PRACTICE EXAM 21: RACM RED SEAL SIMULATION (125 QUESTIONS)

1. The mechanic's correct first action on entering the penthouse is to:

A. Open the manifold gauges to relieve pressure

B. Ventilate the space and ensure breathable atmosphere before working

C. Begin brazing to burn off escaped refrigerant

D. Reset the high-pressure control

2. Before opening any panel on the running unit, the mechanic must:

A. Shut down, isolate, lock out, and verify zero energy with a meter

B. Simply confirm the unit has stopped running

C. Close the suction service valve only

D. Remove the run capacitor first

3. A second technician arrives to assist on the same locked-out unit. Correct practice is that the second technician:

A. Works under the first technician's single lock

B. Uses the supervisor's master key

C. Applies their own personal lock to the isolation point

D. Tags the unit without a lock

4. The maximum refrigerant mass that may be placed in the cylinder under the 80% rule is:

A. 22 kg

B. 17.6 kg

C. 11 kg

D. 19.8 kg

5. Overfilling the cylinder past this limit is dangerous because:

A. The refrigerant will become flammable

B. The cylinder color code changes

C. The refrigerant fractionates

D. There is no vapour space for expansion, risking rupture

6. A technician must identify a chemical hazard on an unlabelled container of brazing flux. The correct first reference is the:

A. Equipment nameplate

B. Manufacturer's price list

C. Safety Data Sheet

D. Recovery log

7. Which statement about WHMIS 2015 pictograms is FALSE?

A. They use a red-bordered diamond shape

B. The flame symbol indicates a flammable hazard

C. A blue circle indicates gases under pressure

D. The gas-cylinder symbol indicates compressed gas

8. A clamp ammeter, an ohmmeter, and a micron gauge are available. To confirm a running compressor's actual current draw against its RLA, the technician uses the:

A. Ohmmeter on the common terminal

B. Micron gauge on the suction port

C. Multimeter on the voltage range only

D. Clamp ammeter around one supply lead

9. A journeyperson mentoring an apprentice on a pump-down best builds judgment by:

A. Having the apprentice memorize the steps only

B. Doing the task quickly while the apprentice watches

C. Explaining why the solenoid closes before the compressor stops

D. Telling the apprentice to research it later

10. Which document satisfies the regulatory record for refrigerant handling at the end of a service call?

A. The ambient temperature log

B. The torque chart

C. The refrigerant type and quantity record

D. The equipment paint specification

11. A hot-work permit and fire watch are arranged. The primary hazard they address during brazing is:

A. Oxygen displacement

B. Electrical shock

C. Frostbite from refrigerant

D. Ignition of nearby combustibles by the flame

12. A capacitor reads 0 V after lockout. The technician still discharges it through a resistor because:

A. It contains pressurized refrigerant

B. Stored charge can remain or rebuild and a reading can be momentary

C. The resistor recharges it for testing

D. WHMIS requires it for all metal parts

13. PPE for breaking into a charged liquid line must specifically include:

A. Hearing protection only

B. A dust mask only

C. A high-visibility vest only

D. Gloves and eye protection rated for refrigerant

Scenario (Q14–Q16): A newly brazed system is being prepared for service. The mechanic pulls a vacuum to 350 microns, isolates the pump, and watches the micron gauge.

14. The reading rises to 800 microns over ten minutes and then holds steady. This indicates:

A. A leak admitting outside air

B. The system is fully dry and tight

C. Moisture still boiling off in the system

D. The vacuum pump is undersized

15. Given that result, the correct next step is to:

A. Charge the system immediately

B. Continue evacuation, possibly with a triple evacuation

C. Pressurize with oxygen to test

D. Replace the compressor

16. Had the reading instead risen continuously without stabilizing, the correct conclusion would be:

A. A leak is present; return to leak testing

B. The system is dry and ready

C. Moisture has finished boiling

D. The micron gauge has failed

17. Which statement about brazing refrigerant tubing is FALSE?

A. A dry-nitrogen purge prevents internal oxide scale

B. The torch flame should melt the filler rod directly, not the base metal

C. Brazing filler melts above 840 °F

D. Capillary action draws filler into the joint

18. A flare joint at a service valve weeps after assembly; the flare is cracked and off-centre. The most likely cause is that the tube was:

A. Purged with nitrogen

B. Cut with a tubing cutter

C. Started by hand on the flare nut

D. Not deburred, leaving a stress riser

19. A system is pressure-tested with dry nitrogen to 350 psig; temperature-corrected pressure falls to 300 psig overnight. This means:

A. A leak is present and must be located

B. The system is leak-free

C. The nitrogen condensed

D. The gauge over-reads

20. The most likely installation cause is that the riser was:

A. Insulated with closed-cell foam

B. Sized too large, dropping velocity below oil-return speed

C. Brazed with a nitrogen purge

D. Sloped toward the compressor

21. The recommended remedy preserving oil return on tall risers is to:

A. Remove all insulation

B. Resize the riser and/or add a P-trap at the base

C. Increase the refrigerant charge only

D. Lower the thermostat setpoint

22. The correct order for finishing a newly piped system is:

A. Charge, evacuate, leak test

B. Charge, leak test, evacuate

C. Evacuate, charge, leak test

D. Leak test, evacuate, charge

23. A cut tube is reamed with the end facing downward chiefly so that:

A. Metal chips fall out rather than into the line

B. The end anneals before flaring

C. The diameter increases

D. The factory nitrogen escapes

24. A refrigeration flare is formed at an included angle of:

A. 30 degrees

B. 37 degrees

C. 45 degrees

D. 60 degrees

25. A swaged socket for a brazed slip joint should be approximately how deep?

A. One tube diameter

B. One-tenth the tube diameter

C. The tube wall thickness

D. Three tube diameters

26. During brazing, a nitrogen purge is held at a low flow rather than high pressure because high pressure would:

A. Improve capillary action

B. Blow molten filler out and overpressurize the heated line

C. Prevent oxide scale better

D. Cool the joint faster

27. An uninsulated suction line in an occupied space will most likely:

A. Raise the discharge pressure

B. Freeze the liquid line solid

C. Reduce the superheat

D. Sweat and drip condensate

28. A tube cut with a hacksaw rather than a tubing cutter most likely leaves:

A. A perfectly square, clean end

B. An annealed end ready to flare

C. Filings and a ragged edge inside the line

D. A factory nitrogen charge

29. ACR refrigeration copper is specified by its:

A. Nominal inside diameter

B. Wall thickness only

C. Coil length

D. Actual outside diameter

30. A horizontal suction run installed dead level with no slope causes:

A. Excessive subcooling

B. Lower head pressure

C. Oil to pool rather than return

D. A reduced refrigerant charge

31. Which statement about soft annealed versus hard-drawn copper is TRUE?

A. Soft copper can be bent and flared by hand

B. Hard-drawn copper cannot be brazed

C. Soft copper is rated only for water

D. Hard-drawn copper is sized by inside diameter

32. A cold joint that leaks after brazing is most directly caused by:

A. Using a tubing cutter

B. The base metal not reaching filler flow temperature

C. Purging with dry nitrogen

D. Sloping the line correctly

33. Expressed in tons of refrigeration, the load is:

A. 2.5 tons

B. 12 tons

C. 5 tons

D. 60 tons

34. The planner finds the manufacturer's data sheet conflicts with a rule of thumb from a past job. The planner must follow:

A. The past job's rule of thumb

B. The manufacturer's installation instructions

C. The supplier's price list

D. The crew's preference

35. Which statement about oversizing a comfort-cooling system is TRUE?

A. It causes short-cycling and poor dehumidification

B. It improves dehumidification

C. It lowers head pressure permanently

D. It eliminates the need for a thermostat

36. A walk-in cooler's product respiration heat contributes to the:

A. Control-circuit load

B. Compressor electrical load

C. Conduction load only

D. Product load

37. A thermostat setpoint of 24 °C with a 2 °C differential calls for cooling at approximately:

A. 22 °C

B. 26 °C

C. 24 °C

D. 20 °C

38. Safety controls are wired in series in the control circuit so that:

A. They share load current

B. They modulate the valve

C. Any one opening stops the equipment

D. They operate only in defrost

39. In a planned pump-down sequence, on a call to stop the first device to act is the:

A. Liquid-line solenoid, which closes

B. High-pressure cutout, which opens

C. Condenser fan, which speeds up

D. Compressor contactor, which energizes

40. A DDC-based Building Automation System is characterized by:

A. Compressed-air signals only

B. Networked microprocessors reading sensors and driving outputs

C. Bimetal contacts only

D. Manual hand valves only

41. A TXV is selected over a fixed orifice for a varying-load application because it:

A. Eliminates superheat entirely

B. Sets subcooling directly

C. Removes the metering device

D. Holds constant superheat across the load range

42. A high-occupancy space is latent-dominated, so the planner emphasizes:

A. Moisture-removal capacity

B. Conduction through opaque walls

C. Solar gain only

D. Control transformer size

43. The document describing step by step how the system starts, cycles, defrosts, and shuts down is the:

A. Refrigerant log

B. WHMIS inventory

C. Sequence of operation

D. Bill of materials

44. Compressed-air signals positioning dampers indicate which control technology?

A. DDC electronic

B. Pneumatic

C. Variable-frequency drive

D. Electromechanical relay

45. A low-pressure control set to stop the compressor on loss of charge functions as a(n):

A. Safety control

B. Operating pump-down control

C. Defrost terminator

D. Modulating actuator

46. A 90,000 BTU/h load expressed in tons is:

A. 9 tons

B. 7.5 tons

C. 18 tons

D. 90 tons

47. Adequate condenser clearance is specified chiefly to:

A. Store the recovery cylinder

B. Shorten control wiring

C. Provide forklift access only

D. Ensure unrestricted airflow for heat rejection

48. Which statement about matching the four primary components to the load is TRUE?

A. It minimizes refrigerant regardless of capacity

B. It ensures rated performance at design conditions

C. It removes the need for commissioning

D. It eliminates safety controls

49. A microprocessor reading thermistors and a transducer to position an EEV is an example of:

A. Pneumatic control

B. Electronic (DDC-type) control

C. Manual hand-valve control

D. Purely electromechanical control

50. The clearest example of an operating (not safety) control is the:

A. High-pressure cutout

B. Pressure-relief valve

C. Thermostat cycling the compressor to hold setpoint

D. Motor overload protector

Scenario (Q51–Q53): A split system is installed with the condensing unit 8 m below the evaporator, requiring a tall vertical suction riser, and the rooftop condenser must be craned into place.

51. To protect oil return up the tall suction riser, the installer fits at its base a:

A. Liquid receiver

B. Pressure-relief valve

C. P-trap

D. Sight glass only

52. As the condenser is craned to the roof, a worker must guide it by:

A. Using a tag line while staying clear of the load

B. Standing under it to center it

C. Riding it down

D. Standing under it with a hard hat

53. The condenser is then set on its pad and checked for level chiefly to ensure:

A. The nameplate faces the door

B. The control voltage is correct

C. Proper oil return and condensate drainage

D. Increased airflow across the coil

54. The correct corrective action is to:

A. Replace the compressor

B. Swap any two of the three supply leads

C. Add refrigerant charge

D. Raise the thermostat setpoint

55. Reverse rotation on a three-phase compressor is best described as:

A. A phase-sequence issue, not a compressor fault

B. A permanent compressor failure

C. A refrigerant-charge problem

D. A control-transformer fault

56. Which statement about this situation is TRUE?

A. The same lead-swap also corrects a reverse-running three-phase condenser fan

B. Only the compressor can run backward

C. Adding charge will correct the rotation

D. The control voltage must be raised

57. A control transformer is installed to:

A. Increase compressor starting torque

B. Filter moisture from refrigerant

C. Step line voltage down to control voltage

D. Measure power factor

58. A high-pressure cutout must be wired in the control circuit:

A. In parallel with the compressor load

B. In series so it can interrupt the circuit

C. Across the run capacitor

D. To the condensate drain

59. Insufficient airflow across the evaporator during install most likely causes the coil to:

A. Reject heat

B. Raise subcooling sharply

C. Increase dehumidification

D. Frost or freeze

60. Which statement about line- and low-voltage control wiring is TRUE?

A. They may be freely combined in one conduit

B. They are kept separated per code for safety and to prevent interference

C. Low voltage powers the compressor

D. Line voltage powers the thermostat only

61. Refrigerant lines are kept short and direct chiefly to:

A. Ease painting

B. Increase subcooling

C. Reduce fitting count only

D. Limit pressure drop and refrigerant charge

62. A vibration-isolation loop near the compressor protects:

A. The thermostat from drafts

B. The condenser from sun

C. Brazed joints from fatigue cracking

D. The drier from moisture

63. A roof curb provides support, weatherproofing, and:

A. Electrical disconnection

B. A path for duct and pipe penetrations

C. Refrigerant storage

D. Airflow measurement

64. An electronic expansion valve install also requires wiring its:

A. Capillary tube to the receiver

B. Flare to the king valve

C. Sensors and stepper-motor leads to the controller

D. Air line to a compressor

65. An outdoor condensing unit boxed in tightly on two sides will most likely:

A. Lower head pressure

B. Raise subcooling

C. Reduce control voltage

D. Recirculate hot air, raising head pressure

66. Which statement about a high-pressure cutout wired in parallel with the load (instead of in series) is TRUE?

A. It will trip too early

B. It will modulate the valve

C. It powers the fan

D. It cannot interrupt the circuit and provides no protection

67. A condensate pan and drain are required under an evaporator that:

A. Runs only in heating

B. Uses hard-drawn copper

C. Dehumidifies and produces condensate

D. Is three-phase

68. After integrating the controls, the installer energizes the system and verifies it:

A. Draws zero compressor current

B. Behaves per the planned sequence of operation

C. Has the minimum possible charge

D. Bypasses the safety string

69. Sloping a long horizontal suction run toward the compressor:

A. Raises head pressure

B. Reduces the charge

C. Increases subcooling

D. Aids oil return

70. Undersized supply ductwork most directly causes:

A. Reduced airflow that can freeze the coil

B. Higher subcooling

C. Zero compressor current

D. Faster dehumidification

71. Which statement about rigging a heavy compressor is TRUE?

A. The longest sling is always best regardless of rating

B. Standing under the load is acceptable if brief

C. Painted lifting points are required

D. Knowing the weight and centre of gravity ensures a safe, balanced lift

72. An economizer with an outdoor-air intake is installed to provide ventilation and:

A. Free cooling when outdoor conditions permit

B. Refrigerant storage

C. Oil separation

D. Vibration isolation

73. A vibration loop, proper supports, and correct slope all share the installation purpose of:

A. Reducing the refrigerant charge

B. Increasing subcooling

C. Protecting system reliability and joint integrity

D. Lowering control voltage

74. Knowing a load's centre of gravity before a lift primarily ensures:

A. The correct refrigerant charge

B. A balanced, controlled lift

C. A shorter line set

D. A lower thermostat differential

75. A line-voltage circuit in a typical install energizes:

A. The 24 V thermostat only

B. The micron gauge

C. The recovery machine

D. The compressor and fan motor loads

76. A three-phase fan and compressor both run backward after a service-panel change. The single fix is to:

A. Replace both motors

B. Swap any two incoming supply leads

C. Add refrigerant

D. Raise the control transformer rating

77. The measured superheat is:

A. 5 °C

B. 13 °C

C. 18 °C

D. 8 °C

78. The measured subcooling is:

A. 44 °C

B. 36 °C

C. 8 °C

D. 80 °C

79. On this TXV system, charge is best confirmed by the:

A. Superheat reading alone

B. Ambient dry-bulb temperature

C. Subcooling value

D. Winding resistance

80. This reading pattern indicates the system is:

A. Overcharged

B. Flooding the evaporator

C. Over-ventilated

D. Undercharged

81. The correct corrective action, after confirming airflow is adequate, is to:

A. Recover refrigerant

B. Add refrigerant to specification

C. Replace the compressor

D. Bypass the low-pressure control

82. Before recording commissioning readings, the system must:

A. Run in reverse briefly

B. Complete the nitrogen purge

C. Cool the vacuum pump

D. Stabilize at near-design conditions

83. A zeotropic blend is charged as a liquid to:

A. Preserve the blend composition

B. Speed charging

C. Lower cylinder pressure

D. Raise subcooling

84. Which set of readings together best describes overall performance?

A. Pressures, superheat, subcooling, split, and current

B. Refrigerant brand and color

C. Wiring-diagram revision date

D. Building age and occupancy

85. Commissioning the controls includes proving a high-pressure cutout actually:

A. Modulates the TXV

B. Powers the condenser fan

C. Lowers suction pressure

D. Stops the compressor at its setpoint

86. Low superheat with high subcooling found at commissioning indicates the system is:

A. Overcharged

B. Undercharged

C. Leaking

D. Air-starved indoors

87. Calibrating an economizer enthalpy control requires instruments measuring:

A. Suction pressure only

B. Supply voltage only

C. Line length only

D. Temperature, humidity, and the control's output

88. During start-up of three-phase equipment, the first thing confirmed is:

A. The cylinder weight

B. Correct rotation of compressor and fans

C. The occupancy schedule

D. The thermostat differential

89. Which statement about verifying refrigerant before charging is TRUE?

A. The type is confirmed against the equipment nameplate

B. The liquid-line color is sufficient proof

C. The vacuum-pump brand determines it

D. The line-set length sets it

90. A temperature split far below design at commissioning points to a problem with:

A. The nameplate

B. The thermostat color

C. Charge, airflow, or capacity

D. The recovery cylinder

91. High head, high subcooling, and normal suction on an air-cooled unit indicates:

A. An undercharge

B. A flooding TXV

C. A return-air filter issue

D. A dirty condenser or non-condensables

92. Compressor current well above nameplate RLA at commissioning indicates the compressor is:

A. Mounted out of level

B. Charged with the wrong blend

C. Drawing too little power

D. Operating under an overload

93. Air balancing during commissioning ensures:

A. The charge is set by weight

B. The compressor draws no current

C. Each space receives its designed airflow

D. Subcooling is maximized

94. Which statement about recording the refrigerant charge at commissioning is TRUE?

A. It is optional

B. It is a regulatory record and a service baseline

C. It is only for warranty

D. It is for duct sizing

95. A standing vacuum that held at a deep micron level before charging confirms the system was:

A. Tight and dry

B. Overcharged

C. Running in reverse

D. Freshly painted

96. On a heat pump being commissioned, the reversing-valve shift is verified by exercising the thermostat's:

A. G terminal

B. W terminal

C. C terminal

D. O or B terminal

97. The commissioning report's primary long-term value is to serve as the:

A. Supplier invoice

B. Baseline of normal readings for future service

C. Occupancy permit

D. Warranty claim form

Scenario (Q98–Q100): A heat pump in heating mode shows higher-than-normal suction pressure, reduced heating capacity, and an unusually warm suction line at the compressor.

98. The most likely cause is:

A. A reversing valve leaking discharge gas to the suction side

B. An undercharge of refrigerant

C. A clogged liquid-line drier

D. A frozen outdoor coil

99. The reading that most directly supports this diagnosis is:

A. Zero compressor current

B. Very low head pressure

C. A frozen liquid line

D. High suction pressure with a warm suction line

100. Which statement about this fault is TRUE?

A. The internal leak connects the high side to the low side

B. It is corrected by adding refrigerant

C. It indicates a defrost-timer failure

D. It only occurs in cooling mode

101. The correct service approach is to:

A. Find and repair the leak, then evacuate and recharge

B. Add refrigerant and a leak-stop additive

C. Reset the low-pressure control

D. Replace the thermostat

102. Repeatedly topping up a leaking system is unacceptable chiefly because it:

A. Raises the control voltage

B. Improves efficiency

C. Calibrates the gauge

D. Vents refrigerant and lets the fault continue

103. A single-phase compressor hums, fails to start, and trips the overload in seconds. The most probable cause is a:

A. Failed start capacitor or relay

B. Slightly dirty condenser

C. Wide thermostat differential

D. Over-evacuated system

104. A condenser coil left heavily fouled will most directly cause:

A. High head pressure and compressor strain

B. Low control voltage

C. A frozen evaporator

D. Loss of the commissioning report

105. A cold spot and temperature drop across the filter-drier on a poorly-cooling system indicates:

A. A healthy drier

B. A reverse-rotating compressor

C. A failed run capacitor

D. A partial liquid-line restriction at the drier

106. A heat pump's outdoor coil is heavily iced and heating output has collapsed. The defrost fault most consistent with this is:

A. Defrost terminating too early

B. The reversing valve stuck in cooling

C. Defrost failing to initiate

D. An overcharge

107. Which statement about a repeatedly tripping high-pressure cutout is TRUE?

A. It should be jumpered to keep the unit running

B. It should be replaced without checks

C. It signals genuinely high head pressure to diagnose

D. It is corrected by adding refrigerant

108. A burned-out compressor has acid-smelling oil. Before installing the replacement, the technician must:

A. Simply swap it in

B. Find and correct the cause and clean the contamination

C. Repaint the condenser

D. Raise the control voltage

109. A low-pressure control cuts out while the measured suction pressure is actually normal. This indicates:

A. A genuine loss of charge

B. A faulty control or its wiring

C. A dirty condenser

D. A leaking reversing valve

110. Resistance and continuity measurements are taken only on a circuit that is:

A. De-energized and locked out

B. Energized and loaded

C. Pressurized with nitrogen

D. Charged with refrigerant

111. Non-condensables left in a system will:

A. Lower head pressure

B. Reduce superheat to zero

C. Freeze the liquid line

D. Raise head pressure abnormally

112. Low suction, high superheat, and low subcooling together indicate:

A. An undercharge or leak

B. An overcharge

C. A flooding metering device

D. Excessive evaporator airflow

113. A heat pump that fails to terminate defrost will:

A. Stay in defrost too long, blowing cool air and wasting energy

B. Ice the outdoor coil solid

C. Draw zero compressor current

D. Freeze the liquid line

114. A megohmmeter showing declining insulation resistance across PM visits indicates:

A. A healthy improving winding

B. An overcharge

C. Winding insulation breaking down toward failure

D. A dirty condenser

115. Which statement about diagnosing a refrigerant-side fault is TRUE?

A. Measuring only suction pressure is sufficient

B. Reading pressures, superheat, and subcooling together reveals the fault pattern

C. Nameplate color identifies the fault

D. Counting fittings identifies the fault

116. A defrost cycle failing to initiate in heating mode results in:

A. Continuous indoor cooling

B. Zero head pressure

C. The outdoor coil icing over and lost heating

D. An overcharged liquid line

117. A repeatedly tripping overload found to coincide with seized bearings was:

A. A symptom of a real mechanical fault

B. A control defect to bypass

C. A normal start event

D. Caused by excessive subcooling

118. Recovered refrigerant during service must be:

A. Vented if the quantity is small

B. Captured in a rated recovery cylinder, never vented

C. Stored in a disposable cylinder

D. Mixed with another refrigerant

119. A clamp ammeter on a running fan motor confirms it is:

A. Free of moisture

B. Mounted level

C. Drawing its rated current

D. Charged correctly

120. Which statement about normal heat-pump defrost behaviour is TRUE?

A. A brief reversal to cooling with steam from the outdoor coil is normal

B. It indicates a failed compressor

C. It indicates an overcharge

D. It indicates a reversing-valve leak

121. Low superheat with high subcooling on a service call confirms:

A. An undercharge

B. A liquid-line restriction

C. An overcharge

D. A reversing-valve leak

122. The first step in systematic troubleshooting is to:

A. Gather information and verify the complaint

B. Replace the costliest part

C. Add refrigerant

D. Reset all safety controls

123. The reversing-valve solenoid on a heat pump is controlled by the thermostat's:

A. G terminal

B. W terminal

C. O or B terminal

D. C terminal

124. A capacitor must be discharged before handling because it:

A. Holds pressurized refrigerant

B. Stores system oil

C. Contains nitrogen

D. Stores a dangerous electrical charge after power off

125. A safety control trips, the technician measures the sensed condition, and finds it genuinely out of range. The correct conclusion is that the:

A. Control is defective

B. System should be jumpered

C. Charge should be topped up

D. Control is working and a real fault must be found

Practice Exam 21: Answer Key and Explanations

1. B — In an enclosed space with a refrigerant odour, the air may be oxygen-deficient, so the space must be ventilated and confirmed breathable before any work. Refrigerant heavier than air displaces oxygen and can cause asphyxiation. Life safety precedes any service task.

2. A — A running unit must be shut down, isolated, locked out, and verified to a zero-energy state with a meter before any panel is opened. Merely seeing the unit stop does not confirm electrical isolation, and verification prevents fatal shock.

3. C — Each worker on a locked-out machine applies their own personal lock to the isolation point. A single shared lock or a master key cannot protect a second worker independently.

4. B — 0.80 × 22 kg = 17.6 kg. Recovery cylinders are filled to no more than 80% of capacity to leave vapour space for liquid expansion. Exceeding this risks hydrostatic rupture.

5. D — Filling past 80% leaves no vapour space for the liquid to expand into as temperature rises, risking a hydrostatic rupture of the cylinder. The fill limit exists specifically to preserve that expansion space.

6. C — The Safety Data Sheet is the authoritative reference for a chemical's hazards and handling. It is consulted before working with an unfamiliar or unlabelled hazardous product such as brazing flux.

7. C — The false statement is that a blue circle indicates gases under pressure; WHMIS 2015 pictograms are red-bordered diamonds, and gases under pressure use the gas-cylinder symbol. The other three statements correctly describe the GHS-aligned system.

8. D — A clamp ammeter clamps around one supply lead to read a running motor's current without breaking the circuit, allowing comparison to RLA. The ohmmeter and micron gauge measure unrelated quantities, and voltage alone does not give current draw.

9. C — Effective mentoring transfers the reasoning — why the solenoid closes before the compressor stops — so the apprentice can adapt to new situations. Rote memorization does not build that judgment.

10. C — The regulatory refrigerant record requires the type and quantity of refrigerant handled. This documents compliance with rules prohibiting venting.

11. D — A hot-work permit and fire watch address the ignition of nearby combustibles by the brazing flame. The open flame is the principal hazard the controls are meant to manage.

12. B — Stored charge can remain or rebuild and a meter reading can be momentary, so the capacitor is discharged through a resistor before handling. A charged capacitor can deliver a serious shock even after lockout.

13. D — Breaking into a charged liquid line exposes the worker to instant frostbite, so gloves and eye protection rated for refrigerant are required. The other PPE addresses noise, dust, or visibility, not the cold-burn hazard.

14. C — A vacuum that rises and then holds steady indicates moisture still boiling off, not a leak; the rise stops once the moisture is gone. A true leak produces a continuous, non-stabilizing rise.

15. B — Because the result indicates remaining moisture, the correct step is to continue evacuation, possibly using a triple evacuation to sweep out stubborn moisture. Charging a wet system causes acid formation and metering-device freeze-ups.

16. A — A vacuum that rises continuously without stabilizing indicates a leak admitting outside air, so the technician returns to leak testing. Moisture would level off once it finishes boiling.

17. B — The false statement is that the flame should melt the filler rod directly; the base metal must reach flow temperature so the heat of the metal melts the rod, allowing capillary action. The other three statements are correct brazing principles.

18. D — A flare that cracks and is off-centre typically results from failing to deburr the tube, leaving a stress riser that splits during forming. A clean, deburred end forms a smooth, concentric flare.

19. A — A temperature-corrected pressure drop from 350 to 300 psig overnight means gas is escaping — a leak is present and must be located. A leak-free system holds its corrected pressure.

20. B — An oversized riser drops refrigerant velocity below the speed needed to sweep oil up the vertical run, so oil pools at the base. Correct sizing maintains oil-carrying velocity.

21. B — The remedy is to resize the riser and/or add a P-trap at the base to collect and lift oil up the riser. Removing insulation or adding charge does not restore oil-carrying velocity.

22. D — The fixed sequence is leak test with nitrogen, then evacuate to a deep vacuum, then charge. Each step depends on passing the previous one, and charging before evacuation is never acceptable.

23. A — Reaming with the cut end facing downward lets metal chips fall out rather than into the line. Chips left inside can clog a metering device or damage the compressor.

24. C — A refrigeration flare is a 45-degree SAE flare, not the 37-degree flare used in some hydraulic work. The correct angle lets the flare seat and seal against the fitting.

25. A — A swaged socket should be about one tube diameter deep to give the brazed joint adequate overlap and strength. Too shallow a socket produces a weak joint.

26. B — Excessive nitrogen pressure during brazing can blow molten filler out of the joint and overpressurize the heated line, so only a low, steady flow is used. The gentle purge still displaces oxygen and prevents scale.

27. D — An uninsulated suction line sweats and drips condensate because its cold surface falls below the air's dew point. In an occupied space this risks water damage.

28. C — A hacksaw leaves filings and a ragged edge inside the line, unlike a tubing cutter which produces a clean, square end. The filings circulate and damage the compressor and metering devices.

29. D — ACR refrigeration copper is specified by its actual outside diameter, unlike plumbing copper sized by nominal inside dimension. Confirming OD sizing prevents mismatched fittings.

30. C — A dead-level suction run with no slope lets oil pool rather than return to the compressor. A slight slope toward the compressor drains oil back with the refrigerant.

31. A — The true statement is that soft annealed copper can be bent and flared by hand, suiting it to small lines and tight routing. Both tempers can be brazed, and ACR copper is sized by outside diameter.

32. B — A cold joint that leaks results from the base metal not reaching filler flow temperature, so capillary action never draws the filler in. The metal — not the flame — must melt the rod.

33. C — 60,000 BTU/h ÷ 12,000 BTU/h per ton = 5 tons. The conversion uses the definition of one ton as 12,000 BTU/h.

34. B — When manufacturer data conflicts with a rule of thumb, the manufacturer's installation instructions govern and are typically a code and warranty requirement. Past-job habits are not authoritative.

35. A — The true statement is that oversizing causes short-cycling and poor dehumidification, because the system satisfies the thermostat before running long enough to remove moisture. The frequent starts also stress the compressor.

36. D — Heat from stored produce that continues to respire is part of the product load. It is distinct from conduction, control, and compressor electrical loads.

37. B — With a setpoint of 24 °C and a 2 °C differential, the thermostat calls for cooling when the space rises to about 26 °C and stops near 24 °C. The differential separates cut-in from cut-out to prevent short-cycling.

38. C — Safety controls wired in series mean any one opening stops the equipment. This gives each protective device the authority to shut the system down.

39. A — In a pump-down sequence the liquid-line solenoid closes first on a call to stop; the compressor then pumps the evaporator down until the low-pressure control stops it. This clears refrigerant from the low side.

40. B — A DDC-based Building Automation System uses networked microprocessors reading sensors and driving outputs. This enables centralized monitoring, scheduling, and energy management.

41. D — A TXV holds constant superheat across the load range, which is why it is selected for varying-load applications. A fixed orifice cannot adjust to changing load.

42. A — A high-occupancy, latent-dominated space requires emphasis on moisture-removal capacity, since occupants add significant latent load. Sizing only for sensible heat leaves the space humid.

43. C — The sequence of operation describes step by step how the system starts, cycles, defrosts, and shuts down. It ties the controls together and guides commissioning and service.

44. B — Compressed-air signals positioning dampers indicate pneumatic control technology. A controller modulates air pressure to drive the actuator.

45. A — A low-pressure control set to stop the compressor on loss of charge acts as a safety control, protecting the compressor. The same device acts as an operating control in a pump-down circuit, but the protective role applies here.

46. B — 90,000 BTU/h ÷ 12,000 BTU/h per ton = 7.5 tons. The conversion applies the one-ton definition.

47. D — Condenser clearance ensures unrestricted airflow for heat rejection. Restricted airflow raises condensing pressure and cuts capacity.

48. B — The true statement is that matching the four primary components to one another and to the load ensures rated performance at design conditions. Mismatched components cannot meet the designed capacity.

49. B — A microprocessor reading thermistors and a transducer to position an EEV is electronic (DDC-type) control. Pneumatic, electromechanical, and manual controls use different means.

50. C — A thermostat cycling the compressor to hold a setpoint is an operating control. High-pressure cutouts, relief valves, and overloads are protective safety devices.

51. C — A P-trap at the base of a tall vertical suction riser collects oil and helps lift it up the riser to the compressor. Without it, oil pools at the bottom of the riser.

52. A — A worker guides a craned load with a tag line while staying clear; standing under a suspended load is never acceptable. Dropped loads cause fatal injuries.

53. C — Setting equipment level ensures proper oil return and condensate drainage. An out-of-level unit suffers poor oil return and standing condensate.

54. B — Poor capacity and abnormal sound from a reverse-rotating three-phase compressor are corrected by swapping any two of the three supply leads. Reverse rotation is a phase-sequence issue, not a compressor fault.

55. A — Reverse rotation on a three-phase compressor is a phase-sequence issue, corrected by swapping two leads, not a compressor fault. The motor itself is healthy.

56. A — The true statement is that the same two-lead swap also corrects a reverse-running three-phase condenser fan, because it reverses the phase sequence for all three-phase loads on that supply. Adding charge or raising voltage does not affect rotation.

57. C — A control transformer steps line voltage down to the low-voltage control voltage. This powers thermostats and relay or contactor coils.

58. B — A high-pressure cutout must be wired in series so it can interrupt the control circuit and stop the compressor. Series wiring gives it that protective authority.

59. D — Insufficient airflow lets the evaporator coil run too cold, causing it to frost or freeze and lose capacity. The refrigerant and air sides are interdependent.

60. B — The true statement is that line- and low-voltage control wiring are kept separated per code for safety and to prevent interference. Low voltage powers controls, not the compressor.

61. D — Short, direct line routing limits pressure drop and the refrigerant charge required. Excess line length reduces performance and increases charge.

62. C — A vibration-isolation loop near the compressor protects brazed joints from fatigue cracking caused by transmitted vibration. Without it, vibration cracks joints over time.

63. B — A roof curb provides weatherproofing and a path for duct and pipe penetrations in addition to support. It integrates the packaged unit with the roof.

64. C — An electronic expansion valve requires its sensors and stepper-motor leads wired to the controller in addition to the refrigerant connections. The controller uses these inputs to position the valve.

65. D — A condensing unit boxed in tightly recirculates its own hot discharge air, raising head pressure and cutting capacity. Adequate clearance prevents recirculation.

66. D — The true statement is that a high-pressure cutout wired in parallel with the load cannot interrupt the control circuit and provides no protection. It must be in series to break the circuit.

67. C — A condensate pan and drain are required under an evaporator that dehumidifies and produces condensate, which must drain away to prevent overflow and damage.

68. B — After integrating controls, the installer verifies the system behaves per the planned sequence of operation. This confirms the controls were connected correctly.

69. D — Sloping a long horizontal suction run toward the compressor aids oil return by letting oil drain back with the refrigerant. Level or rising runs let oil pool.

70. A — Undersized supply ductwork reduces airflow, which can freeze the evaporator coil. The refrigerant and air sides are interdependent.

71. D — The true statement is that knowing the load weight and centre of gravity ensures a safe, balanced lift. Standing under a load is never acceptable, and the longest sling is not automatically correct.

72. A — An economizer with an outdoor-air intake provides ventilation and free cooling when outdoor conditions permit. It is not a refrigerant-side or vibration device.

73. C — Vibration loops, proper supports, and correct slope all protect system reliability and joint integrity over the life of the installation. They guard against fatigue, sagging, and oil-return problems.

74. B — Knowing the load's centre of gravity ensures a balanced, controlled lift. An unbalanced load can swing or drop dangerously.

75. D — The line-voltage circuit energizes the compressor and fan motor loads. The 24 V control circuit handles thermostats and coils.

76. B — Both a three-phase fan and compressor running backward after a panel change are corrected by swapping any two incoming supply leads, which reverses the phase sequence for all three-phase loads.

77. D — Superheat = line temperature − saturation temperature = 13 °C − 5 °C = 8 °C. It confirms all liquid has boiled before the vapour reaches the compressor.

78. C — Subcooling = saturation (condensing) temperature − liquid-line temperature = 44 °C − 36 °C = 8 °C. It confirms a solid column of liquid feeds the metering device.

79. C — On a TXV system the valve already controls superheat, so charge is confirmed by the subcooling value. Reading superheat would not verify charge on a TXV system.

80. D — High superheat (24 °C) with low subcooling (2 °C) indicates an undercharge: too little refrigerant starves the evaporator and leaves the condenser short of liquid. The pair read together reveals the charge state.

81. B — Because the pattern shows undercharge and airflow is confirmed adequate, the correct action is to add refrigerant to specification. Recovering charge would worsen an already low system.

82. D — Readings must wait until the system stabilizes at near-design conditions, because pressures and temperatures shift until equilibrium. Early readings lead to unnecessary charge changes.

83. A — A zeotropic blend is charged as a liquid to preserve its composition. Drawing vapour removes the more volatile components first and fractionates the blend.

84. A — Pressures, superheat, subcooling, temperature split, and current taken together describe overall performance. No single reading tells the whole story.

85. D — Commissioning the controls includes proving the high-pressure cutout actually stops the compressor at its setpoint. An untested safety control may provide no real protection.

86. A — Low superheat with high subcooling indicates an overcharge: excess refrigerant floods the condenser and overfeeds the evaporator. It is the inverse of the undercharge pattern.

87. D — An enthalpy control acts on total heat, so calibration requires measuring temperature, humidity, and the control's electrical output — thermometer, psychrometer, and multimeter. The instruments must match the controlled quantities.

88. B — On start-up of three-phase equipment, correct rotation of the compressor and fans is confirmed first, since reverse rotation damages the compressor and cuts capacity. Rotation is checked before performance readings.

89. A — The true statement is that the refrigerant type is confirmed against the equipment nameplate before charging. Line color and pump brand are not reliable proof.

90. C — A temperature split far below design points to a problem with charge, airflow, or capacity. The split reflects how effectively the coil removes heat.

91. D — High head, high subcooling, and normal suction point to a dirty condenser or non-condensables, both of which impair heat rejection and raise head pressure. An undercharge would show low subcooling instead.

92. D — Compressor current well above nameplate RLA indicates the compressor is operating under an overload. High draw signals excess load, not a level or charge issue.

93. C — Air balancing ensures each space receives its designed airflow. A correctly charged system can still underperform in part of a building if it is unbalanced.

94. B — The true statement is that recording the refrigerant type and charge is a regulatory record and a service baseline. It is neither optional nor solely for warranty.

95. A — A standing vacuum that held at a deep micron level confirms the system was tight and dry before charging. A holding vacuum proves both tightness and dryness.

96. D — The reversing-valve solenoid is exercised through the thermostat's O or B terminal, which switches the valve between heating and cooling. The G, W, and C terminals serve other functions.

97. B — The commissioning report's long-term value is to serve as the baseline of normal readings for future service. It tells the next technician what normal looked like for that installation.

98. A — Higher-than-normal suction pressure, reduced heating capacity, and a warm suction line are the classic signature of a reversing valve leaking hot discharge gas internally to the suction side. The internal leak connects the high side to the low side.

99. D — High suction pressure with a warm suction line most directly supports a reversing-valve internal leak, since hot discharge gas bleeds into the suction side. Zero current or low head point elsewhere.

100. A — The true statement is that the internal leak connects the high side to the low side, bleeding discharge gas to suction. It is not corrected by charge and is not a defrost-timer fault.

101. A — A leak must be found and repaired, then the system evacuated and recharged; topping up vents refrigerant and lets the fault recur. Additives and resets do not fix the leak.

102. D — Repeatedly topping up a leaking system vents refrigerant to the atmosphere and lets the fault continue. It is both illegal and damaging to the compressor.

103. A — A compressor that hums, fails to start, and trips the overload most commonly has a failed start capacitor or relay, leaving it without starting torque. The overload protects it from the locked-rotor draw.

104. A — A heavily fouled condenser left uncleaned causes high head pressure and compressor strain because it cannot reject heat. This also raises energy use and shortens compressor life.

105. D — A cold spot and temperature drop across the filter-drier indicate a partial liquid-line restriction at the drier. The pressure drop across the restriction causes the local cooling.

106. C — A heavily iced outdoor coil with collapsed heating output fits defrost failing to initiate, letting frost build until it insulates the coil. Defrost exists to clear that frost.

107. C — The true statement is that a repeatedly tripping high-pressure cutout signals genuinely high head pressure to diagnose. Jumpering removes protection and adding charge worsens it.

108. B — A burned-out compressor with acid-smelling oil requires finding and correcting the cause and cleaning the contamination before installing the replacement, or the new compressor will fail too.

109. B — A control that cuts out while the measured pressure is normal indicates a faulty control or its wiring. If the pressure were truly low, the control would be doing its job.

110. A — A continuity/resistance check is taken with the circuit de-energized and locked out. Applying an ohmmeter to a live circuit damages the meter and creates a shock hazard.

111. D — Non-condensables left in a system raise the head pressure abnormally, because trapped air occupies condenser space and adds its partial pressure. The fix is proper evacuation.

112. A — Low suction, high superheat, and low subcooling together indicate an undercharge or leak, with too little refrigerant to feed the evaporator and fill the condenser. The pattern is the signature of low charge.

113. A — A heat pump that fails to terminate defrost stays in defrost too long, blowing cool air indoors and wasting energy. Defrost should end once the coil is clear.

114. C — Steadily declining insulation resistance on successive megohmmeter tests indicates winding insulation breaking down toward failure. The trend warns of failure before the winding fails outright.

115. B — The true statement is that reading pressures, superheat, and subcooling together reveals the fault pattern. A single reading or the nameplate color cannot identify the fault.

116. C — A defrost cycle failing to initiate lets the outdoor coil ice over, losing heating capacity. The frost insulates the coil and blocks airflow.

117. A — An overload tripping in step with seized bearings is a symptom of a real mechanical fault, not a control defect. Bypassing it would let the motor destroy itself.

118. B — Recovered refrigerant must be captured in a rated recovery cylinder and never vented. Disposable cylinders are not rated for refilling and mixing refrigerants contaminates the charge.

119. C — A clamp ammeter on a running fan motor confirms it is drawing its rated current. Current is measured live; it does not indicate moisture, charge, or level.

120. A — The true statement is that a brief reversal to cooling with steam from the outdoor coil is normal defrost operation. Mistaking it for a fault is a common error.

121. C — Low superheat with high subcooling confirms an overcharge, as excess refrigerant floods the condenser and overfeeds the evaporator. High superheat with low subcooling would indicate the opposite.

122. A — The first step in systematic troubleshooting is to gather information and verify the complaint. Observing the actual behaviour prevents chasing the wrong fault.

123. C — The reversing-valve solenoid is controlled by the thermostat's O or B terminal, which switches the valve between heating and cooling. The G, W, and C terminals serve other functions.

124. D — A capacitor must be discharged before handling because it stores a dangerous electrical charge after power is removed. A charged capacitor can deliver a serious shock.

125. D — When the measured condition is genuinely out of range, the control is working correctly and a real fault must be found. The trip is the indicator of a problem, not a control defect.