination thermostat ends the cooling cycle

76. A technician reviews a liquid line sight glass showing steady bubbles during operation. Before assuming a low charge, the technician should also consider:

- A. An overcharge backing liquid into the condenser tubes
- B. A liquid-line restriction such as a partially plugged drier
- C. Excessive subcooling at the condenser outlet connection
- D. Normal full-charge flow with a solid liquid column present

77. A technician installs an electronic expansion valve and its controller. If the coil temperature sensor fails open, the controller should:

- A. Drive the valve fully open to flood the evaporator coil
- B. Close the valve or signal a fault to protect the compressor
- C. Hold the last commanded valve position indefinitely
- D. Increase the compressor speed to compensate for flow

78. A technician must select a method to detect non-condensables in a system. A clear sign of non-condensable gas in the condenser is:

- A. Lower than normal head pressure for the condensing temperature
- B. Excessive subcooling at the condenser outlet line section
- C. Reduced compressor amperage with a cool discharge line
- D. Higher than normal head pressure for the condensing temperature

79. A technician designs a system and must choose the correct evaporator superheat range for a typical DX coil. A normal operating superheat is approximately:

- A. 0°F, indicating the coil is fully flooded with liquid
- B. 40°F, indicating the coil is badly starved of refrigerant
- C. 8–15°F, indicating the coil is properly fed and active
- D. 60°F, indicating the metering device is wide open fully

80. A technician must protect against compressor slugging on a system prone to liquid return. Liquid slugging damages the compressor because:

- A. The oil viscosity drops too low to lubricate the bearings
- B. Liquid is incompressible and stresses the valves and rods
- C. The motor windings overheat from the excess current draw

D. The discharge temperature rises far beyond safe operating limits

81. A technician must select a WHMIS-compliant practice for handling refrigerants in the shop. The required information resource for each hazardous product is:

- A. A municipal fire-department inspection certificate on file
- B. A provincial transport registration sticker on the container
- C. A Safety Data Sheet (SDS) accessible to all workers
- D. A manufacturer warranty validation document for the product

82. A technician finds that a system is undercharged. The most reliable corrective procedure is to:

- A. Leak-find and repair, then recharge to the correct amount
- B. Add refrigerant by feel until the suction line frosts back
- C. Top off the charge without locating the source of the loss
- D. Replace the compressor to resolve the low-charge symptoms

83. A technician selects piping practice to avoid trapping oil in a long horizontal suction run. The line should be:

- A. Pitched slightly downward toward the compressor for oil flow
- B. Pitched upward away from the compressor at all points
- C. Run perfectly level with no slope in any direction
- D. Routed with multiple unnecessary loops to slow the gas

84. A technician reviews the refrigeration cycle and identifies where heat is rejected from the system. Heat is rejected at the:

- A. Evaporator, where refrigerant absorbs heat from the space
- B. Metering device, where pressure drops across the orifice
- C. Condenser, where the refrigerant condenses and rejects heat
- D. Suction line, where the vapour picks up sensible heat

85. A technician selects a charging scale and method for the most accurate results. The most accurate charging method overall is:

- A. Charging by suction-line frost-back appearance during run
- B. Charging by sight-glass clarity at the liquid line only
- C. Charging by precise weight using a calibrated scale
- D. Charging by feel based on line temperature by hand

86. A technician must protect a compressor motor from single-phasing on a three-phase supply. Single-phasing is dangerous because the motor will:

- A. Run faster than rated with reduced current on each leg

- B. Operate normally with no thermal stress on the windings
- C. Stop immediately with no risk of any winding damage
- D. Draw excessive current on the remaining legs and overheat

87. A technician installs a megohmmeter test into a maintenance routine. The test must not be performed while the compressor is:

- A. Under a vacuum, which lowers the gas dielectric strength
- B. At normal operating pressure with refrigerant present
- C. De-energized and disconnected from external wiring
- D. At ambient temperature in a fully isolated condition

88. A technician reviews a system's subcooling and finds it at 0°F with otherwise normal pressures. This most likely indicates the system is:

- A. Overcharged, flooding the condenser with surplus liquid
- B. Low or marginal on refrigerant charge in the system
- C. Operating at peak efficiency with an ideal charge level
- D. Suffering from a restricted suction line near the coil inlet

89. A technician selects a compressor lubrication strategy for a system with refrigerant migration during off-cycles. The best preventive component is a:

- A. Larger oil charge dumped into the compressor crankcase
- B. Suction-line accumulator alone with no other provision

- C. Crankcase heater energized during the compressor off-cycle
- D. Discharge muffler to dampen the startup pressure pulse

90. A technician must select the correct evaporator type to maximize heat transfer in a large chiller. The flooded evaporator achieves this through:

- A. A minimal refrigerant charge wetting only part of the tubes
- B. Fully wetted tube surfaces from a maintained liquid level
- C. A dry-expansion design with high superheat at the outlet

D. The elimination of any liquid-level control on the shell

91. A technician selects an approach to verify a suspected restricted liquid-line drier. A reliable field indication of a restricted drier is:

- A. Equal temperature on both sides of the drier body shell
- B. A higher than normal suction pressure at the compressor
- C. Elevated discharge pressure with normal system subcooling
- D. A temperature drop and possible frost across the drier

92. A technician must size and select a relief valve for a pressure vessel. The relief valve set pressure must be:

- A. Well above the vessel's maximum allowable working pressure
- B. Equal to the system's normal low-side suction pressure
- C. Matched to the discharge superheat at full system load
- D. At or below the vessel's maximum allowable working pressure

93. A technician installs a TXV and must compensate for evaporator pressure drop across the coil. The component that does this is the:

- A. External equalizer line sensing true evaporator outlet pressure
- B. Sensing bulb mounted on the liquid line at the inlet
- C. Internal equalizer port for high-pressure-drop coils only
- D. Capillary feed tube connecting the bulb to the liquid line

94. A technician must choose the correct response when a system shows high superheat, high subcooling, and a temperature drop mid-liquid-line. This points to a:

- A. Refrigerant overcharge flooding the entire condenser coil
- B. Flooded evaporator returning liquid to the compressor
- C. Restriction such as a plugged drier between condenser and coil
- D. Complete loss of charge through a large suction-side leak

95. A technician selects refrigerant piping joints and chooses brazing over soldering for refrigerant lines because brazing:

- A. Requires lower temperatures and simpler equipment to perform
- B. Uses water-soluble flux that needs no nitrogen purge at all
- C. Produces stronger, higher-temperature joints suited to refrigerant pressures
- D. Allows the use of standard plumbing solder on copper lines

96. A technician installs an accumulator and reviews how it returns oil. The accumulator returns oil to the compressor through:

- A. A large open port at the top of the accumulator shell
- B. A small metered bleed hole or orifice in the outlet tube
- C. A separate pump dedicated to oil return circulation
- D. The discharge line routed back to the crankcase directly

97. A technician must select a refrigerant charging port and procedure for adding liquid to a zeotropic blend. The correct method is to:

- A. Add vapour slowly from the cylinder top to avoid waste
- B. Add liquid through the suction service valve in large slugs
- C. Meter liquid in through a throttling device to avoid slugging
- D. Invert the cylinder and dump liquid rapidly into the suction

98. A technician designs a condenser water circuit with a water regulating valve. The valve modulates water flow based on the:

- A. System head (condensing) pressure as it rises and falls
- B. Evaporator suction-line temperature at the coil outlet
- C. Electrical current drawn by the compressor motor windings
- D. Ambient air temperature surrounding the condensing unit

99. A technician reviews compressor types and identifies the scroll compressor's compression principle. The scroll compresses gas by:

- A. Reciprocating pistons within machined cylinder bores
- B. Rotating vanes sliding in an eccentric rotor housing
- C. Spinning an impeller to accelerate the refrigerant vapour
- D. Progressively reducing gas-pocket volume toward the center

100. A technician must select the correct action when discharge superheat reads extremely high (over 100°F above condensing). This most likely indicates:

- A. Liquid floodback quenching the discharge gas excessively
- B. An overcharge backing liquid into the condenser tubes
- C. The crankcase heater stuck in the energized position
- D. A low charge or a high compression ratio condition

101. A technician installs a reversing valve on a heat pump and must understand its de-energized state. With the solenoid de-energized, the valve:

- A. Cycles continuously between heating and cooling modes
- B. Loses all refrigerant charge through the valve body
- C. Rests in the mechanically biased default-mode position
- D. Locks the compressor off until the solenoid is powered

102. A technician must select a moisture-removal strategy after a system has taken on water. The correct approach uses:

- A. A single short vacuum pull followed by immediate charging
- B. A liquid-line drier plus deep evacuation with nitrogen sweeps
- C. Compressed shop air blown through the open system lines
- D. Adding extra refrigerant to dilute the moisture present

103. A technician reviews the purpose of subcooling at the condenser outlet. Adequate subcooling is important because it:

- A. Raises the refrigerant temperature entering the evaporator coil
- B. Ensures a solid liquid column and prevents flash gas to the valve
- C. Lowers the compressor discharge temperature directly at the head
- D. Increases the suction pressure to improve compressor efficiency

104. A technician must select the correct conductor for a motor circuit and account for voltage drop. Excessive voltage drop on a motor circuit causes the motor to:

- A. Draw higher current and run hotter to maintain its torque
- B. Run cooler and more efficiently at the reduced voltage
- C. Spin faster than its nameplate rated speed continuously
- D. Operate with no change since motors ignore supply voltage

105. A technician installs a high-pressure cutout as a safety control. The cutout protects the system by:

- A. Opening the circuit when the suction pressure falls too low

- B. Modulating the condenser fan speed based on the pressure
- C. Stopping the compressor when discharge pressure is excessive
- D. Bypassing hot gas to the evaporator during low-load periods

106. A technician must choose the correct refrigerant-line preparation before brazing to ensure a sound joint. The tube ends should be:

- A. Left with the saw burrs in place to roughen the joint
- B. Cleaned, deburred, and fitted with proper joint clearance
- C. Coated with plumbing flux and joined with soft solder
- D. Wetted with water inside to cool the joint while heating

107. A technician reviews the function of the receiver in a TXV system. The receiver's main role is to:

- A. Separate oil from the suction gas before the compressor
- B. Subcool the discharge gas before it enters the condenser
- C. Store liquid refrigerant to accommodate changing load
- D. Filter acid and moisture from the circulating refrigerant

108. A technician must select the correct response to a compressor short-cycling on the low-pressure control. The most likely root cause to investigate is:

- A. A low refrigerant charge or a restricted metering device
- B. An oversized condenser rejecting too much heat at once

- C. The crankcase heater keeping the oil excessively warm
- D. A discharge muffler restricting the high-side gas flow

109. A technician installs a filter drier and must orient it correctly. A directional liquid-line drier must be installed:

- A. In either direction since flow direction does not matter
- B. With its arrow pointing in the direction of liquid flow
- C. Upside down to allow the desiccant to settle properly
- D. In the suction line only, never in the liquid line itself

110. A technician reviews compressor displacement factors for selection. Reciprocating compressor displacement depends on bore, stroke, and:

- A. The discharge pressure developed at the head valves
- B. The suction superheat entering the compressor shell
- C. The number of cylinders and the rotational speed

D. The specific refrigerant type circulating in the system

111. A technician must select the correct interpretation of a 0-ohm reading from a compressor winding to the shell. This reading indicates:

- A. A grounded winding shorted to the shell — a failed compressor
- B. A healthy winding with normal insulation to the shell
- C. An open start winding requiring a hard-start kit installed
- D. A shorted run capacitor that should be replaced first

112. A technician installs a P-h diagram analysis into commissioning. On the diagram, the compression process appears as a line moving:

- A. Upward and to the right, raising both pressure and enthalpy
- B. Horizontally to the left at constant pressure across the chart
- C. Vertically down along the saturated-liquid curve only
- D. Diagonally down into the subcooled-liquid region of the chart

113. A technician must select the correct safe-lifting practice for moving a heavy compressor. The proper technique is to:

- A. Bend at the waist and lift quickly to shorten the strain time
- B. Twist the torso during the lift to position the load faster
- C. Keep the load close to the body and lift using the legs
- D. Hold the load at arm's length to maintain better balance

114. A technician reviews glide when selecting and charging a zeotropic blend. Glide is defined as the:

- A. Temperature difference between the bubble point and dew point
- B. Gradual pressure drop through the system during operation
- C. Migration of oil along the horizontal suction-line runs
- D. Tendency of the blend to leak faster than an azeotrope

115. A technician must choose the correct response to oil pooling at the base of a low-temperature evaporator. This most likely indicates:

- A. The compressor is pumping excess oil into the discharge gas
- B. Poor oil return from insufficient suction-line velocity
- C. The condenser is flooded with surplus liquid refrigerant
- D. The metering device is starving the evaporator of refrigerant

116. A technician installs a crankcase pressure regulator (CPR) on a system. The CPR protects the compressor by:

- A. Limiting the suction pressure to the compressor during high load
- B. Raising the discharge pressure during low-load operation
- C. Increasing the subcooling delivered to the metering device
- D. Bypassing liquid refrigerant around the evaporator coil

117. A technician must select the correct meaning of a non-condensable gas raising head pressure. Air in the condenser raises head pressure because it:

- A. Adds its partial pressure to the refrigerant in the condenser
- B. Condenses along with the refrigerant and adds liquid volume
- C. Absorbs heat and lowers the condensing temperature directly
- D. Dissolves into the oil and improves the lubrication quality

118. A technician reviews the function of an EPR versus a CPR. An evaporator pressure regulator differs from a CPR in that the EPR:

- A. Protects the compressor motor from excessive suction pressure

- B. Maintains a minimum pressure in the evaporator it serves
- C. Limits the maximum discharge pressure at the compressor head
- D. Controls the condenser water flow based on head pressure

119. A technician must select the correct charging reference for a fixed-orifice system on a hot day. The technician charges to a target:

- A. Subcooling value read at the condenser outlet line
- B. Superheat value using a charging chart for the conditions
- C. Discharge line temperature at the compressor head port
- D. Sight-glass clarity regardless of the operating conditions

120. A technician reviews why R-410A systems use higher-pressure-rated components. R-410A operates at pressures roughly:

- A. Identical to older R-22 systems at the same conditions
- B. Lower than R-134a systems at equivalent temperatures
- C. Significantly higher than R-22 at equivalent conditions
- D. Below atmospheric pressure on the entire low side

121. A technician must select the correct response to a heat pump losing capacity as outdoor temperature drops in heating mode. This occurs mainly because:

- A. The reversing valve fails progressively as the air gets colder
- B. The indoor coil cannot reject the additional heat produced
- C. Lower outdoor temperature reduces vapour density and capacity

D. The compressor oil thickens and stops circulating entirely

122. A technician installs an oil separator and reviews its return mechanism. The separator returns captured oil by:

A. Cooling the gas until the oil condenses out completely

B. Coalescing entrained oil and draining it back via a float

C. Adding fresh makeup oil from an external reservoir tank

D. Filtering moisture and acid before the condenser inlet header

123. A technician must select the correct interpretation of frost forming partway along an evaporator coil. This pattern most likely indicates:

A. A partial restriction or underfeeding of the evaporator coil

B. An overcharge flooding the entire coil with liquid refrigerant

C. A completely blocked metering device starving the whole coil

D. Excessive airflow from a fan that is oversized for the coil

124. A technician reviews the documentation requirement after adding refrigerant to a system. Recording the refrigerant added is important because it:

A. Reduces the time needed to complete the next service visit

B. Validates the equipment manufacturer's warranty coverage

C. Determines the electrical permit fee for the installation

D. Tracks refrigerant use and helps identify chronic leaks

125. A technician must select the correct final step after lockout, testing, and completing a repair on an energized-capable circuit. Before restoring power, the technician should:

- A. Leave all guards off to allow easy access on the next visit
 - B. Restore power first and then reinstall the safety guards
 - C. Energize the circuit to test before removing the lockout device
 - D. Reinstall all guards and covers, then remove the lockout and tag
- All 125 questions complete, each crafted so the correct answer matches its pre-assigned key letter.

Practice Exam 25: Answer Key and Explanations

1. D — A thermostatic expansion valve with an external equalizer modulates flow to hold constant superheat as the load varies. The sensing bulb and equalizer let it respond to changing evaporator conditions, unlike a fixed capillary tube. This makes it the best choice for widely varying loads.
2. C — Electric or hot-gas defrost with a termination control is needed because a -20°F coil never warms enough for off-cycle air to melt frost. Active heat clears the coil, and the termination control ends defrost once the ice is gone. This prevents both ice buildup and overheating.
3. B — A properly sized riser and trap maintain gas velocity to carry oil up while the trap collects oil between cycles. Oversizing kills velocity and strands oil. Correct sizing plus a trap is the standard low-temp oil-return solution.
4. D — A zeotropic blend must be charged as a liquid to keep all components in their correct proportion. Charging vapour lets the more volatile components leave first, shifting the blend (fractionation). Liquid charging preserves composition for proper performance.
5. C — Flowing dry nitrogen through the line during brazing displaces oxygen so no copper-oxide scale forms inside the tubing. The inert sweep prevents internal flaking that would plug driers and metering devices. Nitrogen purge is standard on all refrigerant-line brazing.

6. B — A head pressure control such as fan cycling or condenser flooding keeps condensing pressure high enough in cold ambient for the metering device to feed properly. Without it, head pressure collapses in winter and the coil starves. This stabilizes low-ambient operation.

7. D — Overload protection should protect near the motor's full-load amperage per the manufacturer's data. Sizing at locked-rotor or half the FLA either removes protection or causes nuisance trips. Correct sizing guards the windings during normal operation.

8. C — An evaporator pressure regulator on the warmer case's outlet throttles flow to hold a minimum coil pressure (temperature). This keeps that case warmer than the lowest-temp load on the shared suction main. It allows multiple case temperatures off one compressor.

9. A — A suction-line accumulator traps liquid floodback and meters it back as vapour, protecting the compressor at startup. It catches the slug of liquid that returns after long off-cycles. Controlled oil return occurs through a small bleed.

10. A — The primary purpose of recovery is to prevent release of refrigerant to the atmosphere, where it damages ozone and adds to warming. Regulations require recovery before opening a system for this reason. Resale value is incidental, not the regulatory driver.

11. D — A relief device is sized and set to the vessel's maximum allowable working pressure so it relieves before rupture. The MAWP of the protected vessel sets the limit. Suction pressure and superheat are irrelevant to relief sizing.

12. D — Adding capacity control or cycling matches output to light loads so the coil does not run cold enough to freeze. At low load with a fixed full-capacity compressor, coil temperature drops below freezing. Modulating capacity keeps the coil above the frost point.

13. A — Polyolester (POE) oil is compatible with HFC refrigerants, which do not work with mineral oil. HFCs do not carry mineral oil back through the system, causing lubrication failure. POE is the correct match for HFC systems.

14. B — A vertical liquid lift reduces liquid pressure due to the column weight, risking flash gas at the top if it drops below saturation. Adequate subcooling offsets this static loss. Without enough subcooling, vapour forms and the metering device feeds erratically.

15. C — A parallel rack needs an oil management system with separators and regulators so each compressor keeps its proper oil level. Shared suction otherwise lets oil log in one compressor and starve another. Balanced oil distribution protects all compressors.

16. C — Dry nitrogen is the correct test medium, with test pressure limited by the weakest component's rating. Nitrogen is inert and moisture-free; oxygen is dangerous and air carries moisture. The lowest-rated component sets the safe ceiling.

17. D — The external equalizer connects to the suction line just past the bulb at the coil outlet. This lets the valve sense true outlet pressure and compensate for coil pressure drop. Correct placement is essential for accurate superheat control.

18. A — The four-way reversing valve, controlled by a solenoid, reverses refrigerant flow to switch between heating and cooling. It redirects discharge and suction connections to swap coil functions. It is the defining component of a reversible heat pump.

19. B — The common rule limits continuous loads to 80% of the breaker rating to prevent nuisance tripping and overheating. Equivalently, conductors and breakers are sized at 125% of the continuous load. This margin protects sustained-duty circuits like heaters.

20. C — A flooded evaporator gives superior heat transfer because the tube surfaces are fully wetted with boiling liquid. Full wetting maximizes the boiling heat-transfer coefficient versus a partly dry DX coil. The trade-offs are larger charge and level controls.

21. A — After a burnout, install a suction filter drier and acid-test afterward to confirm the system is clean. The acidic oil signals system-wide contamination requiring cleanup, not just a part swap. Follow-up acid tests guide drier changes.

22. B — The contactor coil voltage must match the control-circuit voltage that energizes it, here 24 V. A coil rated for the load voltage would not pull in on a 24 V control circuit, or would burn out. Coil voltage follows the control circuit, not the load.

23. B — R-410A should be charged by weight or using a superheat/subcooling chart because it operates at high pressures and is near-azeotropic. Precise charging ensures safe, efficient operation. Rough vapour charging risks both performance and component limits.

24. D — An oil separator in the discharge line with a float return reliably returns oil on long-line, low-temp systems. It captures entrained oil before it travels the system and feeds it back. This protects compressor lubrication where oil return is difficult.

25. D — The most environmentally responsible refrigerant has both low ozone depletion potential and low global warming potential. Minimizing both impacts is the goal of modern refrigerant selection. Cost and availability do not outweigh environmental impact in this judgment.

26. B — On a satisfied thermostat the liquid-line solenoid closes so the compressor pumps the low side down before stopping. With the liquid feed shut, the compressor evacuates the evaporator into the high side until the low-pressure control stops it. This prevents off-cycle migration.

27. A — Refrigeration-grade (ACR) copper, cleaned and capped dry, is the correct tubing prepared free of moisture and contaminants. Plumbing copper, steel, or aluminum with water or wrong joints is unacceptable for refrigerant service. Dry, clean ACR copper protects the system.

28. D — With charge and airflow confirmed, a TXV that hunts most likely has a sensing bulb that is loose, mislocated, or uninsulated. Poor bulb contact gives erratic readings, swinging the valve and suction pressure. Re-clamp and insulate the bulb to stabilize control.

29. D — Triple evacuation with dry-nitrogen breaks between pulls is most effective after a moisture failure. Each nitrogen sweep absorbs and carries off water vapour, and successive pulls reduce moisture to acceptable levels. It outperforms a single brief vacuum.

30. B — A semi-hermetic compressor has bolted access covers that allow in-place servicing of valves and motor. Unlike a welded hermetic shell, its end bells and head unbolt for repair. This makes it field-serviceable rather than a throwaway unit.

31. A — Remove the valve internals or apply a wet heat-sink wrap to protect a non-metallic seat during brazing. Excess heat would destroy the soft seat material. Protecting heat-sensitive components is standard brazing procedure.

32. A — On a TXV system the subcooling at the condenser outlet is the most reliable charging reference. Because the TXV controls superheat, superheat is not a valid charge indicator; subcooling reflects the liquid inventory. Proper subcooling confirms the correct charge.

33. D — The most reliable arrangement terminates defrost when the coil reaches a set temperature, with a backup time as a fail-safe. Temperature termination ends defrost as soon as ice clears, avoiding overheating. The backup timer prevents an endless cycle if the sensor fails.

34. A — For an A2L mildly flammable refrigerant the detector must be specifically rated and intrinsically safe for it. An ignition-capable or wrong-gas detector is unsafe and unreliable. Open-flame methods are prohibited with flammable refrigerants.

35. A — Suction-line sizing balances adequate oil-return velocity against minimal pressure drop. Too little velocity strands oil; too much pressure drop cuts compressor capacity. Correct sizing satisfies both competing needs.

36. C — A flooding-type head pressure control backs liquid into the condenser to reduce active surface, raising condensing pressure in cold ambient. With less effective surface, head pressure climbs to a usable level. This keeps the metering device fed in winter.

37. C — A bi-flow drier filters and dries in both flow directions, required because a heat pump reverses refrigerant flow. A one-way drier would restrict or fail in reverse. The bi-flow design protects the system in both modes.

38. A — A liquid-line sight glass with a moisture indicator reveals flash-gas bubbles and indicates moisture in the system. Bubbles signal low charge or restriction; the indicator color shows moisture content. It is a quick diagnostic for both conditions.

39. C — A P-trap at the base of a suction riser collects oil so gas velocity can carry it up the riser in slugs. The trapped oil accumulates until the rising vapour pushes it upward. This maintains oil return on vertical lifts.

40. B — A technician must hold an ozone depletion prevention / refrigerant handling certification to purchase and service systems in Canada. This credential authorizes handling of controlled refrigerants under environmental regulations. It is the baseline credential for refrigerant work.

41. A — After locking and tagging out, verify zero energy with a meter before touching conductors. Confirming the absence of voltage proves the isolation is effective. This "test before touch" step is essential electrical safety.

42. A — The crankcase heater prevents refrigerant from migrating and condensing in the oil during the off-cycle. Keeping the oil warm drives refrigerant out of solution, preventing dilution and startup foaming or slugging. It matters most in cold locations.

43. B — The superheat charging method accounts for indoor and outdoor conditions to fine-tune the charge on a fixed-orifice system. The charging chart adjusts the target superheat for load and ambient. This compensates for varying operating conditions.

44. D — High superheat with low subcooling signals a low charge, so the technician should leak-check to find why before adding refrigerant. Topping off without finding the leak only delays a repeat failure. Locating and repairing the leak comes first.

45. D — A capillary tube sized for the fixed operating point is the appropriate low-cost device for a stable, predictable load. It has no moving parts and meters by bore and length. It is ideal where the load does not vary much.

46. C — A scroll compressor in reverse will not pump and can be damaged quickly, so rotation must be verified. Reverse running overheats the scroll set and produces no compression. Confirm phase sequence before extended operation.

47. D — A discharge-line oil separator returns entrained oil to the compressor crankcase. It captures oil from the discharge gas and feeds it back via a float-controlled return. This protects lubrication on long-line, low-temp systems.

48. A — Recovery cylinders must not be filled beyond about 80% capacity to allow for liquid thermal expansion. Overfilling risks hydrostatic rupture as temperature rises. The vapour space accommodates expansion safely.

49. C — An EPR throttles the case outlet to hold a minimum coil pressure on a higher-temperature case. This keeps that evaporator warmer than the lowest-temp load on a shared system. It enables multiple temperatures off one compressor.

50. C — Under CSA B52, relief valves must discharge to a safe location, typically outdoors away from occupants. Relieving into occupied space could harm people. Termination point and clearances are code-specified.

51. D — During running operation the service valve is mid-seated (cracked) to allow both refrigerant flow and a gauge reading. Front-seating blocks flow; back-seating closes the gauge port. The cracked position is the normal operating/reading position.

52. A — A suction-line accumulator ahead of the compressor prevents liquid floodback during defrost and mode reversal on a heat pump. It catches liquid dumped by reversing-valve operation and meters it back as vapour. This protects the compressor through transients.

53. D — Low-temp suction-line insulation prevents heat gain and condensation on the cold line. It preserves capacity and stops dripping or icing on the line exterior. Insulation is required on cold suction lines.

54. D — Cylinder unloading reduces capacity by holding suction valves open so those cylinders do not pump, allowing continuous reduced-load operation. The unloaded cylinders move gas without compressing it. It is a stepped capacity-control method.

55. B — A neutral oxy-acetylene flame provides balanced, clean combustion for brazing copper lines. An oxidizing flame scales the metal and a carburizing flame adds carbon. The neutral flame produces a sound joint.

56. B — In a secondary (brine) system, the secondary fluid carries cooling from a central chiller to remote display loads. Centralizing the refrigerant reduces charge and leak risk in occupied areas. The brine transports the cooling effect to the cases.

57. C — An A1 refrigerant has lower toxicity and no flame propagation (nonflammable). The "A" denotes lower toxicity and the "1" denotes no flammability, the safest classification group. This makes A1 suitable for occupied spaces.

58. B — The TXV sensing bulb belongs on a clean horizontal run, firmly clamped and insulated. Good contact and insulation give an accurate temperature signal. Poor mounting causes hunting and erratic control.

59. B — A hot-gas bypass valve feeds discharge gas to the low side to add artificial load and prevent low suction pressure at light load. It keeps suction pressure up to avoid freezing or short-cycling. It provides false load on demand.

60. A — A liquid-suction heat exchanger subcools the liquid while superheating the suction vapour. The heat exchange boosts capacity and ensures dry suction gas. The trade-off is higher discharge temperature.

61. D — A critically charged capillary system must be charged to the exact specified weight because there is no receiver to absorb surplus. Over- or undercharging quickly causes problems. Charge is critical and weight is the only reliable method.

62. A — A discharge check valve prevents reverse flow from running compressors into an idle one on a parallel rack. Without it, high-side gas would back-feed and could flood or spin the off compressor. The check valve isolates each discharge.

63. A — A condenser must be sized with adequate surface for the high-ambient design day to hold a reasonable condensing temperature. Undersizing raises head pressure and cuts capacity on hot days. Design-day sizing ensures performance at peak ambient.

64. D — A cross-charged or MOP bulb throttles the valve to cap suction pressure during pulldown, protecting the compressor motor from overload. It limits maximum operating pressure as the high load is reduced. Suction pressure stays under the design ceiling.

65. B — Refrigerant recovered from a severe burnout must be sent for reclamation to restore it to purity standards. Burnout contaminates it with acid and byproducts, making direct reuse unsafe. Reclamation processes it to AHRI purity or it is destroyed.

66. D — A 24 V control transformer requires a 24 V contactor coil matched to the control-circuit voltage. The coil voltage follows the control circuit, not the load. A mismatched coil fails to pull in or burns out.

67. D — A low-temp defrost drain must be trapped and heated where it passes through freezing zones. Otherwise meltwater refreezes and blocks the drain, causing ice buildup. Heat tape and a trap keep it clear.

68. C — Volumetric efficiency decreases as the compression ratio rises, because more clearance-volume gas re-expands before fresh suction gas enters. The higher the ratio, the less the cylinder refills. This reduces pumped capacity.

69. B — Verify zero energy with a properly rated meter to confirm the absence of voltage. Touching conductors or relying on the tag alone is unsafe. The meter is the only valid verification of a de-energized circuit.

70. C — Excessive liquid-line pressure drop can cause flash gas to form before the metering device. If pressure falls below saturation, the liquid boils prematurely, starving the valve. Keeping pressure drop low preserves a solid liquid column.

71. C — Superheat is measured at the evaporator outlet by comparing line temperature to the saturation temperature for the suction pressure. This shows how much the vapour has been heated past saturation. It indicates whether the coil is properly fed.

72. B — Hot-gas defrost routes hot discharge gas through the evaporator coil to melt frost from the inside. It is fast and efficient because it uses heat already in the system. Controls divert discharge gas to the coil during defrost.

73. D — Beyond lubrication, the oil circulates and returns to the compressor while sealing running clearances. Proper return maintains lubrication and the internal seal between high and low sides. Oil that does not return causes both lubrication failure and capacity loss.

74. D — Locked-rotor amperage is several times the running current during the starting surge. The stalled motor draws heavy inrush until it accelerates. Starting components and protection must tolerate this brief high current.

75. A — In pump-down the compressor stops when the low-pressure control opens as suction pressure falls. With the liquid solenoid closed, refrigerant is pumped to the high side and the LP control halts the compressor. This stores charge for a clean restart.

76. B — Before assuming a low charge, consider a liquid-line restriction such as a partially plugged drier, which also produces bubbles. A restriction drops pressure and flashes liquid into vapour. Both low charge and restriction must be checked.

77. B — On an open coil-sensor circuit, the EEV controller closes the valve or signals a fault to protect the compressor. Without a valid temperature input, safe metering is impossible, so it fails to a protective state. This prevents blind flooding or starving.

78. D — Higher than normal head pressure for the condensing temperature is a clear sign of non-condensable gas. The air's partial pressure adds to the refrigerant's, raising total head pressure. Recovery and evacuation remove the non-condensables.

79. C — A normal DX evaporator superheat is roughly 8–15°F, indicating the coil is properly fed and fully active. Too low risks floodback; too high means a starved coil. This range balances coil use and compressor protection.

80. B — Liquid slugging damages the compressor because liquid is incompressible and stresses the valves and connecting rods. The compressor cannot compress liquid, so the hydraulic load breaks parts. Accumulators and proper superheat prevent it.

81. C — WHMIS 2015 requires a Safety Data Sheet (SDS) be accessible to all workers for each hazardous product. The SDS communicates hazards, handling, and first-aid information. Supplier labels plus SDS access are core right-to-know requirements.

82. A — The reliable corrective procedure is to leak-find and repair, then recharge to the correct amount. Adding refrigerant without fixing the leak only delays a repeat failure. Repair first, then charge properly by weight.

83. A — A horizontal suction run should be pitched slightly downward toward the compressor so oil flows back. Proper pitch uses gravity to assist oil return. Level or uphill runs trap oil and starve the compressor.

84. C — Heat is rejected at the condenser, where the high-pressure vapour condenses and gives up heat to the surroundings. This is the high-side heat-rejection step of the cycle. The evaporator, by contrast, absorbs heat.

85. C — Charging by precise weight using a calibrated scale is the most accurate method overall. Weight is exact and independent of operating conditions. Frost-back, sight-glass, and feel methods are approximate by comparison.

86. D — Single-phasing causes the motor to draw excessive current on the remaining legs and overheat. With one phase lost, the motor cannot run normally and the windings overheat. Protection must detect and stop single-phasing.

87. A — A megohmmeter test must not be done while the compressor is under vacuum, which lowers the gas dielectric strength and invites flashover. The high test voltage can arc inside the low-pressure shell. Test only at normal pressure.

88. B — Zero subcooling with otherwise normal pressures indicates the charge is low or marginal, leaving no liquid column at the condenser outlet. Without subcooling, flash gas forms and capacity falls. Adding charge restores proper subcooling.

89. C — A crankcase heater energized during the off-cycle prevents refrigerant migration into the oil. Keeping the oil warm drives refrigerant out of solution, avoiding startup foaming and slugging. It is the targeted fix for off-cycle migration.

90. B — The flooded evaporator achieves superior heat transfer through fully wetted tube surfaces from a maintained liquid level. Complete wetting maximizes the boiling heat-transfer coefficient. A liquid-level control holds the proper level.

91. D — A restricted liquid-line drier shows a temperature drop and possible frost across the drier body. The pressure drop across the restriction causes localized cooling and flashing. A noticeable differential across the drier confirms the restriction.

92. D — A relief valve set pressure must be at or below the vessel's maximum allowable working pressure. Setting it above the MAWP defeats overpressure protection. Code requires the set pressure not exceed the vessel rating.

93. A — The external equalizer line senses true evaporator outlet pressure to compensate for coil pressure drop. By referencing outlet rather than inlet pressure, the valve maintains accurate superheat. It is essential on high-pressure-drop coils.

94. C — High superheat, high subcooling, and a mid-liquid-line temperature drop point to a restriction such as a plugged drier between condenser and coil. Liquid stacks up upstream (high subcooling) while the coil starves downstream (high superheat). The temperature drop locates the restriction.

95. C — Brazing produces stronger, higher-temperature joints suited to refrigerant pressures, which is why it is chosen over soldering. Soldered joints lack the strength and temperature rating for refrigerant service. Brazed joints withstand system pressures reliably.

96. B — An accumulator returns oil through a small metered bleed hole or orifice in the outlet tube. The bleed draws oil back gradually with the suction gas while liquid refrigerant boils off. This returns oil without slugging the compressor.

97. C — Liquid for a zeotropic blend must be metered in through a throttling device to avoid slugging the compressor. Throttling flashes the liquid safely while keeping the blend composition correct. Dumping liquid into the suction risks compressor damage.

98. A — A condenser water regulating valve modulates water flow based on system head (condensing) pressure. As head pressure rises, the valve opens to admit more water, holding condensing pressure steady. It saves water and stabilizes operation.

99. D — A scroll compressor compresses gas by progressively reducing gas-pocket volume toward the center. The orbiting scroll traps vapour at the periphery and squeezes it inward to the discharge port. This gives smooth, efficient compression.

100. D — Extremely high discharge superheat (over 100°F above condensing) most likely indicates a low charge or a high compression ratio. Starved suction gas and high compression both drive discharge temperature up sharply. Verify charge and check for high-side restrictions.

101. C — With the solenoid de-energized, the reversing valve rests in its mechanically biased default-mode position. The solenoid only shifts the valve when powered, so a failed coil leaves the heat pump in the default mode. Most systems default to heating.

102. B — After a system takes on water, the correct approach uses a liquid-line drier plus deep evacuation with nitrogen sweeps. The drier captures residual moisture and the sweeps carry off water vapour. Air or a single short pull is inadequate.

103. B — Adequate subcooling ensures a solid liquid column and prevents flash gas reaching the metering device. If the liquid flashes before the valve, capacity drops and feeding becomes erratic. Subcooling guarantees liquid at the valve inlet.

104. A — Excessive voltage drop makes the motor draw higher current and run hotter to maintain its torque. The motor compensates for low terminal voltage by pulling more amps. Sustained low voltage shortens motor life.

105. C — The high-pressure cutout stops the compressor when discharge pressure becomes excessive. It protects against dangerous overpressure from causes like a blocked condenser or non-condensables. It is a safety control, distinct from operating controls.

106. B — Tube ends must be cleaned, deburred, and fitted with proper joint clearance before brazing. Clean, properly fitted joints allow capillary flow of the filler for a sound bond. Burrs, flux-and-solder, or water inside ruin the joint.

107. C — The receiver stores liquid refrigerant to accommodate changing load and charge demands. It provides a reservoir so the metering device always sees solid liquid as conditions shift. It is typical on TXV systems with variable load.

108. A — Short-cycling on the low-pressure control most likely stems from a low refrigerant charge or a restricted metering device. Suction pressure drops quickly to the cutout, the compressor stops, pressure recovers, and it restarts. Find the charge loss or restriction.

109. B — A directional liquid-line drier must be installed with its arrow pointing in the direction of liquid flow. Correct orientation ensures the desiccant and filter work as designed. Reversed installation can restrict flow or release trapped debris.

110. C — Reciprocating compressor displacement depends on bore, stroke, and the number of cylinders and rotational speed. These geometric and speed factors set the swept volume per unit time. Discharge pressure and refrigerant type do not change displacement.

111. A — A 0-ohm reading from a winding to the shell indicates a grounded winding shorted to the shell — a failed compressor. A healthy motor reads effectively infinite resistance to ground. This insulation breakdown condemns the compressor.

112. A — On a P-h diagram the compression process moves upward and to the right, raising both pressure and enthalpy. The compressor adds work, increasing pressure and adding heat of compression. This is the cycle's energy-input leg.

113. C — Safe lifting means keeping the load close to the body and lifting with the legs. This keeps the spine neutral and uses the strong leg muscles instead of the back. It is the foundation of safe manual material handling.

114. A — Glide is the temperature difference between the bubble point and the dew point of a zeotropic blend. The components boil and condense over a temperature range rather than at one point. Glide must be accounted for when reading superheat and subcooling.

115. B — Oil pooling at the base of a low-temp evaporator indicates poor oil return from insufficient suction-line velocity. Cold, low-density vapour and undersized or untrapped lines fail to carry oil back. Correct line sizing and traps restore return.

116. A — A crankcase pressure regulator limits suction pressure to the compressor during high load, protecting the motor from overload. It throttles to keep suction pressure below a set ceiling on pulldown. This prevents motor overload during high-load conditions.

117. A — Air in the condenser adds its partial pressure to the refrigerant's, raising total head pressure. The non-condensable does not condense, so it occupies condenser volume and elevates pressure. Recovery and evacuation remove it.

118. B — An EPR maintains a minimum pressure in the evaporator it serves, unlike a CPR which protects the compressor from high suction pressure. The EPR throttles the coil outlet to hold case temperature. The two regulators serve different points and purposes.

119. B — On a fixed-orifice system the technician charges to a target superheat using a charging chart for the conditions. The chart adjusts the target for load and ambient. This compensates for varying operating conditions on a hot day.

120. C — R-410A operates at pressures significantly higher than R-22 at equivalent conditions, which is why its components are rated for higher pressure. The elevated pressures demand precise charging and rated tubing and fittings. Using R-22-rated parts would be unsafe.

121. C — A heat pump loses heating capacity as outdoor temperature drops because lower temperature reduces vapour density and capacity. The outdoor coil (evaporator in heating) sees less dense suction gas, so the compressor moves less mass. This is why supplemental heat is needed in cold climates.

122. B — An oil separator returns captured oil by coalescing entrained oil and draining it back via a float. The float-controlled return feeds oil to the crankcase when enough collects. It protects lubrication on long-line and low-temp systems.

123. A — Frost partway along the coil indicates a partial restriction or underfeeding of the evaporator. The refrigerant boils off before reaching the outlet, leaving the last passes dry and warm. Check the metering device and liquid feed.

124. D — Recording refrigerant added tracks refrigerant use and helps identify chronic leaks. Logging top-ups reveals systems that repeatedly need charge, flagging leaks for repair. This supports environmental compliance and good service practice.

125. D — Before restoring power, reinstall all guards and covers, then remove the lockout and tag. Replacing guards protects against contact with moving or energized parts. Lockout removal is the final step once the equipment is safe to run.