PRACTICE EXAM 33: RACM RED SEAL SIMULATION (125 QUESTIONS)

1. A technician is about to recover refrigerant from a system in a small, enclosed plant room with no mechanical ventilation. Which precaution most directly addresses the primary life-safety hazard of that space?

A. Wear cut-resistant gloves before touching the recovery hoses

B. Place a drip tray beneath the recovery machine to catch oil

C. Set the recovery machine on a level surface away from the wall

D. Ensure ventilation and monitor for oxygen displacement before work

2. A technician reviews a Safety Data Sheet before using a chemical solvent. Which SDS section identifies the hazards and the required precautionary statements?

A. Section 9, which lists the physical and chemical properties only

B. Section 2, which covers hazard identification and precautions

C. Section 12, which addresses the product's ecological information

D. Section 15, which lists the applicable regulatory information

3. A technician must select eye protection for grinding burrs off a steel bracket. Which protection is appropriate for the hazard of flying particles?

A. Safety glasses or goggles rated for impact from flying particles

B. Tinted welding lenses rated only for arc-flash brightness

C. Ordinary prescription glasses with no side or impact rating

D. A clear face shield worn alone with no glasses underneath it

4. A technician is asked to work from a scissor lift to reach a rooftop air handler. Before raising the platform, which check most directly addresses the fall and tip-over hazard?

A. Confirm the lift battery is charged enough for the full shift

B. Verify the tool pouch is secured to the technician's belt

C. Inspect the platform, guardrails, and ground conditions first

D. Check that the lift's paint is free of scratches or rust spots

5. A technician must communicate a change in the work scope to the rest of the crew mid-job. What is the most effective way to convey the change?

A. Send a single text message and assume everyone reads it

B. Tell only the apprentice and let the message pass along

C. Change the work quietly without informing the other workers

D. Brief the crew directly and confirm each understands the change

6. A technician needs to measure a 2 mm clearance between two machined surfaces. Which instrument is suited to that measurement?

A. A standard steel tape measure read to the nearest millimetre

B. A feeler gauge with blades selected for the gap being checked

C. A framing square laid flat across the two surfaces being checked

D. A torque wrench set to the assembly's specified value

7. A technician is preparing to lift a heavy motor by hand from floor level. Which technique reduces the risk of a back injury during the lift?

A. Bend the knees, keep the back straight, and lift with the legs

B. Bend at the waist and lift the motor with the arms extended

C. Twist the torso while raising the load to set it on the bench

D. Hold the motor away from the body to keep clothing clear of it

8. A technician finds the shop's eyewash station blocked by stored boxes during a routine check. What is the correct action?

A. Note it for the next monthly inspection and leave it as found

B. Use a different sink temporarily and ignore the obstruction

C. Clear the obstruction so the eyewash station is fully accessible

D. Move the eyewash station to a more convenient corner location

9. A technician must organize tools and parts for an efficient service call. Which practice best supports organized, productive work?

A. Carry every tool the truck holds into the building each time

B. Begin the repair and fetch parts one at a time as needed

C. Borrow tools from the customer to avoid trips to the truck

D. Stage the likely tools and parts based on the reported fault

10. A WHMIS 2015 workplace label is applied to a refrigerant container decanted from a larger drum. What information must this workplace label include?

A. Product identifier, safe-handling precautions, and a reference to the SDS

B. The full chemical synthesis route used to manufacture the product

C. The supplier's complete annual sales and distribution figures

D. The names of every worker who has handled the container

11. A technician must work near energized electrical equipment to take voltage readings. Which practice most directly controls the electrical hazard during the measurement?

A. Remove all PPE so the meter leads can be handled freely

B. Stand in a puddle of water to ensure a solid ground reference

C. Use properly rated meter and PPE and follow safe work limits

D. Hold both meter leads in one hand to keep the other one free

12. A technician is mentoring an apprentice on a brazing task. Which approach best builds the apprentice's competence safely?

A. Complete the joint quickly and let the apprentice watch only

B. Demonstrate, supervise a practice joint, then give feedback

C. Hand the torch over with no demonstration to build confidence

D. Describe the task verbally and send the apprentice to try alone

13. A technician must dispose of used refrigerant oil after a service. What is the correct handling practice?

A. Pour it down the shop floor drain with plenty of hot water

B. Mix it with solvent and discard it in the general garbage

C. Leave it in an open pail outdoors to evaporate over time

D. Collect it in a labelled container for approved waste disposal

14. A technician is staging a brazing operation beside a wood-framed wall in an occupied home. Which preparation best controls the fire risk at that location?

A. Shield the wall with a non-combustible barrier and stage an extinguisher

B. Raise the torch flame to finish the joint before heat can spread

C. Open a nearby window and rely on the draft to carry heat away

D. Wet the framing lightly with water just before lighting the torch

15. A technician must join two sections of copper tube with a brazed coupling. Which preparation step immediately precedes applying heat and filler?

A. Pressurize the joint with nitrogen to expand the fitting

B. Apply oil to the joint to help the filler metal flow in

C. Clean and abrade the mating surfaces to bright bare metal

D. Crimp the coupling closed to hold the tubes in alignment

16. A technician forms a flare on a soft copper line for a mechanical connection. Why is the copper end annealed or kept soft before flaring?

A. Soft copper raises the line's pressure rating after flaring

B. Soft copper flares without cracking, forming a sound seat

C. Soft copper eliminates the need to torque the flare nut

D. Soft copper changes the refrigerant type that can be used

17. A technician is cutting rigid copper tube to length for a liquid line. Which tool and method give the cleanest, squarest cut?

A. A torch melted slowly through the wall of the tube

B. Side-cutting pliers squeezed to pinch the tube closed

C. A hacksaw drawn rapidly with no guide or deburring

D. A tubing cutter tightened gradually around the tube

18. A technician must support refrigerant lines run horizontally along a ceiling. What is the main consideration when spacing the pipe hangers?

A. Spacing and hanger material matched to pipe size and weight

B. The colour of the hangers to match the building's decor

C. Maximizing the span to use the fewest hangers possible

D. Allowing the line to sag freely between widely set hangers

19. A technician is selecting filler metal for a copper-to-brass valve connection. Which filler is appropriate for joining copper to a dissimilar metal like brass?

A. A pure soft lead solder rated for low-pressure drains only

B. A self-fluxing copper-phosphorus rod used with no flux

C. A silver-bearing brazing alloy used with the proper flux

D. An aluminum rod intended for joining aluminum fins only

20. A technician must label cylinders of recovered refrigerant staged in the shop. Which labelling practice is correct?

A. Leave them blank since the valve fitting identifies the gas

B. Mark each with refrigerant type, status, and a hazard label

C. Combine several refrigerants into one cylinder to save room

D. Store full and empty cylinders mixed together unmarked

21. A technician reams a freshly cut copper tube during a routine job. What is the consequence of failing to ream the internal burr?

A. The tube becomes too soft to support its own weight

B. The outside diameter grows too large for the fitting socket

C. The tube end work-hardens and can no longer be flared

D. The burr restricts flow and creates turbulence in the line

22. A technician must protect a copper line where it passes through a drilled wood stud. What practice prevents long-term damage at that point?

A. Use a grommet or protective sleeve to prevent abrasion

B. Braze the line to a steel plate fastened across the stud

C. Leave a tight press fit so the stud grips the line firmly

D. Fill the entire bored hole with rigid expanding foam

23. A technician purges a newly assembled refrigerant line with dry nitrogen before connecting it. What does this purge accomplish?

A. It pressurizes the line to seat the mechanical fittings

B. It coats the interior with a film of refrigerant oil

C. It clears moisture and debris from inside the tubing

D. It raises the line temperature to speed up the charge

24. A technician records refrigerant added to a system during a routine top-up. Why is this record a required part of the work?

A. To calculate the technician's driving distance for the day

B. For regulatory leak-tracking and an accurate service history

C. To decide the colour the recovery cylinder should be painted

D. Because recording the amount changes the refrigerant's type

25. A technician selects insulation for a suction line running through a hot attic. Which property is most important to prevent sweating on the line?

A. A vapour barrier with adequate R-value to stop condensation

B. A bright outer colour to make the line easy to identify

C. A high permeability that lets moisture pass through freely

D. A low crush strength so it conforms tightly to the pipe

26. A technician must bend a length of soft copper tubing without flattening it during a routine install. Which tool is correct?

A. A pipe wrench applied across the centre of the bend

B. A bench vise clamped tightly at the point of the bend

C. A spring or lever-type tube bender sized to the tube

D. A propane torch to soften the full length before bending

27. A technician finishes a routine repair and must verify the joint is leak-free before recharging. Which method is appropriate at this stage?

A. A nitrogen pressure test followed by a leak-detection check

B. Running the compressor briefly to pressurize the new joint

C. A visual look at the joint's colour as the sole confirmation

D. Charging the refrigerant first and watching the gauges

28. A technician must store oxygen and acetylene cylinders for a brazing job. What is the correct storage practice for these cylinders?

A. Lay both cylinders flat together for easy transport on site

B. Keep them next to a heat source so the gas flows more freely

C. Remove the valve caps and store the cylinders uncapped

D. Store them upright, secured, with caps on and gases separated

29. A technician must clean an oxidized copper surface before soldering a water line. What does proper cleaning achieve on the joint?

A. It increases the solder's melting point for a stronger bond

B. It allows the solder to wet the copper and flow by capillary action

C. It bonds the joint so no solder needs to be added at all

D. It leaves a thick coating that insulates the finished joint

30. A technician must verify deliveries before starting a routine install. Against which document are the materials checked?

A. The bill of materials or take-off list prepared for the job

B. A blank daily time sheet not yet filled out for the shift

C. The manufacturer's glossy product marketing brochure

D. The previous job's signed and completed inspection form

31. A technician encounters poor lighting in a mechanical room during a routine task. What is the correct response to the hazard?

A. Work from memory of the layout to avoid stopping the job

B. Hold a phone light in the mouth while using both hands

C. Set up adequate temporary task lighting before proceeding

D. Postpone the work until natural daylight reaches the room

32. A technician completes a routine service in an occupied building and prepares to leave. Which closing step reflects professional practice?

A. Leave offcuts and packaging for the customer to clean up

B. Depart without speaking to avoid disturbing the customer

C. Leave the access panels off so the work stays visible

D. Reinstall panels, clean the area, and report the work done

33. A technician is planning the suction line for a system with a long vertical riser up to a rooftop condensing unit. Why must minimum velocity be maintained in the riser?

A. Higher velocity automatically lowers the system's charge

B. Adequate velocity carries oil up the riser to the compressor

C. Velocity in the riser sets the evaporator's superheat value

D. Low velocity is preferred to reduce the line's pressure drop

34. A technician plans a cooling-load estimate for a glass-walled lobby with strong afternoon sun. Which heat-gain component is likely dominant in that space?

A. Solar heat gain through the large area of exterior glazing

B. Internal heat from a small number of light fixtures only

C. Heat conducted through the well-insulated interior partitions

D. Latent load from a low-occupancy, dry indoor environment

35. A technician plans the metering device for a system that must hold superheat across a wide load range. Which device modulates flow to maintain superheat?

A. A fixed-orifice piston sized for one design condition only

B. A hand expansion valve set manually at a single position

C. A thermostatic expansion valve that adjusts to the load

D. A capillary tube of a fixed length and internal diameter

36. A technician plans the duct layout and must limit noise from air movement. Which design choice helps keep duct-generated noise low?

A. Sizing ducts for the highest practical air velocity throughout

B. Routing all ducts in the shortest straight line regardless of size

C. Using the smallest ducts that physically fit the available space

D. Sizing ducts to keep air velocity within recommended limits

37. A technician plans a refrigerant line set and wants to limit pressure drop. Why are long runs and excessive fittings avoided in the design?

A. Fewer fittings reduce the refrigerant charge to almost zero

B. Each fitting and length adds pressure drop that cuts capacity

C. More fittings always make the system quieter in operation

D. Long runs raise the suction pressure entering the compressor

38. A technician plans the placement of a rooftop condensing unit. Which siting consideration most affects its operating performance?

A. Clearance for airflow so hot discharge air is not recirculated

B. Positioning the unit to be hidden from view at street level

C. Mounting the unit on bare soil to dampen its vibration

D. Locating the unit as close as possible to an occupied room

39. A technician plans the electrical feed for a packaged unit and reads the data plate. What does the minimum circuit ampacity (MCA) value tell the planner?

A. The maximum fuse size permitted to protect the circuit

B. The refrigerant charge that must be weighed into the unit

C. The static pressure the supply fan is rated to develop

D. The smallest conductor ampacity that can safely feed the unit

40. A technician plans condensate disposal for a cooling coil mounted in a negative-pressure plenum. Why is a properly sized trap part of the plan?

A. The trap filters particulate from the condensate before it drains

B. The trap maintains a seal so the plenum pressure does not block flow

C. The trap raises the condensate temperature before discharge

D. The trap meters refrigerant flow into the evaporator coil

41. A technician plans insulation for a chilled-water line in a humid mechanical room. What does omitting an adequate vapour barrier cause?

A. The water velocity in the line increases beyond the design

B. The chilled-water supply temperature setpoint rises on its own

C. Moisture reaches the cold surface, causing condensation and dripping

D. The circulating pump draws far less current during operation

42. A technician plans a control system and must document how the equipment responds to demand. What does the sequence of operation define?

A. The order and conditions under which components are energized

B. The refrigerant charge weight required for the whole system

C. The colour code applied to the low-voltage control wiring

D. The physical route the refrigerant piping takes between units

43. A technician plans the liquid line where the condenser is located several metres below the evaporator. What design issue does this lift create?

A. The lift increases liquid subcooling automatically as it rises

B. The vertical lift has no effect on the liquid line at all

C. The lift requires the suction line to be insulated only at the top

D. Static head from the lift can cause flash gas if subcooling is low

44. A technician plans the wire gauge for a long thermostat control run. Why must voltage drop be considered in the sizing?

A. Larger wire reduces the system's required refrigerant charge

B. Excess voltage drop can stop relays and contactors pulling in

C. Voltage drop has no effect on a 24-volt control circuit

D. Smaller wire raises the control transformer's output voltage

45. A technician plans an evaporator selection for a high-humidity storage room with sensitive product. Which selection factor most affects the room's humidity?

A. The coil TD, since it governs how much moisture is removed

B. The shipping weight of the coil as delivered to the site

C. The brand name printed on the coil's nameplate label

D. The number of mounting brackets supplied with the coil

46. A technician plans equipment anchoring for an installation in a seismic zone. What must the plan provide for the equipment and piping?

A. Refrigerant changed to a non-flammable type for safety

B. The system operated at a higher condensing pressure

C. Restraint and bracing to resist movement during an event

D. A salt-resistant paint scheme on all exposed surfaces

47. A technician plans the refrigerant selection for a new medium-temperature system. Which combination of factors should govern the choice?

A. The colour the customer prefers for the supply cylinders

B. Whichever refrigerant is cheapest in the supply house today

C. The brand of recovery machine the shop currently owns

D. Operating range, efficiency, oil compatibility, and regulations

48. A technician plans air-elimination devices for a chilled-water loop. Where in the loop should automatic air vents be located?

A. At the lowest point in the loop near the circulating pump

B. At the system high points where trapped air collects

C. On the refrigerant suction line of the chiller compressor

D. At every supply diffuser inside the conditioned space

49. A technician plans the structural support for a rooftop unit on a curb. What is the main function of the curb in the installation plan?

A. It increases the unit's refrigerant holding capacity

B. It serves as the unit's primary electrical ground path

C. It supports the unit, seals the roof, and routes the ducts

D. It replaces the need for any vibration isolation entirely

50. A technician plans a system charged with a zeotropic blend and must account for glide. How should the plan treat the blend's temperature glide?

A. Treat the blend as a single-temperature refrigerant with no glide

B. Charge the blend as vapour to remove glide from the mixture

C. Ignore glide because it disappears once the system runs

D. Use the correct dew and bubble points for control and charging

51. A technician installs a new line set and must verify it is leak-tight before evacuation. The circuit is pressurized with dry nitrogen and held for an extended period. What confirms the joints are sound?

A. The micron level drops to a deep vacuum on the gauge

B. The test pressure holds steady with no measurable loss

C. The refrigerant charge matches the unit's data plate weight

D. The compressor amperage stays below the nameplate rating

52. A technician evacuates a system and pulls it down to a deep vacuum. What is the purpose of achieving and holding this deep vacuum?

A. To raise the system pressure above its normal operating range

B. To add lubricating oil to the compressor crankcase before start

C. To set the superheat at the thermostatic expansion valve

D. To boil off moisture and remove non-condensables from the system

53. A technician installs a TXV and positions the external sensing bulb. For accurate superheat control, where is the bulb correctly mounted?

A. On a clean horizontal suction line with firm thermal contact

B. On the vertical liquid line below the condenser outlet

C. Loosely against the compressor discharge service valve

D. Inside the evaporator coil among the lower return bends

54. A technician brazes the field joints on a refrigerant circuit while flowing dry nitrogen. What internal defect does the nitrogen flow prevent?

A. Over-torquing of the system's mechanical flare connections

B. Excessive subcooling forming at the condenser outlet

C. Copper oxide scale forming on the inside of the tubing

D. An increase in the system's total refrigerant charge weight

55. A technician installs a liquid line filter-drier marked with a flow-direction arrow. Why must it be installed matching that arrow?

A. The arrow indicates which joint to braze first on the line

B. Correct orientation lets it filter and dry the flowing refrigerant

C. Orientation sets the colour the drier should be painted

D. Reversed flow has no effect on the drier's performance at all

56. A technician must charge a system using a zeotropic blend from a cylinder. How is the refrigerant correctly removed to preserve the blend?

A. As vapour drawn from the top of the upright cylinder

B. After warming the cylinder in hot water above 60 degrees

C. By venting some refrigerant first to clear the valve

D. As liquid, since drawing vapour causes the blend to fractionate

57. A technician wires a three-phase scroll compressor and energizes it briefly. Why is the rotation direction checked at startup?

A. Reverse rotation produces no pumping and can damage the scroll

B. Reverse rotation only makes the compressor run more slowly

C. Rotation direction has no effect on a scroll compressor at all

D. Reverse rotation raises the refrigerant charge that is required

58. A technician installs a suction-line accumulator on a heat pump system. What does the accumulator protect the compressor against?

A. Excessive subcooling building at the condenser in cooling mode

B. High head pressure occurring during the summer cooling season

C. Liquid refrigerant slugging returning to the compressor

D. Low static pressure forming in the supply air ductwork

59. A technician installs ductwork connected to an air handler with a flexible connector. What is the connector's primary function?

A. To act as the main structural support for the duct's weight

B. To increase the static pressure the supply fan can produce

C. To filter particulate matter out of the supply air stream

D. To isolate fan vibration from being transmitted into the duct

60. A technician installs flare fittings on a mini-split's small copper lines. What ensures each flare seals reliably under operating pressure?

A. A flare cracked slightly so refrigerant can seat the joint

B. A correctly formed flare torqued to the manufacturer's value

C. A flare made on hardened copper without annealing the end

D. A flare tightened far beyond the specified torque for safety

61. A technician installs a condensate P-trap on a draw-through air handler. Why is the trap required on this configuration?

A. The trap maintains a seal against the negative pan pressure

B. The trap meters the refrigerant flow into the evaporator

C. The trap raises the condensate temperature before draining

D. The trap increases the static pressure across the coil

62. A technician installs service access ports on a new condensing unit. Why are these ports an important part of the installation?

A. They serve as the structural mount for the compressor body

B. They function as the system's refrigerant metering device

C. They allow gauge connection for charging and diagnostics

D. They replace the need for a liquid line filter-drier

63. A technician installs refrigerant lines penetrating a fire-rated wall. What is required at the penetration to maintain the wall's rating?

A. The lines left loose in an oversized, unsealed open hole

B. The line insulation stripped away at the wall opening

C. The opening sealed only with ordinary duct tape on each face

D. An approved firestop system rated to match the wall assembly

64. A technician installs a low-ambient head-pressure control on an air-cooled condenser. What does this control do in cold weather?

A. It raises the evaporator superheat to protect the compressor

B. It maintains adequate head pressure for proper TXV feeding

C. It increases the compressor's oil charge during the winter

D. It shuts the system off completely below the freezing point

65. A technician installs a long horizontal suction line and supports it at intervals. What does inadequate support of this line risk?

A. Sagging that traps oil and places stress on the brazed joints

B. An automatic increase in the condenser's liquid subcooling

C. A gradual decrease in the system's refrigerant charge

D. A rise in the suction pressure above the design value

66. A technician installs vibration isolation between a compressor and a steel frame. Which method correctly provides the isolation?

A. Bolting the compressor rigidly and directly to the steel frame

B. Resting the compressor loosely on the bare structural steel

C. Placing spring or pad isolators between compressor and frame

D. Hanging the compressor from the refrigerant piping for give

67. A technician installs a sight glass with a moisture indicator in a liquid line. During steady operation, a steady stream of bubbles most likely indicates what?

A. The refrigerant is correctly charged and fully subcooled

B. The compressor crankcase oil level has risen too high

C. The condenser fan is running at an excessive speed setting

D. A low charge or a restriction producing flash gas in the line

68. A technician installs a reversing valve on a heat pump circuit. What does this valve allow the system to do?

A. Meter refrigerant flow into the evaporator like a TXV does

B. Reverse refrigerant flow to switch between heating and cooling

C. Filter moisture and acids out of the circulating refrigerant

D. Store surplus liquid refrigerant during the system's off cycle

69. A technician weighs in the refrigerant charge on a newly installed critically charged system. Why is weighing the preferred charging method here?

A. The manufacturer specifies an exact charge that weighing achieves

B. Weighing changes the refrigerant to a safer non-flammable type

C. The cylinder's colour requires a precisely measured amount

D. Weighing lowers the pressure drop in the installed suction line

70. A technician installs a condensate pump for a high-wall head with no gravity drain. Which safety feature must be included in the installation?

A. A connection that discharges condensate into the suction line

B. Continuous pump operation regardless of the water level

C. A float switch that stops cooling if the pump fails to clear water

D. Wiring of the pump to the system's high-pressure switch

71. A technician installs dissimilar metals together in a piping circuit. Why does this junction require special attention during installation?

A. Dissimilar metals always braze together more easily than like metals

B. The metal combination sets the system's required superheat value

C. Dissimilar metals raise the refrigerant's saturation pressure

D. Galvanic corrosion can occur at the junction of dissimilar metals

72. A technician installs and connects a 24-volt control circuit on a furnace and coil. Which component supplies the 24-volt control power?

A. The compressor contactor coil on the outdoor condensing unit

B. The control transformer mounted within the furnace cabinet

C. The defrost termination thermostat on the evaporator coil

D. The crankcase heater wrapped around the compressor shell

73. A technician installs a multi-stage thermostat and verifies each stage's wiring. Why is this stage-by-stage verification important?

A. To confirm each stage energizes the correct equipment in order

B. To set the refrigerant charge required for each cooling stage

C. To choose the correct paint colour for the thermostat cover

D. To determine the duct static pressure at each supply outlet

74. A technician installs a P-trap at the base of a suction riser during a vertical-rise installation. What does this trap accomplish?

A. It drains condensate away from the supply air ductwork

B. It increases the liquid subcooling along the vertical riser

C. It collects oil so velocity can carry it up the riser

D. It acts as the metering device feeding the evaporator coil

75. A technician installs a temperature sensor clamped to a refrigerant pipe for a control. Why must firm thermal contact be ensured?

A. Firm contact increases the refrigerant charge held in the line

B. Firm contact lowers the control circuit's required voltage

C. Poor contact has no measurable effect on the sensor reading

D. Poor contact gives inaccurate readings and faulty control

76. A technician completes a rooftop unit installation and connects the supply ductwork. Why must the curb provide a proper weather seal at the roof?

A. The seal sets the refrigerant subcooling at the condenser coil

B. The seal acts as the electrical ground for the entire unit

C. The seal prevents water leakage into the building below

D. The seal increases the refrigerant capacity the unit can hold

77. A technician commissioning a system reads very low superheat with a cold, sweating suction line at the compressor. What does this reading most likely indicate?

A. The metering device is overfeeding and the coil may be flooding

B. The evaporator is starved and short of refrigerant feed

C. The condenser airflow is restricted by accumulated debris

D. The high-pressure safety control has tripped the compressor

78. A technician commissions a unit and measures only 1°C of subcooling at the condenser outlet on a hot day. What does this very low subcooling suggest?

A. The system is significantly overcharged with refrigerant

B. The condenser is heavily oversized for the present load

C. The compressor is running in the reverse rotation direction

D. The system is undercharged or has insufficient liquid feed

79. A technician commissions a TXV system and must increase the operating superheat slightly. How is the valve adjusted to do this?

A. Add refrigerant until the suction pressure rises substantially

B. Turn the adjustment stem to increase the valve's spring pressure

C. Lower the condenser fan speed to raise the head pressure

D. Replace the TXV with a larger fixed-orifice metering device

80. A technician commissions an electric duct heater and measures the temperature rise to find airflow. Which relationship is used for that calculation?

A. Airflow equals the duct area divided by the velocity pressure

B. Airflow equals the refrigerant mass flow times the latent heat

C. Airflow is found from the heater output, the rise, and a constant

D. Airflow equals the static pressure times the fan motor amperage

81. A technician commissions a system using a blended refrigerant and reads the pressures. Why must the pressure-temperature chart for that specific blend be used?

A. Each blend has its own unique pressure-temperature relationship

B. All refrigerants share one universal pressure-temperature curve

C. The chart determines the supply voltage required by the unit

D. The chart sets the flare-nut torque on the refrigerant lines

82. A technician commissions a low-temperature evaporator and checks the defrost cycle. What correctly describes a typical timed electric defrost sequence?

A. The discharge pressure rising past a limit starts and ends it

B. The condenser fan ambient sensor controls the full defrost cycle

C. The sight glass clearing of bubbles starts and stops the defrost

D. A timer or demand control initiates it; temperature or time ends it

83. A technician commissions a unit and records compressor amperage well above the nameplate RLA. Which condition fits this reading?

A. The system is undercharged and starved of refrigerant flow

B. The compressor is overloaded, possibly from high head pressure

C. The control transformer is supplying an excess secondary voltage

D. The evaporator superheat is set too high to draw any current

84. A technician commissions an air system and balances the supply branches. What is the objective of the air-balancing process?

A. To deliver the design airflow to each conditioned space or zone

B. To raise the refrigerant subcooling measured at the condenser

C. To increase the static pressure within the main trunk duct

D. To correct a voltage phase imbalance at the electrical panel

85. A technician commissions a system and verifies the high-pressure cutout operation. What should this control do when its setpoint is reached?

A. Open the expansion valve fully to relieve the high side

B. Increase the condenser fan speed to lower head pressure

C. Open the control circuit to stop the compressor and prevent damage

D. Add refrigerant automatically to balance the system pressures

86. A technician commissions a rooftop economizer and confirms the dampers modulate. What is the economizer designed to provide?

A. A higher compressor discharge pressure on demand

B. Precise weighing of the refrigerant charge into the system

C. Increased liquid subcooling during peak load periods

D. Free cooling using suitable outdoor air when conditions allow

87. A technician commissions a system and records baseline pressures and temperatures. Why is this baseline valuable beyond commissioning day?

A. It sets the refrigerant type the system was charged with

B. It provides a reference for diagnosing future performance changes

C. It eliminates the need for any future maintenance visits

D. It determines the colour code applied to the control wiring

88. A technician commissions a heat pump and tests the reversing valve in both modes. What confirms the valve is operating correctly?

A. The refrigerant flow switches and the modes change as commanded

B. The suction pressure stays identical in heating and cooling

C. The compressor stops each time the valve is energized

D. The condenser fan reverses its rotation in the heating mode

89. A technician commissioning a chilled-water coil bleeds the trapped air from the high points. Why is removing this air necessary?

A. The trapped air increases the refrigerant charge in the loop

B. The trapped air raises the chilled-water supply setpoint

C. Air pockets reduce heat transfer and impede water circulation

D. The air improves circulation and should be retained in the coil

90. A technician commissions a system and sets the anti-short-cycle timer. What does this timer protect the equipment against?

A. Excessive subcooling forming at the condenser on startup

B. Air becoming trapped at the high points of the piping

C. Low refrigerant velocity in the horizontal suction line

D. Rapid compressor restarts that can overload the motor

91. A technician commissions a control system and tests the sequence of operation step by step. Why is this stepwise check performed?

A. To calculate the refrigerant charge weight for the system

B. To confirm each component energizes correctly in the right order

C. To select the proper paint colour for the control panel

D. To set the torque on the refrigerant flare connections

92. A technician commissioning a unit finds the liquid line sight glass clear with subcooling in the normal range. What does this combination indicate?

A. The charge appears adequate with solid liquid reaching the valve

B. The system is badly undercharged and starving the evaporator

C. The compressor is operating in the reverse rotation direction

D. The condenser fan motor has failed completely during the test

93. A technician commissions an air handler and measures wet-bulb and dry-bulb supply temperatures. What air property is determined from these readings?

A. The static pressure the supply fan is currently developing

B. The refrigerant superheat present at the evaporator outlet

C. The relative humidity and moisture content of the supply air

D. The electrical power factor of the supply fan motor circuit

94. A technician commissions a system and confirms condenser airflow is unobstructed. What does restricted condenser airflow most directly cause?

A. Lower-than-normal suction pressure with suction-line frost

B. A reduced refrigerant charge requirement for the system

C. Negative subcooling measured at the condenser outlet

D. Elevated head pressure and increased compressor load

95. A technician commissions a packaged unit and confirms the condensate drain slopes correctly. Why is correct slope important at commissioning?

A. It ensures condensate flows away and does not pool in the pan

B. It increases the airflow delivered across the evaporator coil

C. It raises the refrigerant charge the system is able to hold

D. It reduces the electrical load drawn by the supply fan motor

96. A technician commissions a multi-stage system and confirms the stages activate in sequence under load. Why is verifying staged operation part of commissioning?

A. To set the flare-nut torque on each refrigerant connection

B. To confirm capacity stages energize correctly as load rises

C. To determine the paint colour for the equipment panels

D. To calculate the refrigerant subcooling at the condenser

97. A technician commissions a heat pump in heating mode and measures performance against the design data. Why is comparing measured to design values useful at commissioning?

A. It sets the colour code applied to the low-voltage wiring

B. It changes the type of refrigerant charged into the system

C. It removes the need for any defrost control on the unit

D. It verifies the system delivers its rated heating capacity

98. A technician services a system with weak cooling and measures high superheat together with low subcooling. Which diagnosis best fits these readings?

A. The system is overcharged well beyond the data-plate weight

B. The evaporator is flooded with excess liquid refrigerant

C. The system is undercharged and short on refrigerant

D. The condenser fan motor is running in the reverse direction

99. A technician finds a compressor repeatedly tripping on its thermal overload. Which condition should be investigated first as the likely cause?

A. High head pressure from a dirty condenser or restricted airflow

B. The presence of normal subcooling at the condenser outlet

C. A clean evaporator coil with full and unobstructed airflow

D. A correctly sized circuit feeding a properly charged system

100. A technician must remove the refrigerant from a system before opening it for repair. Under environmental regulations, how must the refrigerant be handled?

A. Vented slowly to atmosphere if the total charge is under a kilogram

B. Recovered into an approved cylinder rather than vented to atmosphere

C. Released outdoors where it can disperse safely into the open air

D. Discharged into the building floor drain with plenty of water

101. A technician services an air system and finds the evaporator coil heavily iced. Which cause should be checked first for this symptom?

A. The condenser airflow being far above the system's design value

B. The refrigerant charge being far above the data-plate weight

C. The thermostat being set far too high for the conditioned space

D. Low airflow from a dirty filter or a failing blower motor

102. A technician measures the resistance from a motor winding to the motor frame and reads near zero ohms. What does this reading indicate?

A. The winding is open with no electrical continuity at all

B. The winding is grounded due to failed insulation to the frame

C. The motor is operating correctly under its rated full load

D. The winding is healthy with fully intact insulation to ground

103. A technician troubleshoots a no-cool call and reads 24 volts at the contactor coil, but the contactor will not pull in. What is the most likely fault?

A. The room thermostat is open and is not calling for cooling

B. The supply breaker feeding the condensing unit is switched off

C. The contactor coil is open or the contactor mechanism has failed

D. The refrigerant charge is slightly below the target weight value

104. A technician tests a run capacitor on a single-phase fan motor that hums but will not start. What symptom does a capacitor failed open most likely cause?

A. The motor fails to start, hums, and trips on its thermal overload

B. The motor runs noticeably faster than its rated nameplate speed

C. The motor overcharges the refrigerant circuit during operation

D. The condenser excessively subcools the liquid leaving the coil

105. A technician services a system after a compressor burnout and must clean up the circuit. Which component is essential to install during the cleanup?

A. A larger condenser fan motor to increase the airflow rate

B. A second expansion valve piped in parallel with the first

C. An additional sight glass installed in the discharge line

D. A suction-line filter-drier to capture acids and contaminants

106. A technician performs an acid test on an oil sample drawn from a system. A positive acid test result most directly indicates what?

A. The refrigerant charge is correctly within the specified range

B. The oil is fresh and fully suitable for continued service

C. System contamination, often linked to overheating or a burnout

D. The condenser airflow is operating exactly at its design rate

107. A technician services a heat pump that heats poorly in cold weather while the auxiliary heat runs almost constantly. Which fault group should be checked?

A. The economizer dampers stuck closed during the summer season

B. A defrost or reversing valve problem, or a low refrigerant charge

C. The chilled-water pump cavitating at the system's high points

D. A dry condensate trap on the cooling coil's drain connection

108. A technician must locate a slow refrigerant leak on a system losing charge over weeks. Which leak-detection approach is appropriate?

A. Using an electronic detector, bubble solution, or UV dye

B. Listening only for an audible hiss near the components

C. Spraying plain water on the joints and watching for steam

D. Adding refrigerant repeatedly until the leak stops itself

109. A technician services a walk-in freezer not reaching temperature with a heavily frosted evaporator. Which system should be checked first?

A. The static pressure measured across the supply air ductwork

B. The paint condition on the outdoor condensing unit cabinet

C. The colour code of the low-voltage control circuit wiring

D. The defrost system and its defrost termination control

110. A technician finds a fixed-orifice system short-cycling on the low-pressure control. Which cause is consistent with frequent low-pressure cutouts?

A. The condenser being heavily oversized for the cooling load

B. The high-pressure control set far above the relief valve setting

C. A low charge or a restriction lowering the suction pressure

D. The supply fan delivering excessive airflow to the space

111. A technician measures the three-phase voltages at a compressor and finds a notable imbalance. Why is voltage imbalance a concern for the motor?

A. Imbalance causes excessive current and overheating of the windings

B. Imbalance automatically raises the refrigerant subcooling level

C. Imbalance lowers the refrigerant charge weight that is required

D. Voltage imbalance has no measurable effect on the motor

112. A technician services a system and suspects non-condensable gases are present. Where do these gases collect, and what symptom appears?

A. In the compressor crankcase, where they lower the oil level

B. In the condenser and high side, raising head pressure abnormally

C. In the evaporator coil, where they raise the cooling capacity

D. In the suction line, where they drive the superheat to zero

113. A technician services a hermetic compressor that hums and trips after a few seconds. With the capacitor confirmed good, what should be checked next?

A. The slope of the condensate drain line leaving the coil pan

B. The static pressure measured at the system's return grille

C. The paint colour applied to the discharge line insulation

D. The start components, the windings, and for a seized rotor

114. A technician adjusts a head-pressure control on a system running in cold ambient conditions. What is the role of this control?

A. To lower the suction pressure during the system's defrost cycle

B. To raise the evaporator superheat when the weather is mild

C. To maintain sufficient head pressure for proper TXV operation

D. To weigh refrigerant into the system during the charging process

115. A technician measures an unusually high compressor discharge temperature during service. Which condition can contribute to an elevated discharge temperature?

A. A low refrigerant charge or a high compression ratio

B. An oversized condenser providing excessive liquid subcooling

C. A flooded evaporator returning liquid to the suction line

D. A system charged correctly and running at its design point

116. A technician notices oil staining around a fitting during a service visit. What does this oil residue most likely indicate?

A. The compressor crankcase has been overfilled with oil

B. The condenser is operating below its normal subcooling

C. The evaporator superheat is set marginally above target

D. A refrigerant leak at that fitting carrying entrained oil

117. A technician services a system and finds the condenser coil heavily fouled. Why must the condenser be cleaned during maintenance?

A. A dirty coil lowers the suction pressure below the freezing point

B. A dirty coil reduces heat rejection and raises the head pressure

C. A dirty coil reduces the refrigerant charge the system needs

D. A dirty coil increases the control transformer's output voltage

118. A technician finds a defrost termination thermostat stuck closed so it never opens. What symptom results from this fault?

A. The system refuses to enter the defrost cycle at any time

B. The compressor trips immediately on the high-pressure cutout

C. The defrost runs too long, wasting energy and adding heat

D. The evaporator subcools the liquid line far beyond normal

119. A technician suspects a reversing valve is leaking internally on a heat pump. Which symptom points to an internal leak in the valve?

A. Reduced capacity with the suction line warmer than expected

B. The suction line holding a perfectly normal temperature

C. The system reaching its full rated capacity faster than normal

D. The condenser fan motor drawing no measurable current at all

120. A technician must verify a thermistor temperature sensor during a control service call. How is a thermistor typically checked?

A. By weighing the refrigerant charge against the sensor's value

B. By reading the refrigerant pressure at the sensor's location

C. By checking the paint colour coding marked on the sensor body

D. By measuring its resistance and comparing to a temperature chart

121. A technician services a system that lost its charge and must select a replacement refrigerant for a retrofit. What is the primary concern in that selection?

A. Choosing whichever refrigerant happens to be cheapest in stock

B. Matching the new cylinder's colour to the original refrigerant

C. Compatibility with the existing oil, materials, and system design

D. Selecting the refrigerant suited to the longest copper line run

122. A technician services a TXV-fed evaporator that is starving for refrigerant. After ruling out the charge, what should be checked next?

A. The colour of the insulation wrapped on the suction line

B. The TXV, the sensing bulb, and any liquid line restriction

C. The condenser fan blade pitch and its rotation direction

D. The duct static pressure measured at the supply register

123. A technician completes a maintenance visit and documents all readings and work performed. Why is a complete service record an important professional practice?

A. It establishes a history for warranty, compliance, and diagnostics

B. It changes the type of refrigerant stored within the system

C. It removes the need to recover refrigerant on future visits

D. It sets the supply air static pressure required for the building

124. A technician checks compressor current against the nameplate during service and finds it well above the rated load amps. What does this suggest?

A. The control transformer is supplying excessive secondary voltage

B. The evaporator superheat has been set too high to draw current

C. The system has been overcharged with lubricating oil only

D. An overloaded compressor, possibly from high head pressure

125. A technician performs preventive maintenance and replaces a clogged liquid line filter-drier. Why is the system recovered before the drier is removed?

A. Recovery raises the suction pressure to ease the drier's removal

B. Recovery converts the refrigerant into a non-flammable type

C. Recovery prevents refrigerant loss when the sealed line is opened

D. Recovery changes the cylinder colour to match the new drier

Practice Exam 33: Answer Key and Explanations

1. D — Ensure ventilation and monitor for oxygen displacement before working in an unventilated plant room. Refrigerant released in an enclosed space displaces oxygen and can cause asphyxiation without warning. Confirming a safe atmosphere is the primary life-safety control before any recovery work.

2. B — Section 2 of an SDS covers hazard identification and the precautionary statements. It summarizes the product's classified hazards and the precautions for safe use. Reviewing it lets the technician understand the risks before handling the solvent.

3. A — Safety glasses or goggles rated for impact protect against flying particles from grinding. The hazard is high-speed debris, so impact-rated eye protection is the correct match. Welding lenses or unrated glasses do not provide proper impact protection.

4. C — Inspect the platform, guardrails, and ground conditions before raising a scissor lift. Sound rails and stable, level ground are what prevent falls and tip-overs at height. Checking these directly addresses the lift's primary hazards.

5. D — Brief the crew directly and confirm each member understands the scope change. Verbal confirmation ensures everyone has received and grasped the new information. Relying on a single message or a relay risks dangerous gaps in understanding.

6. B — A feeler gauge with blades selected for the gap measures a small clearance like 2 mm. The thin calibrated blades slip into the gap to read the clearance directly. A tape or square cannot resolve a clearance that fine.

7. A — Bend the knees, keep the back straight, and lift with the legs. This keeps the spine neutral and uses the strong leg muscles instead of the lower back. Proper technique minimizes the risk of disc and muscle injury during the lift.

8. C — Clear the obstruction so the eyewash station is fully accessible. Emergency equipment must be reachable instantly during an exposure, so any blockage is corrected immediately. Deferring the fix leaves workers unprotected in an emergency.

9. D — Stage the likely tools and parts based on the reported fault. Preparing for the expected work reduces trips to the truck and keeps the job efficient. Sound organization saves time and supports productive service.

10. A — A WHMIS 2015 workplace label must include the product identifier, safe-handling precautions, and a reference to the SDS. These elements identify the decanted contents and direct the worker to full hazard information. The label keeps the relabelled container safe to handle.

11. C — Use properly rated meter and PPE and follow safe work limits near energized equipment. Rated equipment and approach boundaries protect against shock and arc-flash during live readings. Matching protection to the electrical hazard is the correct control.

12. B — Demonstrate the task, supervise a practice joint, then give feedback. Guided practice with feedback builds the apprentice's skill safely and confirms understanding. This is the core of effective hands-on mentoring.

13. D — Collect used refrigerant oil in a labelled container for approved waste disposal. The oil is a regulated waste that must not enter drains or general garbage. Proper collection and disposal protect the environment and meet regulations.

14. A — Shield the wall with a non-combustible barrier and stage an extinguisher before brazing near wood framing. The shield blocks flame and heat from the combustible wall, and the extinguisher allows immediate response. Together they manage the fire risk of open-flame work indoors.

15. C — Clean and abrade the mating surfaces to bright bare metal just before brazing. Oxide-free surfaces let the filler metal wet and bond by capillary action. Clean preparation is essential for a sound brazed joint.

16. B — Soft copper flares without cracking, forming a sound seat. Annealed copper is ductile enough to spread into a smooth flare that seals against the fitting. Hard copper would split during flaring and leak under pressure.

17. D — A tubing cutter tightened gradually around the tube gives the cleanest, squarest cut. The wheel scores and severs the copper without the debris of a saw or torch. A clean square cut is essential for proper flares, swages, and brazed joints.

18. A — Hanger spacing and material must be matched to the pipe size and weight. Correct spacing prevents sag that traps oil and stresses joints, and proper material avoids galvanic problems. Appropriate support carries the load safely.

19. C — A silver-bearing brazing alloy with the proper flux joins copper to a dissimilar metal like brass. Silver alloys bond dissimilar metals well, and flux is needed because phosphorus rods are unsuitable on brass. The combination produces a sound, leak-tight joint.

20. B — Mark each recovered cylinder with refrigerant type, status, and a hazard label. Clear labelling prevents dangerous mixing and meets transport and regulatory rules. It also identifies the contents for safe handling and reclaim.

21. D — Failing to ream leaves an internal burr that restricts flow and creates turbulence. The raised edge reduces the effective bore and disturbs refrigerant and oil flow. Reaming restores full flow area and protects downstream components.

22. A — Use a grommet or protective sleeve where a copper line passes through a wood stud. Vibration against the bored edge would otherwise wear through the tube and cause a leak. Protecting the contact point preserves the line's integrity.

23. C — Purging with dry nitrogen clears moisture and debris from inside the tubing. Removing these contaminants before connection protects the metering device and prevents acid formation. A clean, dry interior is essential for reliable operation.

24. B — Refrigerant records are required for regulatory leak-tracking and an accurate service history. Logging quantities added reveals chronic leaks and satisfies environmental reporting rules. Documentation is both a legal duty and a diagnostic aid.

25. A — A vapour barrier with adequate R-value stops condensation on a suction line in a hot attic. The barrier blocks moisture migration to the cold surface and the R-value limits heat gain and sweating. This protects efficiency and prevents water damage.

26. C — A spring or lever-type tube bender sized to the tube bends soft copper without flattening it. The bender supports the wall through the radius so the tube does not kink. Maintaining full bore keeps the line free of restriction.

27. A — Verify joints with a nitrogen pressure test followed by a leak-detection check. Holding test pressure and checking for loss confirms integrity without wasting refrigerant. This is the correct pre-charge verification after a repair.

28. D — Store oxygen and acetylene cylinders upright, secured, with caps on and gases separated. Upright securing prevents falls, caps protect the valves, and separation reduces fire risk between the fuel and the oxidizer. This is the correct compressed-gas storage practice.

29. B — Proper cleaning allows the solder to wet the copper and flow by capillary action. A bright, oxide-free surface lets the molten solder draw into and fill the joint. Clean surfaces are essential for a leak-free soldered connection.

30. A — Check delivered materials against the bill of materials or take-off list for the job. This confirms the correct items and quantities arrived before work proceeds. Catching shortages early prevents delays during the install.

31. C — Set up adequate temporary task lighting before proceeding in a poorly lit room. Good lighting prevents errors and injury and allows proper inspection of the work. Correcting the hazard first is the appropriate response.

32. D — Reinstall panels, clean the area, and report the work done when leaving an occupied site. A safe, clean handover with a clear summary reflects professional conduct. Leaving panels off or departing silently is unsafe and unprofessional.

33. B — Adequate suction-riser velocity carries oil up the riser to the compressor. Too low a velocity lets oil log in the vertical run and starve the compressor of lubrication. Sizing maintains velocity high enough for oil return against acceptable pressure drop.

34. A — Solar heat gain through the large glazing is the dominant load in a sun-exposed glass lobby. Direct solar radiation through extensive glass far exceeds the modest lighting or partition gains. The cooling design must be sized to handle this solar load.

35. C — A thermostatic expansion valve adjusts flow to maintain superheat across a wide load range. It modulates the orifice in response to the sensing bulb, unlike fixed devices set for one condition. This keeps the coil fully active without flooding the compressor.

36. D — Sizing ducts to keep air velocity within recommended limits keeps duct-generated noise low. Excessive velocity produces air noise and turbulence at fittings and registers. Reasonable velocity balances quiet operation with efficient air delivery.

37. B — Each fitting and length of pipe adds pressure drop that cuts capacity. The equivalent-length penalty accumulates and reduces system performance. Minimizing runs and fittings keeps pressure drop within design limits.

38. A — Condensing unit siting must allow clearance for airflow so hot discharge air is not recirculated. Recirculating discharge air raises condensing temperature and reduces capacity. Proper clearance protects performance.

39. D — The MCA value tells the planner the smallest conductor ampacity that can safely feed the unit. It sets the minimum wire size needed to supply the equipment without overheating. Sizing conductors to the MCA keeps the installation safe and code-compliant.

40. B — A properly sized trap maintains a seal so the negative plenum pressure does not block condensate flow. Without the trap, the fan's suction holds water in the pan or pulls air through the drain. The trap allows condensate to drain freely.

41. C — Omitting an adequate vapour barrier lets moisture reach the cold surface, causing condensation and dripping. Water vapour migrates to the chilled line and condenses, soaking the insulation and dripping. The vapour barrier is essential on cold lines in humid spaces.

42. A — The sequence of operation defines the order and conditions under which components are energized. It describes how the control system responds to demands and safeties. This logic guides installation, commissioning, and troubleshooting.

43. D — Static head from a tall liquid lift can cause flash gas if subcooling is low. Lifting liquid drops its pressure, and below saturation it boils into vapour at the metering device. Adequate subcooling must offset the lift to keep solid liquid feeding the valve.

44. B — Excess voltage drop on a long control run can stop relays and contactors from pulling in. Resistance over distance lowers the voltage at the load below the level needed to operate. Correct wire size maintains reliable control signalling.

45. A — Coil TD governs how much moisture is removed, so it most affects room humidity. A higher TD dehumidifies more, while a lower TD maintains higher humidity for sensitive product. Selecting the right TD protects the stored product's condition.

46. C — A seismic installation plan must provide restraint and bracing to resist movement during an event. Unsecured equipment and piping can shift or rupture under seismic forces. Bracing keeps the system intact and safe.

47. D — Refrigerant selection is governed by operating range, efficiency, oil compatibility, and regulations. The refrigerant must suit the application's conditions, circulate the oil, and comply with environmental rules. These combined factors govern a sound, legal choice.

48. B — Automatic air vents belong at the system high points where trapped air collects. Air rises and accumulates at the peaks, blocking flow and reducing heat transfer if not released. Venting at high points keeps the loop circulating fully.

49. C — A rooftop curb supports the unit, seals the roof, and routes the ducts. It elevates and anchors the equipment while keeping the roof watertight at the penetration. The curb is integral to a sound rooftop installation.

50. D — A zeotropic blend is handled using the correct dew and bubble points for control and charging. Glide means the blend evaporates and condenses across a temperature range, so superheat and subcooling reference different saturation points. Using the proper points ensures accurate control.

51. B — A steady test pressure held with no measurable loss confirms the joints are sound. No pressure drop over time means there is no measurable leak in the assembled circuit. This nitrogen pressure test must pass before evacuation and charging.

52. D — A deep vacuum boils off moisture and removes non-condensables from the system. Under deep vacuum, water vaporizes and is drawn out along with trapped air. Proper evacuation prevents acid formation and ice at the metering device.

53. A — Mount the TXV sensing bulb on a clean horizontal suction line with firm thermal contact. Good contact at the evaporator outlet lets the bulb sense true outlet temperature for accurate superheat control. Poor placement causes hunting or improper feeding.

54. C — Flowing dry nitrogen during brazing prevents copper oxide scale from forming inside the tubing. Without it, heated copper forms oxide flakes that circulate and clog the TXV and drier. Purging keeps the internal surfaces clean.

55. B — Correct orientation lets the filter-drier filter and dry the flowing refrigerant. Installed with the arrow matching flow, it traps moisture and debris as designed. Reversed, it cannot capture contaminants and may release them.

56. D — A zeotropic blend must be drawn as liquid because drawing vapour causes fractionation. The components boil off at different rates, so removing vapour shifts the blend composition. Charging liquid preserves the intended refrigerant mixture.

57. A — Reverse rotation produces no pumping and can damage the scroll, so rotation must be checked. A scroll compressor run backward quickly overheats and fails. Confirming phase sequence at startup protects the compressor.

58. C — A suction-line accumulator protects the compressor against liquid refrigerant slugging back. It holds liquid and meters it back as vapour so only gas reaches the compressor. This prevents the mechanical damage that liquid slugs cause.

59. D — A flexible connector isolates fan vibration from being transmitted into the duct. Breaking the rigid path stops noise and fatigue from reaching the ductwork. This improves comfort and protects connections.

60. B — A correctly formed flare torqued to the manufacturer's value seals reliably under pressure. The flare must seat fully against the fitting at the specified torque to hold. Cracks, wrong angles, or over-torque all compromise the seal.

61. A — A P-trap on a draw-through air handler maintains a seal against the negative pan pressure. Without it, the fan's suction holds condensate in the pan or pulls air through the drain. The trap allows condensate to drain freely.

62. C — Service access ports allow gauge connection for charging and diagnostics. They give safe access to system pressures without opening the sealed circuit. Ports are essential for commissioning and future service.

63. D — A fire-rated wall penetration requires an approved firestop system rated to match the assembly. The firestop reseals the opening so fire and smoke cannot spread through it. Code requires maintaining the wall's rating at the penetration.

64. B — A low-ambient head-pressure control maintains adequate head pressure for proper TXV feeding. Low condensing pressure in cold weather starves the valve and cuts capacity. The control keeps the high side pressure high enough to feed liquid.

65. A — Inadequate support causes sagging that traps oil and stresses the brazed joints. Oil pooling in low spots starves the compressor and the strain can crack joints. Proper hanger spacing prevents both problems.

66. C — Place spring or pad isolators between the compressor and the steel frame for vibration isolation. The isolators absorb operating vibration so it does not transmit into the structure. This reduces noise and structural fatigue.

67. D — A steady stream of bubbles in the sight glass during operation indicates a low charge or restriction producing flash gas. Vapour in the liquid line shows the refrigerant is not fully subcooled liquid. It signals a charge or flow problem to investigate.

68. B — A reversing valve reverses refrigerant flow to switch the system between heating and cooling. Its piping determines which coil acts as condenser or evaporator in each mode. Correct installation enables proper heat pump operation.

69. A — On a critically charged system, the manufacturer specifies an exact charge that weighing achieves. Weighing in the stated amount removes guesswork and ensures correct performance. Accurate charge protects capacity and the compressor.

70. C — A condensate pump installation must include a float switch that stops cooling if the pump fails to clear water. This prevents overflow and water damage when the pump cannot keep up. The interlock is a required safety on gravity-drainless setups.

71. D — Galvanic corrosion can occur at the junction of dissimilar metals, so it needs special attention. An electrolytic reaction between unlike metals attacks the joint over time. Proper material selection or isolation prevents premature failure.

72. B — The control transformer in the furnace cabinet supplies the 24-volt control power. It steps the line voltage down to operate the thermostat, relays, and contactor coil. It is the source of the low-voltage control supply.

73. A — Each thermostat stage's wiring is verified to confirm it energizes the correct equipment in order. Correct staging ensures capacity steps activate as the load rises. Verification catches miswiring before the system is left running.

74. C — A P-trap at the base of a suction riser collects oil so velocity can carry it up the riser. The trapped oil is lifted by refrigerant velocity, preventing oil logging. This protects compressor lubrication on vertical rises.

75. D — Poor thermal contact gives inaccurate readings and faulty control. An air gap lets the sensor read ambient instead of pipe temperature, so the control responds to false data. Firm contact ensures the control acts on true conditions.

76. C — The curb's weather seal prevents water leakage into the building below. It keeps the roof watertight where the unit and ducts penetrate the assembly. A proper seal is essential to a sound rooftop installation.

77. A — Low superheat with a cold, sweating suction line indicates the metering device is overfeeding and the coil may be flooding. Excess liquid leaves the evaporator without fully boiling, chilling the suction line. Flooding risks liquid return and compressor damage.

78. D — Very low subcooling on a hot day suggests the system is undercharged or has insufficient liquid feed. Too little refrigerant leaves little liquid backed up in the condenser to subcool. The reading points to a charge or feed deficiency.

79. B — Turn the adjustment stem to increase the valve's spring pressure to raise operating superheat. More spring force requires more superheat before the TXV opens. This tunes the coil's superheat to the target value.

80. C — Airflow is found from the heater output, the temperature rise, and a constant (the sensible heat equation). With a known heater output and measured rise, the equation is rearranged to solve for airflow. This is a standard field method for verifying air volume.

81. A — Each blend has its own unique pressure-temperature relationship, so its specific chart is required. Using the wrong chart misreads saturation and leads to charging errors, and blends also have glide. The correct chart is essential for accurate readings.

82. D — A typical timed electric defrost is initiated by a timer or demand control and ended by temperature or time. Initiation clears coil frost on schedule, and termination ends it once the coil clears. Proper defrost control maintains low-temperature capacity.

83. B — Compressor amperage well above nameplate RLA fits an overloaded compressor, possibly from high head pressure. Excess load draws more current and risks overheating and tripping. The reading flags a high-side or mechanical problem.

84. A — Air balancing delivers the design airflow to each conditioned space or zone. Adjusting dampers and registers distributes air for proper comfort and capacity. Balanced airflow ensures the system performs as engineered.

85. C — A high-pressure cutout opens the control circuit to stop the compressor and prevent damage. Cutting power when pressure reaches the setpoint protects against overpressure and rupture. It is a critical safety device.

86. D — An economizer provides free cooling using suitable outdoor air when conditions allow. Modulating dampers bring in cool outside air to reduce mechanical cooling. Confirming damper operation verifies the energy-saving function works.

87. B — A documented baseline provides a reference for diagnosing future performance changes. Comparing later readings to the recorded baseline reveals developing faults. Documentation turns commissioning into an ongoing diagnostic tool.

88. A — Correct reversing valve operation is confirmed when the refrigerant flow switches and the modes change as commanded. Both heating and cooling must respond to the valve's energizing. Proper switching verifies the heat pump's core function.

89. C — Air pockets reduce heat transfer and impede water circulation, so trapped air must be bled. The pockets insulate the coil surface and block flow in a hydronic loop. Venting restores full coil capacity.

90. D — An anti-short-cycle timer protects against rapid compressor restarts that can overload the motor. It enforces an off-period so pressures equalize and the motor cools before restart. This prevents starting-current damage and tripping.

91. B — The sequence of operation is tested step by step to confirm each component energizes correctly in the right order. Verifying the logic ensures safeties and stages function as designed. Step-testing catches wiring or control faults at commissioning.

92. A — A clear sight glass with normal subcooling indicates the charge appears adequate with solid liquid reaching the valve. Subcooled liquid and no bubbles show the high side is supplying full liquid. It is a good sign of proper charge.

93. C — Wet-bulb and dry-bulb supply temperatures determine the relative humidity and moisture content of the air. The two readings together fix the air's psychrometric state. This is fundamental to evaluating air conditioning performance.

94. D — Restricted condenser airflow most directly causes elevated head pressure and increased compressor load. Poor heat rejection forces a higher condensing temperature and pressure. This stresses the compressor and lowers efficiency.

95. A — Correct drain slope ensures condensate flows away and does not pool in the pan. Standing water breeds microbial growth and can overflow into the building. Proper slope provides continuous drainage.

96. B — Verifying staged operation confirms capacity stages energize correctly as the load rises. Each stage must activate in turn so the system matches output to demand. Confirming this at commissioning ensures proper staged control.

97. D — Comparing measured to design values verifies the system delivers its rated heating capacity. Performance against the design data confirms the heat pump is operating as intended. This validation is a key purpose of commissioning.

98. C — High superheat with low subcooling and weak cooling points to an undercharged system. Too little refrigerant starves the evaporator and leaves little subcooling at the condenser. Restoring the charge level corrects the capacity loss.

99. A — A compressor tripping on overload should first be checked for high head pressure from a dirty condenser or restricted airflow. Elevated head pressure drives up current and trips the overload. Restoring heat rejection often clears the fault.

100. B — Refrigerant must be recovered into an approved cylinder rather than vented to atmosphere. Environmental regulations prohibit venting to prevent atmospheric release. Recovery is the only compliant way to empty a system.

101. D — An iced-up evaporator is most often caused by low airflow from a dirty filter or failing blower. Reduced airflow drops the coil below freezing and frost accumulates. Restoring airflow is the first corrective step.

102. B — A winding-to-frame reading near zero ohms indicates the winding is grounded due to failed insulation. The short to the frame means the insulation has broken down. Such a motor is faulty and unsafe to operate.

103. C — With 24 volts at the coil but no pull-in, the contactor coil is open or the mechanism has failed. Voltage is reaching the coil, so the fault lies in the coil or contactor itself. Replacing the contactor restores operation.

104. A — A run capacitor failed open will most likely cause the motor to fail to start, hum, and trip on overload. Without the capacitor's phase shift, the motor cannot develop starting torque. The locked rotor draws high current until the overload opens.

105. D — After a burnout, a suction-line filter-drier is essential to capture acids and contaminants. It cleans the circulating refrigerant and oil to protect the replacement compressor. This cleanup step prevents a repeat failure.

106. C — A positive acid test indicates system contamination, often linked to overheating or a burnout. Acid forms as oil and refrigerant break down under high heat. Detecting it directs the technician to clean up the system.

107. B — A heat pump heating poorly with constant auxiliary heat points to a defrost or reversing valve problem, or low charge. Any of these reduces heat-pump output and forces the backup heat to run. These are the primary faults to check.

108. A — A slow leak is located using an electronic detector, bubble solution, or UV dye. These methods reliably find refrigerant escaping from joints and components. Adding refrigerant or guessing wastes refrigerant and finds nothing.

109. D — A frosted freezer evaporator not reaching temperature calls for checking the defrost system and its termination control first. Failed defrost lets frost block the coil and kill capacity. The defrost circuit is the logical starting point.

110. C — Frequent low-pressure cutouts on a fixed-orifice system are consistent with a low charge or a restriction lowering suction pressure. Too little refrigerant reaching the coil drops suction below the control setpoint. Checking charge and restrictions addresses the cause.

111. A — Voltage imbalance causes excessive current and overheating of the motor windings. A small voltage imbalance produces a much larger current imbalance in the windings. This overheats the motor and shortens its life.

112. B — Non-condensable gases collect in the condenser and high side, raising head pressure abnormally. Because they do not condense, they occupy condenser volume and add partial pressure. The elevated head pressure signals their presence and cuts efficiency.

113. D — A humming compressor that trips after a few seconds, with a good capacitor, calls for checking the start components, windings, and for a seized rotor. A mechanical seizure or winding fault also prevents starting. These checks isolate the cause.

114. C — A head-pressure control maintains sufficient head pressure for proper TXV operation in cold weather. Adequate high-side pressure ensures the valve feeds enough liquid. Without it, capacity falls in low-ambient conditions.

115. A — A low refrigerant charge or a high compression ratio can raise the discharge temperature. Less refrigerant means less cooling of the compressor and hotter discharge gas. Excessive discharge temperature breaks down oil and damages the compressor.

116. D — Oil staining around a fitting most likely indicates a refrigerant leak carrying entrained oil. Escaping refrigerant brings oil that collects at the leak point. The stain is a visual marker for locating the leak.

117. B — A dirty condenser reduces heat rejection and raises head pressure. The insulating layer of dirt impairs heat transfer, forcing a higher condensing pressure. Cleaning restores capacity and efficiency.

118. C — A defrost termination thermostat stuck closed lets the defrost run too long, wasting energy and adding heat. The cycle should end when the coil clears, but a stuck-closed control keeps heating. This wastes energy and can raise box temperature.

119. A — An internally leaking reversing valve shows reduced capacity with the suction line warmer than expected. Hot discharge gas bypasses internally and warms the suction side. The capacity loss and warm suction line are the diagnostic signs.

120. D — A thermistor is checked by measuring its resistance and comparing it to a temperature chart. Its resistance varies predictably with temperature, so the reading verifies calibration. A value off the chart indicates a faulty sensor.

121. C — Retrofit refrigerant selection must ensure compatibility with the existing oil, materials, and system design. The wrong refrigerant can attack seals or fail to circulate the oil. Compatibility ensures a safe, reliable retrofit.

122. B — On a starving TXV-fed evaporator, after ruling out charge, check the TXV, the sensing bulb, and any liquid line restriction. A faulty valve, lost bulb charge, or plugged drier all underfeed the coil. These are the logical next suspects.

123. A — A complete service record establishes a history for warranty, compliance, and diagnostics. Documented readings and actions support warranty claims, satisfy regulations, and speed later troubleshooting. Good records are a core professional practice.

124. D — Compressor current well above rated load amps suggests an overloaded compressor, possibly from high head pressure. Excess mechanical or pressure load draws more current and risks tripping. The reading flags a high-side or mechanical fault to investigate.

125. C — The system is recovered before the drier is removed to prevent refrigerant loss when the sealed line is opened. Opening a charged line would vent refrigerant illegally and lose the charge. Recovery makes the repair clean and compliant.