PRACTICE EXAM 30: RACM RED SEAL SIMULATION (125 QUESTIONS)

1. A multimeter placed across an open disconnect that should be isolated reads 240 V. The correct interpretation is that the circuit is:

A. Safely dead and ready to open

B. Reading only induced voltage

C. Still live and not safe to touch

D. Grounded and de-energized

2. A recovery cylinder has a 13.6 kg refrigerant capacity. The scale shows 10.9 kg of recovered refrigerant in it. The fill level is approximately:

A. 50% of capacity

B. 65% of capacity

C. 80% of capacity

D. 95% of capacity

3. An ohmmeter across a compressor's start winding, with the unit locked out, reads "OL." This reading indicates:

A. An open winding

B. A shorted winding

C. A normal winding

D. A grounded winding

4. A plant room measures 94 dBA. NIOSH-rated muffs provide about 14 dBA of real-world attenuation. The exposure at the ear is approximately:

A. 108 dBA

B. 94 dBA

C. 70 dBA

D. 80 dBA

5. A clamp ammeter reads 9.0 A on a compressor with a nameplate RLA of 12.0 A. As a percentage of RLA, the draw is:

A. 75%

B. 133%

C. 100%

D. 25%

6. A capacitor measured immediately after lockout reads 180 V across its terminals. The correct interpretation and action is:

A. It is safe to handle as-is

B. The reading is a meter error

C. It must be recharged before handling

D. It still holds a dangerous charge and must be discharged

7. A refrigerant log shows "R-410A, 2.3 kg recovered." This entry satisfies the regulatory requirement to record:

A. The ambient temperature

B. The service-valve torque

C. The equipment paint color

D. The refrigerant type and quantity handled

8. A torque spec of 25 N·m must be converted for a wrench reading in ft·lb (1 N·m ≈ 0.738 ft·lb). The correct setting is approximately:

A. 34 ft·lb

B. 18 ft·lb

C. 25 ft·lb

D. 9 ft·lb

9. A worker entering an enclosed room reads an oxygen meter showing 18.5% (normal is 20.9%). The correct interpretation is:

A. Oxygen is being displaced; ventilate before entry

B. The atmosphere is normal

C. The meter is over-ranging

D. Oxygen is enriched and safe

10. Two technicians each hang a personal lock on the same disconnect. This arrangement indicates that:

A. Only the first technician is protected

B. The second lock is redundant and may be removed

C. A supervisor's master key can override both

D. Each technician is independently protected until they remove their own lock

11. A clamp ammeter reads 0.0 A on a contactor's load lead while the thermostat is calling for cooling. The most direct interpretation is that:

A. The compressor is drawing rated current

B. No current is flowing to the load

C. The capacitor is fully charged

D. The refrigerant charge is correct

12. A WHMIS label shows a flame pictogram on a container of refrigerant blend. This indicates the product is:

A. A compressed gas only

B. Flammable

C. An oxidizer

D. Corrosive

13. A recovered-refrigerant cylinder is sent to a facility that reprocesses it to a recognized purity standard for resale. The log should record this as:

A. Recovery

B. Recycling

C. Venting

D. Reclaim

14. During a standing vacuum test the gauge reads 400 microns, the pump is isolated, and ten minutes later it reads 410 microns and holds. This reading indicates the system is:

A. Leaking badly

B. Full of moisture

C. Over-evacuated

D. Tight and dry

15. A standing vacuum reads 500 microns, then rises to 1,500 microns and levels off. This pattern indicates:

A. A large leak

B. A dry, tight system

C. Remaining moisture boiling off

D. A failed gauge sensor

16. A standing vacuum rises from 500 microns continuously past 5,000 microns without stabilizing. This indicates:

A. Moisture boiling off

B. A leak admitting outside air

C. A dry system

D. An oversized pump

17. A 24-hour nitrogen pressure test reads 350 psig at the start and 350 psig at the end after temperature correction. This indicates:

A. A small leak

B. A large leak

C. No detectable leak

D. Moisture in the system

18. A flare is inspected and found cracked and off-centre. The most likely workmanship cause indicated is:

A. The tube was not deburred before flaring

B. A 45-degree angle was used

C. The line was purged with nitrogen

D. The nut was started by hand

19. A brazed joint cut open shows a bright, clean interior. This indicates that during brazing the line was:

A. Heated with the flame on the rod only

B. Purged with dry nitrogen

C. Left open to air

D. Over-pressurized

20. A suction line reads abnormally low velocity at part load and oil is found pooling in a vertical riser. The reading pattern indicates the riser is:

A. Oversized for oil return

B. Undersized causing pressure drop

C. Correctly sized

D. Insulated incorrectly

21. A tubing cutter and a hacksaw both cut a sample tube; the hacksaw sample shows metallic debris inside. This indicates the hacksaw left:

A. A clean, square end

B. Filings that will circulate and damage components

C. An annealed end

D. A nitrogen charge

22. A swaged socket is measured at a depth equal to one tube diameter. This indicates the socket is:

A. Too shallow for a sound joint

B. Too deep, wasting filler

C. Correctly sized for adequate overlap

D. Suitable only for a flare

23. A micron gauge during evacuation reads steadily 250 microns and holds after the pump is valved off. This indicates the system is ready to:

A. Be leak tested again

B. Be charged

C. Be pressurized with oxygen

D. Have its compressor replaced

24. A suction line in an occupied space is dripping water onto the ceiling below. The reading/observation indicates the line is:

A. Over-insulated

B. Carrying liquid refrigerant

C. Uninsulated and sweating below dew point

D. Sized too large

25. Soft copper is bent by hand and shows a flattened, kinked section. This indicates the bend was made:

A. Without a tube bender, restricting flow

B. With a correctly sized bender

C. After annealing properly

D. At too gradual a radius

26. A 24-hour nitrogen test drops from 300 psig to 280 psig after temperature correction. This indicates:

A. A leak that must be located

B. A perfectly tight system

C. Nitrogen condensation

D. An over-ranged gauge

27. ACR tubing is uncapped and the interior is found bright and dry with a faint nitrogen smell. This indicates the tubing is:

A. Pre-charged with refrigerant

B. Annealed for water service

C. Clean and dry, ready for refrigerant service

D. Contaminated and unusable

28. During brazing the nitrogen regulator is set to 2 psi and a low steady flow is confirmed. This setting is:

A. Too high, risking blown filler

B. Too low to displace oxygen

C. Correct for a brazing purge

D. Only suitable for pressure testing

29. A horizontal suction run is found installed dead level and oil is pooling in it. The reading indicates the run lacks:

A. A slope toward the compressor

B. Insulation

C. A larger diameter

D. A nitrogen charge

30. The finishing sequence performed was: leak test passed, evacuated to 400 microns held, then charged. This sequence is:

A. Out of order

B. Correct

C. Missing the evacuation step

D. Charged before evacuation

31. A brazing rod melts only when touched to the flame, not to the joint metal. This reading of the process indicates the joint is:

A. Fully penetrated

B. Over-annealed

C. Correctly heated

D. Too cold for capillary action

32. A pressure-test gauge on a system filled with shop air shows moisture condensing inside the manifold. This indicates the wrong test medium was used because air introduces:

A. Moisture into the system

B. Excess subcooling

C. A nitrogen charge

D. Higher capacity

33. A load calculation totals 24,000 BTU/h. Converted to tons, this is:

A. 2 tons

B. 4 tons

C. 12 tons

D. 24 tons

34. A 3-ton system is specified. Its capacity in BTU/h is:

A. 12,000 BTU/h

B. 36,000 BTU/h

C. 24,000 BTU/h

D. 3,000 BTU/h

35. A load of 42,000 BTU/h is converted to tons as:

A. 3.5 tons

B. 7 tons

C. 12 tons

D. 42 tons

36. A planner reads a manufacturer data sheet specifying a maximum line length of 25 m, conflicting with a 40 m past-job habit. The planner should design to:

A. 40 m, the past habit

B. The average of the two

C. 50 m for margin

D. 25 m, the manufacturer figure

37. A space's sensible heat ratio is given as 0.75. This indicates the latent portion of the load is:

A. 75%

B. 100%

C. 25%

D. 50%

38. A thermostat is set to 21 °C with a 2 °C differential. The cut-in (cooling-on) temperature is approximately:

A. 19 °C

B. 21 °C

C. 23 °C

D. 17 °C

39. One ton of refrigeration in kilowatts (1 ton ≈ 3.517 kW) is approximately:

A. 1.0 kW

B. 12 kW

C. 0.3 kW

D. 3.5 kW

40. A control plan shows the high-pressure cutout, low-pressure cutout, and overload all in one string to the contactor coil. This series arrangement means that:

A. The controls share current

B. They modulate the valve

C. They work only in defrost

D. Any one opening stops the compressor

41. A walk-in cooler load sheet lists "produce respiration heat." This belongs to the:

A. Control-circuit load

B. Compressor electrical load

C. Product load

D. Conduction load only

42. A 96,000 BTU/h load is converted to tons as:

A. 6 tons

B. 16 tons

C. 96 tons

D. 8 tons

43. A control schedule lists compressed-air signal lines to damper actuators. This identifies the control type as:

A. DDC electronic

B. Electromechanical relay

C. Pneumatic

D. Variable-frequency drive

44. A planner notes a TXV will be used on a system with widely varying load. The TXV is chosen because it holds constant:

A. Evaporator pressure

B. Condenser subcooling

C. Superheat across the load range

D. Discharge temperature

45. A document lists, in order, how the system starts, cycles, defrosts, and shuts down. This document is the:

A. Sequence of operation

B. Refrigerant log

C. WHMIS inventory

D. Bill of materials

46. A low-pressure control on the plan is set to stop the compressor if charge is lost. In this role it is a(n):

A. Pump-down operating control

B. Defrost terminator

C. Modulating actuator

D. Safety control

47. A control description reads "microprocessor reads thermistors and a transducer, drives a stepper-motor valve." This identifies the control type as:

A. Pneumatic

B. Electronic (DDC-type)

C. Electromechanical

D. Manual hand-valve

48. A planner reviews the four primary components and confirms each is rated for the same capacity at design conditions. This matching ensures:

A. The least refrigerant regardless of capacity

B. No need for commissioning

C. No need for safety controls

D. Rated performance at design conditions

49. A control list shows a thermostat cycling the compressor to hold a setpoint. This is classified as a(n):

A. Safety cutout

B. Relief device

C. Overload protector

D. Operating control

50. A condenser is planned in an alcove with the minimum clearance the manufacturer specifies. This clearance is set primarily to:

A. Store the recovery cylinder

B. Shorten control wiring

C. Ensure unrestricted airflow for heat rejection

D. Provide forklift access

A condenser fan motor draws 5.0 amperes at 230 volts. Using $P = V \times I$, its real power consumption is approximately:

A. 46 watts of total power

B. 230 watts of total power

C. 575 watts of total power

D. 1,150 watts of total power

52. A worker is observed standing directly under a craned rooftop unit to guide it. This practice is:

A. Acceptable if brief

B. Unsafe; the worker must stay clear and use a tag line

C. Required to center the load

D. Safe with a hard hat

53. A heater element reads 240 V across 12 Ω. Its current draw ($I = V \div R$) is:

A. 20 A

B. 0.05 A

C. 2,880 A

D. 252 A

54. A unit set on its pad reads 3° out of level on a digital level, and oil-return and drainage problems follow. The corrective action is to:

A. Re-set the unit dead level

B. Add refrigerant

C. Enlarge the suction line

D. Raise the control voltage

55. A three-phase compressor reads correct voltage but runs with low capacity and abnormal sound. After confirming charge, the next corrective step is to:

A. Replace the compressor

B. Swap any two of the three supply leads

C. Raise the setpoint

D. Add more refrigerant

56. A control transformer reads 240 V on the primary and 24 V on the secondary. Its function is to:

A. Increase compressor torque

B. Filter moisture

C. Step line voltage down to control voltage

D. Measure power factor

57. A 24 V relay coil draws 0.5 A of current. Using R = V ÷ I, the coil's resistance is calculated to be:

A. 12 ohms of resistance

B. 0.02 ohms of resistance

C. 48 ohms of resistance

D. 24 ohms of resistance

58. An evaporator coil reads a surface temperature well below freezing with airflow far below design, and frost is forming. The reading indicates:

A. An overcharged condenser

B. Excessive subcooling

C. A defective high-pressure switch

D. An air-side restriction causing the coil to freeze

59. A high-pressure cutout is wired so that opening it breaks the contactor-coil circuit. This series wiring allows it to:

A. Stop the compressor on high pressure

B. Share current with the load

C. Modulate the valve

D. Power the fan

60. A 600 V three-phase resistive load reads 12 kW. Its line current ($I = P \div (\sqrt{3} \times V)$, $\sqrt{3} \approx 1.732$) is approximately:

A. 60 A

B. 20 A

C. 1 A

D. 11.5 A

61. A P-trap is installed at the base of a vertical suction riser. Its purpose, confirmed by oil returning properly, is to:

A. Store the liquid charge

B. Collect and lift oil up the riser

C. Provide a service port

D. Filter the refrigerant

62. A boxed-in condenser reads head pressure well above normal on a mild day with clean coils. The reading indicates:

A. An undercharge

B. Recirculation of hot discharge air

C. A flooding TXV

D. A frozen evaporator

63. A condensate pan under an operating evaporator collects water steadily. This confirms the coil is:

A. Operating in heating mode

B. Using hard-drawn copper

C. Running three-phase

D. Dehumidifying the air

64. An installed suction line reads heavy surface condensation in an occupied space. The reading indicates the line is:

A. Uninsulated and below dew point

B. Carrying only vapour correctly

C. Over-subcooled

D. Sized too small

65. An electronic expansion valve is wired with refrigerant connections only; the controller shows a sensor fault. The missing connection is the:

A. Capillary tube to the receiver

B. Flare nut to the king valve

C. Sensor and stepper-motor leads to the controller

D. Air line to a compressor

66. A line-voltage circuit reads 240 V and energizes the compressor; a separate circuit reads 24 V. The 24 V circuit powers the:

A. Compressor windings

B. Condenser fan motor

C. Thermostat and contactor coil

D. Recovery machine

67. A vibration-isolation loop is installed near the compressor. Its purpose, confirmed by reduced joint stress, is to:

A. Reduce the thermostat differential

B. Increase condenser airflow

C. Filter moisture

D. Protect brazed joints from fatigue cracking

68. An undersized supply duct reads high static pressure and low airflow. The most direct refrigeration-side risk is:

A. Higher subcooling

B. A frozen evaporator coil

C. Zero compressor current

D. Faster dehumidification

69. A three-phase condenser fan reads correct voltage but spins backward after a panel rewire. The single corrective step is to:

A. Replace the fan motor

B. Swap any two of the three supply leads

C. Add refrigerant

D. Raise the control voltage

70. A roof curb is installed under a packaged unit. Beyond support, the curb provides:

A. Electrical disconnection

B. Refrigerant storage

C. Weatherproofing and a penetration path

D. Airflow measurement

71. A rigging plan lists the unit weight as 320 kg and marks its centre of gravity. This information is required to:

A. Set the refrigerant charge

B. Plan a safe, balanced lift within gear ratings

C. Size the control transformer

D. Set the thermostat differential

72. A high-pressure cutout reads continuity in parallel with the compressor load rather than in series. This wiring error means the cutout:

A. Cannot interrupt the circuit and gives no protection

B. Trips too early

C. Modulates the valve

D. Powers the fan

73. A suction line is sloped 1° toward the compressor over its run. This slope is installed to:

A. Raise head pressure

B. Reduce the charge

C. Increase subcooling

D. Aid oil return

74. A filter-drier is installed in the liquid line ahead of the metering device. Its position is correct because it must:

A. Be on the suction side

B. Be at the compressor discharge

C. Remove moisture before the metering device

D. Be in a hot-gas bypass

75. A suction accumulator is installed on the suction side ahead of the compressor. Its purpose is to:

A. Store the high-side liquid charge

B. Filter the liquid line

C. Provide a discharge service port

D. Trap returning liquid and protect against floodback

76. Both a three-phase fan and compressor read reverse rotation after a service-panel change. The single fix is to:

A. Replace both motors

B. Add refrigerant

C. Swap any two incoming supply leads

D. Raise the control transformer rating

77. Suction pressure converts to a 6 °C saturation temperature; the suction line reads 14 °C. The superheat is:

A. 8 °C

B. 6 °C

C. 14 °C

D. 20 °C

78. Liquid-line saturation (condensing) temperature is 43 °C; the liquid line reads 35 °C. The subcooling is:

A. 78 °C

B. 8 °C

C. 43 °C

D. 35 °C

79. A fixed-orifice system reads superheat of 23 °C and subcooling of 2 °C. The interpretation is:

A. Overcharge

B. Undercharge

C. Flooding evaporator

D. Excess condenser airflow

80. A TXV system reads correct superheat. To confirm charge, the technician reads:

A. Superheat again

B. Ambient dry-bulb

C. Condenser subcooling

D. Winding resistance

81. A system reads low superheat (3 °C) and high subcooling (14 °C). The interpretation is:

A. Undercharge

B. Overcharge

C. Liquid-line restriction

D. Excess evaporator airflow

82. Readings are taken 90 seconds after start-up and are erratic. The correct action is to:

A. Add charge immediately

B. Recover charge immediately

C. Replace the TXV

D. Wait for the system to stabilize

83. Suction saturation is −4 °C and the suction line reads 7 °C. The superheat is:

A. 11 °C

B. 3 °C

C. 7 °C

D. 28 °C

84. A blend cylinder is nearly empty and the technician keeps drawing vapour to finish a charge. The risk created is:

A. Excess subcooling only

B. A frozen liquid line

C. Fractionation altering the blend composition

D. Over-evacuation

85. A commissioning sheet records pressures, superheat, subcooling, temperature split, and current. Together these:

A. Replace the leak test

B. Set the thermostat differential

C. Size the ductwork

D. Describe overall system performance

86. Before charging, the technician confirms the refrigerant type against the:

A. Liquid-line color

B. Vacuum-pump brand

C. Equipment nameplate

D. Line-set length

87. A high-pressure condition is simulated and the cutout stops the compressor at its setpoint. This verifies that:

A. The safety control functions and provides protection

B. The system is charged correctly

C. The micron gauge is calibrated

D. The duct is balanced

88. An air-cooled unit reads high head pressure, high subcooling, and normal suction. The interpretation is:

A. An undercharge

B. A dirty condenser or non-condensables

C. A flooding TXV

D. A return-air filter problem

89. A standing vacuum held at 350 microns before charging. This confirms the system was:

A. Overcharged

B. Running in reverse

C. Freshly painted

D. Tight and dry

90. A heat pump's reversing valve is verified by exercising the thermostat terminal that controls its solenoid, which is the:

A. G terminal

B. W terminal

C. C terminal

D. O or B terminal

91. A compressor reads current well above nameplate RLA at commissioning. The interpretation is the compressor is:

A. Charged with the wrong blend

B. Mounted out of level

C. Operating under an overload

D. Drawing too little power

92. A temperature split across the evaporator reads far below design. The interpretation is a problem with:

A. The nameplate

B. Charge, airflow, or capacity

C. The thermostat color

D. The recovery cylinder

93. Recording the refrigerant type and exact charge at commissioning is required because the record is:

A. For duct sizing

B. A regulatory record and service baseline

C. Warranty-only

D. Optional

94. A fixed-orifice system reads high superheat and low subcooling. The interpretation is:

A. Overcharge

B. Flooding evaporator

C. Undercharge

D. Excess condenser airflow

95. Air balancing during commissioning is performed so that the reading confirms:

A. The charge set by weight

B. Each space receives its design airflow

C. Zero compressor current

D. Maximized subcooling

96. A zeotropic blend is charged as a liquid. This method is used to:

A. Preserve the blend composition

B. Speed the charge

C. Lower cylinder pressure

D. Raise subcooling

97. During three-phase start-up the technician confirms rotation before recording performance. This order is correct because reverse rotation:

A. Improves capacity

B. Damages the compressor and cuts capacity

C. Has no effect

D. Raises subcooling

98. A heat pump in heating reads high suction pressure, reduced capacity, and a warm suction line. The interpretation is:

A. A reversing valve leaking discharge gas to suction

B. An undercharge

C. A clogged liquid drier

D. A frozen outdoor coil

99. A system reads low and the technician's record shows it was topped up twice in a month. The correct approach is to:

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

B. Add refrigerant and an additive

C. Reset the low-pressure control

D. Replace the thermostat

100. A single-phase compressor reads a hum, no start, and an overload trip in seconds. The interpretation is a:

A. Slightly dirty condenser

B. Failed start capacitor or relay

C. Wide thermostat differential

D. Over-evacuated system

101. A condenser coil reads heavily fouled and head pressure is high. Left uncleaned, the direct consequence is:

A. High head pressure and compressor strain

B. Low control voltage

C. A frozen evaporator

D. Loss of the commissioning report

102. A filter-drier reads a cold spot and a temperature drop across it on a poorly-cooling system. The interpretation is:

A. A healthy drier

B. A partial liquid-line restriction at the drier

C. A reverse-rotating compressor

D. A failed run capacitor

103. A heat pump's outdoor coil reads heavily iced with collapsed heating output. The defrost fault indicated is:

A. Defrost terminating too early

B. The reversing valve stuck in cooling

C. An overcharge

D. Defrost failing to initiate

104. A burned-out compressor's oil reads acidic. 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

105. A low-pressure control cuts out, but a gauge reads suction pressure as normal. The interpretation is:

A. A genuine loss of charge

B. A dirty condenser

C. A leaking reversing valve

D. A faulty control or its wiring

106. A run capacitor reads 22 µF against a 40 µF rating, and the motor runs hot. The interpretation is a:

A. Weak or failed run capacitor

B. Normal capacitor

C. Over-evacuated system

D. Dirty condenser

107. An ohmmeter is to be used on a winding. The safe condition for the reading is with the circuit:

A. Energized and loaded

B. Pressurized with nitrogen

C. De-energized and locked out

D. Charged with refrigerant

108. A system reads abnormally high head pressure after a sloppy prior repair, with subcooling slightly high. The interpretation is:

A. A severe undercharge

B. A flooding evaporator

C. Non-condensables in the system

D. A frozen liquid line

109. A system reads low suction, high superheat, and low subcooling. The interpretation is:

A. An undercharge or leak

B. An overcharge

C. A flooding metering device

D. Excess evaporator airflow

110. A heat pump reads continuous defrost, blowing cool air indoors for long periods. The fault indicated is:

A. The outdoor coil icing solid

B. A defrost termination control or sensor fault

C. Zero compressor current

D. A frozen liquid line

111. A megohmmeter reads steadily declining insulation resistance over three PM visits. The interpretation is:

A. Winding insulation breaking down toward failure

B. A healthy improving winding

C. An overcharge

D. A dirty condenser

112. A no-cooling call is best diagnosed by reading pressures, superheat, and subcooling together because:

A. Each fault produces a characteristic pattern a single reading can't reveal

B. Single readings are always wrong

C. It avoids using instruments

D. It removes the need to find the root cause

113. A clamp ammeter on a running fan motor reads its rated current. This confirms the motor is:

A. Free of moisture

B. Drawing its rated operating current

C. Charged correctly

D. Mounted level

114. A system reads low superheat and high subcooling. The interpretation is:

A. An undercharge

B. A leak

C. A liquid-line restriction

D. An overcharge

115. A repeatedly tripping high-pressure cutout reads genuinely high head pressure when measured. The correct next step is to:

A. Jumper out the cutout

B. Replace it without checks

C. Add refrigerant

D. Find and correct the cause of the high pressure

116. A heat pump briefly reverses to cooling, the outdoor fan stops, and steam rises from the coil. The interpretation is:

A. Normal defrost operation

B. A failed compressor

C. An overcharge

D. A reversing-valve leak

117. During service, recovered refrigerant reads 1.8 kg on the recovery scale. It must be:

A. Captured in a rated recovery cylinder, never vented

B. Vented since the amount is small

C. Stored in a disposable cylinder

D. Mixed with another refrigerant

118. An overload reads a trip coinciding with seized fan bearings. The trip is:

A. A control defect to bypass

B. A symptom of a real mechanical fault

C. A normal start event

D. Caused by excessive subcooling

119. A defrost cycle reads as failing to initiate in heating mode. The resulting effect is:

A. Continuous indoor cooling

B. Zero head pressure

C. The outdoor coil icing over and lost heating

D. An overcharged liquid line

120. A safety control trips; the technician measures the sensed condition and finds it normal. The correct conclusion is the:

A. System lost its charge

B. Refrigerant should be topped up

C. Control or wiring is faulty

D. System should be jumpered

121. The reversing-valve solenoid on a heat pump reads as controlled by the thermostat's:

A. G terminal

B. W terminal

C. C terminal

D. O or B terminal

122. A capacitor on a failed motor reads stored voltage after lockout. Before handling, the technician must:

A. Discharge it safely through a resistor

B. Charge it for testing

C. Pressurize it with nitrogen

D. Store oil in it

123. A safety control trips and the measured sensed condition reads genuinely out of range. The conclusion is the:

A. Control is defective

B. System should be jumpered

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

D. Charge should be topped up

124. Non-condensables left in a system read as abnormally high head pressure because trapped air:

A. Occupies condenser space and adds partial pressure

B. Lowers the condensing temperature

C. Improves heat rejection

D. Freezes the liquid line

125. Frost on a heat pump's outdoor coil in heating mode reads as expected. The correct interpretation is that it is:

A. Always a refrigerant leak

B. A sign of compressor failure

C. Caused by an overcharge

D. Normal, and managed by the defrost cycle

Practice Exam 30: Answer Key and Explanations

1. C — A 240 V reading across an open disconnect means the circuit is still live and not safe to touch. The meter test is exactly what catches a disconnect that failed to isolate, preventing fatal shock.

2. C — 10.9 kg ÷ 13.6 kg ≈ 0.80, or 80% of capacity. This is the maximum safe fill, the point at which recovery into that cylinder must stop to leave vapour space for expansion.

3. A — An "OL" (infinite) ohms reading on a winding indicates an open winding with no continuous path. A good winding reads a specific low resistance; a short reads abnormally low.

4. D — 94 dBA minus about 14 dBA of real-world attenuation gives roughly 80 dBA at the ear. NIOSH derates the rated NRR to reflect field performance, leaving exposure near the action level.

5. A — 9.0 A ÷ 12.0 A RLA = 0.75, or 75% of rated load amps. A draw below RLA is normal and indicates the compressor is not overloaded.

6. D — A 180 V reading means the capacitor still holds a dangerous charge and must be discharged through a resistor before handling. A charged capacitor can deliver a serious shock after lockout.

7. D — "R-410A, 2.3 kg recovered" records the refrigerant type and quantity handled, satisfying the regulatory requirement. This documents compliance with rules prohibiting venting.

8. A — 25 N·m × 0.738 ft·lb per N·m ≈ 18.5 ft·lb, closest to 18 ft·lb. Correct conversion prevents over- or under-torquing the connection.

9. A — An oxygen reading of 18.5% against a normal 20.9% shows oxygen is being displaced, so the space must be ventilated before entry. Reduced oxygen signals an asphyxiation hazard.

10. D — Two personal locks mean each technician is independently protected until they remove their own lock. No one else may remove another worker's lock.

11. B — A 0.0 A reading on the load lead during a cooling call means no current is flowing to the load. The load is not energized, pointing to an open upstream in the control circuit.

12. B — A flame pictogram indicates the product is flammable. Many modern low-GWP blends are mildly flammable (A2L), requiring ignition-source controls.

13. D — Reprocessing recovered refrigerant to a recognized purity standard for resale is reclaim. Recovery only removes it and recycling cleans it for on-site reuse without certifying purity.

14. D — A vacuum that holds essentially steady (400 to 410 microns) after the pump is isolated indicates a tight, dry system. A rise that levels off would mean moisture; a continuous rise would mean a leak.

15. C — A vacuum that rises and then levels off indicates remaining moisture boiling off. Continued evacuation removes it; the leveling-off distinguishes moisture from a leak.

16. B — A vacuum that rises continuously without stabilizing indicates a leak admitting outside air. Moisture would level off once it finishes boiling.

17. C — A temperature-corrected pressure that holds at 350 psig over 24 hours indicates no detectable leak. A pressure drop would indicate a leak.

18. A — A cracked, off-centre flare indicates the tube was not deburred before flaring, leaving a stress riser that split during forming. A clean, deburred end forms a smooth, concentric flare.

19. B — A bright, clean interior indicates the line was purged with dry nitrogen during brazing, which displaced oxygen and prevented oxide scale. Brazing in air would leave dark, flaky scale.

20. A — Low velocity at part load with oil pooling in a riser indicates the riser is oversized for oil return. The velocity has fallen below the speed needed to sweep oil up the vertical run.

21. B — Metallic debris inside the hacksaw sample indicates it left filings that will circulate and damage the compressor and metering devices. A tubing cutter leaves a clean, filing-free end.

22. C — A swaged socket about one tube diameter deep is correctly sized for adequate brazed overlap. Too shallow a socket produces a weak joint.

23. B — A micron gauge holding steadily at 250 microns after the pump is valved off indicates a tight, dry system ready to be charged. The held deep vacuum confirms both tightness and dryness.

24. C — A suction line dripping water indicates it is uninsulated and sweating because its surface is below the air's dew point. Insulation prevents the condensation.

25. A — A flattened, kinked bend indicates it was made without a tube bender, restricting flow. A bender forms a smooth radius without kinking.

26. A — A temperature-corrected drop from 300 to 280 psig indicates a leak that must be located. A tight system holds its corrected pressure.

27. C — Bright, dry interior with a faint nitrogen smell indicates the ACR tubing is clean and dry and ready for refrigerant service. The nitrogen holding charge kept moisture and contaminants out.

28. C — A 2 psi, low, steady nitrogen flow is correct for a brazing purge: enough to displace oxygen without blowing filler out or overpressurizing the heated line.

29. A — A dead-level run with oil pooling indicates it lacks a slope toward the compressor. A slight slope lets oil drain back with the refrigerant.

30. B — Leak test passed, evacuated and held, then charged is the correct finishing sequence. Each step depended on passing the previous one.

31. D — A rod that melts only in the flame, not on the joint metal, indicates the joint is too cold for capillary action. The base metal must reach flow temperature so the metal melts the rod.

32. A — Moisture condensing in the manifold during an air pressure test indicates shop air introduced moisture into the system. Dry nitrogen, which is moisture-free, is the correct test medium.

33. A — 24,000 BTU/h ÷ 12,000 BTU/h per ton = 2 tons. The conversion uses the one-ton definition.

34. B — 3 tons × 12,000 BTU/h per ton = 36,000 BTU/h. The conversion applies the one-ton definition.

35. A — 42,000 BTU/h ÷ 12,000 BTU/h per ton = 3.5 tons. The conversion uses the one-ton definition.

36. D — The manufacturer's 25 m maximum governs over a past-job habit and is a code and warranty requirement. Designing to 25 m respects the authoritative figure.

37. C — A sensible heat ratio of 0.75 means 75% of the load is sensible, so the latent portion is the remaining 25%. SHR is the sensible fraction of total load.

38. C — With a 21 °C setpoint and a 2 °C differential, the thermostat calls for cooling at about 23 °C and stops near 21 °C. The differential separates cut-in from cut-out to prevent short-cycling.

39. D — One ton ≈ 3.517 kW, closest to 3.5 kW. This conversion links cooling capacity in tons to thermal kW.

40. D — Wiring the safety controls in one series string means any one opening stops the compressor. Series wiring gives each protective device shutdown authority.

41. C — Produce respiration heat is part of the product load in a refrigeration calculation. It is distinct from conduction, control, and compressor loads.

42. D — 96,000 BTU/h ÷ 12,000 BTU/h per ton = 8 tons. The conversion uses the one-ton definition.

43. C — Compressed-air signal lines to damper actuators identify a pneumatic control system. A controller modulates air pressure to position the actuator.

44. C — A TXV is chosen for varying loads because it holds constant superheat across the load range. A fixed orifice cannot adjust to changing load.

45. A — A document listing in order how the system starts, cycles, defrosts, and shuts down is the sequence of operation. It ties the controls together and guides commissioning.

46. D — A low-pressure control set to stop the compressor on lost charge functions as a safety control. In a pump-down circuit the same device acts as an operating control.

47. B — A microprocessor reading thermistors and a transducer and driving a stepper-motor valve is electronic (DDC-type) control. Pneumatic, electromechanical, and manual controls use different means.

48. D — Components all rated for the same capacity at design conditions ensure rated performance at design conditions. Mismatched components cannot meet the designed capacity.

49. D — A thermostat cycling the compressor to hold a setpoint is an operating control. Safety cutouts, relief devices, and overloads are protective.

50. C — Minimum condenser clearance is set to ensure unrestricted airflow for heat rejection. Restricted airflow raises condensing pressure and cuts capacity.

51. D — Power calculation — P = V × I = 230 V × 5.0 A = 1,150 W. Option C (575 W) reflects a 115 V miscalculation; A and B ignore the current-voltage product entirely..

52. B — Standing under a craned load is unsafe; the worker must stay clear and guide it with a tag line. Dropped loads cause fatal injuries regardless of duration or PPE.

53. A — I = V ÷ R = 240 V ÷ 12 Ω = 20 A. Ohm's law gives the current from voltage and resistance.

54. A — A unit 3° out of level with oil-return and drainage problems is corrected by re-setting it dead level. Adding charge or enlarging lines does not address the level fault.

55. B — Low capacity and abnormal sound after confirming charge indicate reverse rotation, corrected by swapping any two of the three supply leads. It is a phase-sequence issue, not a compressor fault.

56. C — A transformer reading 240 V primary and 24 V secondary steps line voltage down to the control voltage. This powers thermostats and relay or contactor coils.

57. C. Resistance calculation — R = V ÷ I = 24 V ÷ 0.5 A = 48 Ω. Option A halves the result, B inverts the formula (I ÷ V), and D mistakenly returns the source voltage value.

58. D — A coil surface well below freezing with airflow far below design and frost forming indicates an air-side restriction causing the coil to freeze. The refrigerant and air sides are interdependent.

59. A — A high-pressure cutout wired so opening it breaks the contactor-coil circuit can stop the compressor on high pressure. Series wiring gives it that protective authority.

60. D — $I = P \div (\sqrt{3} \times V) = 12{,}000 \div (1.732 \times 600) = 12{,}000 \div 1{,}039 \approx 11.5$ A. The three-phase power formula gives the line current.

61. B — A P-trap at the base of a riser collects and lifts oil up the riser, confirmed by proper oil return. A receiver, by contrast, stores the liquid charge.

62. B — High head pressure on a mild day with clean coils on a boxed-in condenser indicates recirculation of hot discharge air. The unit is breathing its own exhaust, raising condensing pressure.

63. D — A condensate pan collecting water under an operating evaporator confirms the coil is dehumidifying the air. Moisture condenses on the cold coil and drains away.

64. A — Heavy surface condensation on a suction line in an occupied space indicates it is uninsulated and below the dew point. Insulation prevents the sweating and dripping.

65. C — A sensor fault on an EEV wired with refrigerant connections only indicates the missing connection is the sensor and stepper-motor leads to the controller. The controller needs these to position the valve.

66. C — The 24 V circuit powers the thermostat and contactor coil. The line-voltage circuit energizes the compressor and fan motor loads.

67. D — A vibration-isolation loop near the compressor protects brazed joints from fatigue cracking, confirmed by reduced joint stress. Without it, vibration cracks joints over time.

68. B — High static pressure and low airflow from an undersized duct most directly risk a frozen evaporator coil. The refrigerant and air sides are interdependent.

69. B — A three-phase fan spinning backward after a rewire is corrected by swapping any two of the three supply leads. Reverse rotation is a phase-sequence issue, not a motor fault.

70. C — A roof curb provides weatherproofing and a penetration path beyond support. It integrates the packaged unit with the roof.

71. B — Knowing the 320 kg weight and centre of gravity is required to plan a safe, balanced lift within gear ratings. Planning precedes lifting.

72. A — A high-pressure cutout reading continuity in parallel with the load cannot interrupt the control circuit and gives no protection. It must be in series to break the circuit.

73. D — A 1° slope toward the compressor aids oil return by letting oil drain back with the refrigerant. Level or rising runs let oil pool.

74. C — A filter-drier in the liquid line ahead of the metering device must remove moisture before the metering device, where moisture would freeze and restrict flow. Its position is therefore correct.

75. D — A suction accumulator ahead of the compressor traps returning liquid and protects against floodback. Receivers and driers sit on the high/liquid side.

76. C — Both a three-phase fan and compressor reading reverse rotation are corrected by swapping any two incoming supply leads, which reverses the phase sequence for all three-phase loads.

77. A — Superheat = line temperature − saturation temperature = 14 °C − 6 °C = 8 °C. It confirms all liquid has boiled before the vapour reaches the compressor.

78. B — Subcooling = saturation (condensing) temperature − liquid-line temperature = 43 °C − 35 °C = 8 °C. It confirms a solid column of liquid feeds the metering device.

79. B — High superheat (23 °C) with low subcooling (2 °C) on a fixed-orifice system indicates an undercharge. Too little refrigerant starves the evaporator and leaves the condenser short of liquid.

80. C — On a TXV system the valve already controls superheat, so charge is confirmed by condenser subcooling. Reading superheat again would not verify charge.

81. B — Low superheat (3 °C) with high subcooling (14 °C) indicates an overcharge. Excess refrigerant floods the condenser and overfeeds the evaporator.

82. D — Erratic readings 90 seconds after start-up mean the system has not stabilized, so the technician waits. Acting on early readings leads to unnecessary charge changes.

83. A — Superheat = line temperature − saturation temperature = 7 °C − (−4 °C) = 11 °C. Subtracting a negative saturation temperature adds the magnitudes.

84. C — Drawing vapour from a nearly empty blend cylinder causes fractionation, changing the charged blend composition. Blends must be charged as liquid to stay correct.

85. D — Pressures, superheat, subcooling, temperature split, and current together describe overall system performance. No single reading tells the whole story.

86. C — The refrigerant type is verified against the equipment nameplate before charging. Line color and pump brand are not reliable proof.

87. A — Simulating high pressure and confirming the cutout stops the compressor verifies the safety control functions and provides protection. An untested safety control may protect nothing.

88. B — High head, high subcooling, and normal suction indicate a dirty condenser or non-condensables, both of which impair heat rejection and raise head pressure. An undercharge would show low subcooling.

89. D — A standing vacuum that held at 350 microns confirms the system was tight and dry before charging. A holding deep vacuum proves both tightness and dryness.

90. 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.

91. C — Compressor current well above nameplate RLA indicates it is operating under an overload. High draw signals excess load, not a level or charge issue.

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

93. B — Recording the refrigerant type and exact charge is a regulatory record and a service baseline. It is neither optional nor solely for warranty.

94. C — High superheat with low subcooling on a fixed-orifice system indicates an undercharge. Too little refrigerant starves the evaporator and leaves the condenser short of liquid.

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

96. 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.

97. B — Rotation is confirmed before performance readings because reverse rotation damages the compressor and cuts capacity. Checking rotation first prevents that damage.

98. A — High suction pressure, reduced capacity, and a warm suction line are the classic signature of a reversing valve leaking discharge gas to the suction side. The internal leak connects the high side to the low side.

99. A — A system topped up twice in a month must have the leak found and repaired, then be evacuated and recharged. Topping up vents refrigerant and lets the fault recur.

100. B — A compressor that hums, fails to start, and trips the overload in seconds most commonly has a failed start capacitor or relay, leaving it without starting torque. The overload protects it.

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

102. B — 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.

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

104. B — A burned-out compressor with acidic oil requires finding and correcting the cause and cleaning the contamination before the replacement is installed, or it will fail too.

105. D — A control cutting out while the measured suction pressure is normal indicates a faulty control or its wiring. If the pressure were truly low, the control would be doing its job.

106. A — A run capacitor reading 22 μF against a 40 μF rating with the motor running hot indicates a weak or failed run capacitor. The capacitor's loss degrades running efficiency.

107. C — A winding resistance reading 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.

108. C — Abnormally high head pressure with slightly high subcooling after a sloppy repair indicates non-condensables in the system. Trapped air occupies condenser space and adds its partial pressure.

109. 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.

110. B — Continuous defrost blowing cool air indoors indicates a defrost termination control or sensor fault. Defrost should end once the coil is clear.

111. A — Steadily declining insulation resistance over PM visits indicates winding insulation breaking down toward failure. The trend warns of failure before the winding fails outright.

112. A — Reading pressures, superheat, and subcooling together is favoured because each fault produces a characteristic pattern a single reading cannot reveal. The pattern identifies the fault.

113. B — A clamp ammeter reading rated current on a running fan motor confirms it is drawing its rated operating current. Current is measured live and does not indicate moisture, charge, or level.

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

115. D — A high-pressure cutout that reads genuinely high head pressure when measured must have the cause of the high pressure found and corrected. Jumpering removes protection and adding charge worsens it.

116. A — A brief reversal to cooling with the outdoor fan off and steam rising is normal defrost operation. Mistaking it for a fault is a common error.

117. A — Recovered refrigerant must be captured in a rated recovery cylinder and never vented, regardless of quantity. Disposable cylinders are not rated for refilling and mixing contaminates the charge.

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

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

120. C — A safety control that trips while the measured sensed condition is normal indicates the control or wiring is faulty. A genuine fault would show the condition out of range.

121. D — 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.

122. A — A capacitor reading stored voltage after lockout must be discharged safely through a resistor before handling. A charged capacitor can deliver a serious shock.

123. C — When the measured sensed 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 defect.

124. A — Non-condensables raise head pressure because trapped air occupies condenser space and adds its partial pressure. The fix is proper evacuation.

125. D — Frost on a heat pump's outdoor coil in heating mode is normal, and the defrost cycle manages it. The outdoor coil runs below freezing as the evaporator, so frost is expected.