PRACTICE EXAM 15: ASE A7 SIMULATION (50 QUESTIONS)

1. A vehicle's A/C system has the following readings at 88°F ambient: low side 28 psi, high side 200 psi, vent temperature 44°F, subcooling 14°F, superheat 10°F. The customer wants the system "topped off" with an extra 2 ounces of refrigerant because "it can't hurt." What should the technician do?

A. Add the 2 ounces as requested since a small addition above specification improves cooling on hot days

B. Add 1 ounce as a compromise that satisfies the customer without significantly risking system performance

C. Decline the request and explain that every parameter confirms a full, proper charge — adding refrigerant would create an overcharge

D. Recover the entire charge and recharge with 2 additional ounces above the label specification for maximum cooling

2. A vehicle has an A/C system where the compressor shaft seal has been leaking slowly for approximately four months. The technician recovers the remaining refrigerant and finds the oil is clear amber with no discoloration. The recovered charge is 4 ounces below specification. What does the clear oil condition tell the technician?

A. The compressor has not sustained internal heat damage despite the charge loss, because the leak was gradual enough to maintain adequate lubrication

B. The oil was recently replaced during a previous service and has not yet circulated long enough to show wear

C. The system was overcharged initially and the 4-ounce loss simply brought it back to the correct amount

D. The clear oil indicates the wrong oil type was installed, since correct PAG oil always turns dark within months

3. On a vehicle with electronic HVAC controls, the scan tool shows the following live data: A/C button pressed (YES), ambient temp 82°F, engine running, coolant temp 195°F, A/C pressure 88 psi,

evaporator temp 65°F. The module is commanding the compressor relay ON, but the compressor does not engage. The clutch relay does not click. What is the MOST likely cause?

A. The evaporator temperature of 65°F exceeds the module's maximum engagement threshold for compressor activation

B. The A/C pressure reading of 88 psi is below the module's minimum pressure requirement for safe engagement

C. The module is not providing a valid ground or the relay coil circuit has a fault preventing the relay from energizing

D. The relay coil is receiving the command but the relay contacts have welded open and cannot close

4. A vehicle's heater produces adequate heat from the floor vents when the mode is set to FLOOR. When the mode is changed to DEFROST, hot air comes from the defrost vents but significantly less air comes from the floor vents than the customer expects. What should the technician explain?

A. The mode door actuator has a calibration error that is directing too much air to the defrost outlet in this mode

B. In defrost mode, most airflow is redirected to the windshield — reduced floor output is normal design behavior

C. The defrost ductwork has a restriction that is creating back-pressure and robbing air from the floor outlets

D. A stuck mode door is allowing air to escape through the defrost and floor simultaneously instead of splitting correctly

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5. A technician is testing an NTC evaporator temperature sensor. With the sensor disconnected, the technician measures the resistance between the sensor terminals with a DMM. At 75°F shop temperature, the reading is 3,200 ohms. The manufacturer's resistance-temperature chart shows 3,200 ohms corresponds to approximately 75°F. What can the technician conclude?

A. The sensor is shorted internally because 3,200 ohms is too low for an NTC sensor at room temperature

B. The sensor resistance matches the expected value for the current temperature, confirming the sensor element is functional

C. The reading is inconclusive because NTC sensors cannot be tested with an ohmmeter at room temperature

D. The sensor has failed open because a functioning NTC sensor should read less than 500 ohms at 75°F

6. A vehicle's A/C system has been operating with a confirmed low charge for several months. The technician repairs the leak and recharges the system. The vent temperature reaches 42°F, but the compressor is noticeably noisier than before the repair. What is the MOST probable cause of the new noise?

A. The compressor sustained internal wear from extended operation with reduced oil circulation due to the low charge

B. The new refrigerant charge is creating higher discharge pressures than the compressor experienced while undercharged

C. Air was introduced during the recharge process and the non-condensable gases create turbulence noise inside the compressor

D. The leak repair involved tightening a fitting that shifted the compressor mounting bracket and introduced vibration

7. Technician A says that a variable displacement compressor adjusts its output by changing the swashplate angle inside the compressor body. Technician B says that some variable displacement compressors are controlled electronically through a solenoid-operated displacement control valve commanded by the HVAC module. Who is correct?

A. Technician A only, because all variable displacement compressors use purely mechanical internal pressure regulation

B. Technician B only, because variable displacement is achieved by varying compressor shaft speed not swashplate angle

C. Neither Technician A nor Technician B, because variable displacement compressors use a variable-speed electric motor

D. Both Technician A and Technician B are correct about the swashplate mechanism and electronic control methods

8. On a vehicle with ATC, the scan tool shows the following: set temperature 70°F, in-car sensor 70°F, ambient 80°F, evaporator temp 36°F, blend door 15%, compressor ON. The customer complains the air feels humid even though the temperature is correct. What is the MOST likely cause?

A. The evaporator is running too cold and producing excess moisture that is being blown into the cabin by the fan

B. The compressor clutch coil is weak and slipping intermittently, reducing dehumidification during brief disengagements

C. The recirculation door is stuck in the fresh air position, continuously introducing humid outside air into the system

D. The blend door at 15% is mixing too much warm air, which raises the air temperature above the dew point

9. A vehicle's cooling system uses a degas bottle (pressurized reservoir) with the pressure cap mounted on top. The customer reports the coolant level drops slowly over several weeks but no external leaks are visible. The cap tests correctly at 16 psi. The combustion gas test is negative. What should the technician investigate?

A. The degas bottle itself for hairline cracks in the plastic that allow pressurized coolant to seep and evaporate

B. The head gasket for a small internal leak that does not produce detectable combustion gases in the coolant

C. The water pump weep hole for intermittent dripping that only occurs during operation and evaporates after shutdown

D. The heater core for an internal leak that is evaporating coolant inside the HVAC housing before visible accumulation

10. A vehicle's scan tool HVAC data shows the blend door actuator commanded to 60% and the actual feedback reads 60%. The vent temperature is correct for the set temperature. However, 15 minutes later — without any setting changes — the scan tool shows the blend door commanded to 55% and actual at 55%. The vent temperature is now slightly cooler. What does this gradual position change indicate?

A. A failing blend door actuator motor that is slowly losing its position hold against internal spring tension

B. Normal ATC closed-loop operation where the module adjusts the blend door as cabin conditions gradually change

C. An intermittent position feedback fault that causes the module to periodically recalibrate the actuator position

D. A drifting in-car temperature sensor that is slowly reading warmer and causing the module to command more cooling

11. A vehicle's A/C system performance varies dramatically between the morning commute and the afternoon return drive on the same day. Mornings produce 42°F vent temperatures at 75°F ambient. Afternoons produce 52°F at 98°F ambient. The system was recently charged to specification. Is this a system fault?

A. Yes — a properly functioning system should maintain the same vent temperature regardless of ambient conditions

B. Yes — the 10°F difference indicates a developing restriction that becomes worse as temperatures increase

C. No — but the system should be checked because a properly functioning A/C should compensate for the change

D. No — higher ambient temperatures naturally reduce cooling capacity, and this temperature variation is expected

12. A vehicle has an orifice tube system. The technician removes the orifice tube and finds the inlet screen completely blocked by fine metallic particles with a silver color. No brown sludge or desiccant material is present. What does this debris indicate?

A. Normal wear debris from the compressor's internal aluminum components accumulated over the system's service life

B. A recent or developing compressor failure that is releasing internal metallic wear particles into the refrigerant circuit

C. Corrosion from the evaporator's aluminum tubes caused by moisture contamination inside the refrigerant system

D. Debris from a failing condenser that is shedding internal tube material into the refrigerant flow stream

13. A vehicle's scan tool shows the A/C high-side pressure reading 0 psi with the engine off. The ambient temperature is 82°F. The technician connects a manifold gauge to the high-side port and reads 0 psi as well. What has occurred?

A. Both instruments are malfunctioning simultaneously and should be verified against a third pressure reference

B. The high-side Schrader valve has seized closed and is preventing any pressure from reaching the manifold gauge

C. The system has lost its entire refrigerant charge — there is no refrigerant remaining in the system

D. The compressor's internal check valve has closed and is isolating the high side from the rest of the system

14. A vehicle's engine overheats only during extended idling in heavy traffic with the A/C turned on. The temperature gauge reaches 230°F before the cooling fans bring it back to 210°F. With the A/C off in the same traffic conditions, the engine maintains 200°F without issue. All cooling fans are operating. What is the MOST likely cause?

A. The additional heat load from the A/C condenser is overwhelming the cooling system's capacity at idle with limited airflow

B. The A/C compressor is creating excessive engine load at idle that generates more combustion heat than the cooling system can reject

C. The condenser fan is running in reverse due to incorrect wiring, blowing hot condenser air backward into the radiator

D. The A/C system is severely overcharged, creating abnormally high condenser temperatures that overwhelm the radiator

15. On a vehicle with electronic HVAC controls, the technician finds that the recirculation door actuator moves to the correct position when tested with the scan tool's bidirectional function. However, pressing the recirculation button on the control panel produces no response. All other panel buttons (temp, fan, mode, A/C) work normally. What is the MOST likely cause?

A. A failed recirculation door actuator motor that only responds to the higher test voltage from the scan tool

B. A CAN bus communication fault that selectively drops recirculation commands while passing other button data

C. A failed HVAC control module that correctly processes scan tool commands but ignores the recirculation input

D. A faulty recirculation button or its dedicated circuit on the HVAC control panel that is not sending its signal

16. A vehicle's A/C condenser has been replaced after stone damage. The new condenser is a parallel flow type with an integrated receiver-drier section. After installation, evacuation, and charging, the system cools well. However, the technician notices that the liquid line temperature between the condenser outlet and the TXV is 5°F warmer than the condenser outlet measured at the sub-cool section exit. What could cause this temperature increase along the liquid line?

A. Normal heat absorption from the engine compartment as the liquid line runs near hot engine components

B. A partial restriction in the liquid line that is causing a secondary pressure drop and temperature change

C. The liquid line absorbing heat from the nearby exhaust manifold indicates the line must be rerouted or insulated

D. An incorrect condenser installation where the sub-cool section is positioned on the wrong end of the housing

17. Technician A says that when measuring superheat, the technician subtracts the P-T chart saturation temperature at the measured low-side pressure from the actual suction line temperature at the evaporator outlet. Technician B says that superheat can only be measured using a dedicated superheat gauge and cannot be calculated manually from pressure and temperature readings. Who is correct?

A. Technician A only, because superheat is calculated by subtracting the saturation temperature from the actual line temperature

B. Both Technician A and Technician B, because both manual calculation and dedicated gauges are valid methods

C. Technician B only, because manual calculation introduces too many variables that make the reading unreliable

D. Neither Technician A nor Technician B, because superheat is measured only at the compressor discharge port

18. On a vehicle with vacuum-operated mode doors, the technician replaces a split vacuum hose to the floor mode actuator. After the repair, the floor mode works correctly. However, the customer returns one week later reporting that the panel vent mode now occasionally drops out and reverts to defrost for a few seconds before returning to panel mode. What is the MOST likely cause?

A. The new vacuum hose was routed too close to the exhaust manifold and periodically softens and collapses

B. The technician inadvertently damaged an adjacent vacuum hose during the repair, creating a slow leak in the panel circuit

C. The vacuum check valve is failing intermittently and allowing stored vacuum to bleed back during high engine load

D. The replaced hose is the wrong diameter and is restricting vacuum flow to the floor actuator, affecting overall supply

19. A vehicle's engine reaches operating temperature of 200°F. The heater supply hose at the firewall measures 198°F and the return hose measures 190°F. The maximum floor vent temperature is 128°F. The customer complains the heater is not producing enough warmth. Both hose temperatures are verified hot. What should the technician conclude?

A. The heater core is performing below expectations — a healthy core should produce floor vent temperatures above 130°F

B. The blend door is not reaching the full-hot position, which is limiting the maximum air temperature from the heater

C. A floor vent temperature of 128°F is within the expected operating range and the system is performing normally

D. A floor vent temperature of 128°F with a small differential between supply and return hoses indicates normal heater performance

20. A vehicle's A/C compressor clutch engages and the system cools normally. However, the scan tool shows DTC P0533 — A/C Refrigerant Pressure Sensor Circuit High. The sensor live data shows 320 psi

while the manifold gauge reads 210 psi at 90°F ambient. The A/C system operates normally based on gauge readings. What should the technician do?

A. Ignore the DTC since the system cools normally and the manifold gauge confirms correct operating pressures

B. Replace the compressor since the high internal pressure reading indicates an internal bypass valve is stuck

C. Replace the A/C pressure sensor or repair its circuit since the sensor is sending a falsely elevated reading to the module

D. Replace the manifold gauge since the electronic sensor is typically more accurate than a mechanical gauge

21. A vehicle's cooling system was drained and refilled with fresh coolant during a water pump replacement. The customer returns two days later reporting that the heater blows cold on the passenger side but hot on the driver side. The vehicle has dual-zone climate control with both zones set to 78°F. The engine reaches full operating temperature. What is the MOST likely cause?

A. The replacement water pump has a different impeller design that creates asymmetric coolant flow to the heater core

B. The passenger-side blend door actuator lost calibration during the battery disconnect and needs to be relearned

C. An air pocket trapped in the passenger-side section of the heater core from the coolant refill procedure

D. The new coolant type is incompatible with the heater core material and is creating a blockage on one side

22. A vehicle with ATC has all HVAC functions working correctly. The system maintains temperature accurately. However, the customer complains of a continuous faint whistling noise from the right-side dashboard vent that is most noticeable at moderate blower speeds. The noise disappears at both the lowest and highest blower settings. What is the MOST likely cause?

A. A partially restricted evaporator passage on the right side that creates turbulence noise at specific airflow velocities

B. The cabin air filter is slightly misaligned and vibrates at the resonant frequency produced by moderate airflow speeds

C. A vent register flap or duct connection at the right-side outlet that vibrates at a specific airflow velocity range

D. The blend door has a crack that whistles as air passes through it at the moderate position during medium speeds

23. A vehicle's A/C system has been diagnosed with a slow leak at the evaporator. The estimated labor for evaporator replacement is 10 hours. The customer asks if simply adding refrigerant annually is a viable alternative to the expensive repair. What should the technician advise?

A. Annual top-offs are the manufacturer-recommended approach for slow evaporator leaks under 4 ounces per year

B. Annual recharging is possible but introduces moisture and air each time, gradually degrading system components

C. Simply adding a can of retail refrigerant each year is a permanent repair equivalent to replacing the evaporator

D. Annual top-offs are acceptable as long as the technician uses a refrigerant with built-in sealant additive each time

24. A vehicle's A/C system has the following gauge readings at 78°F ambient: low side 15 psi, high side 285 psi. The vent temperature is 55°F. What gauge pattern is the MOST likely cause of these readings?

A. A severely overcharged system where excess refrigerant is flooding the condenser and creating back-pressure

B. A completely blocked condenser that is trapping all refrigerant on the high side and starving the evaporator

C. A worn compressor that cannot develop adequate pressure differential between the high and low sides

D. A restricted liquid line or metering device that is creating excessive pressure differential across the restriction

25. On a vehicle with electronic HVAC controls, the scan tool shows the ambient temperature sensor reading −40°F on a summer day when the actual temperature is 85°F. The A/C compressor does not engage. What electrical condition MOST commonly produces a −40°F reading on an NTC sensor?

A. An open circuit in the sensor wiring or a failed sensor element that the module reads as maximum resistance

B. A short to ground on the sensor signal wire that pulls the voltage to zero and produces a minimum temperature reading

C. A short to battery voltage on the signal wire that drives the reading to the maximum positive temperature value

D. A corroded connector that adds resistance to the circuit and produces a reading slightly below actual temperature

26. A vehicle has an A/C system that cools well from all vents when the blower is on LOW or MEDIUM. However, when the blower is set to HIGH, the vent temperature from all outlets rises by approximately 8°F–10°F. Gauge pressures remain stable at all blower speeds. What is the MOST likely cause?

A. The evaporator cannot absorb heat fast enough at the highest airflow rate, so the air passes through without being fully cooled

B. The blower motor draws excessive current on HIGH that causes a voltage drop affecting the compressor clutch coil strength

C. The high-speed relay has marginal contacts that reduce compressor current when the blower draws maximum amperage

D. Normal behavior because increased airflow always raises the evaporator surface temperature and reduces efficiency

27. A vehicle's scan tool shows the HVAC module commanding the A/C compressor relay OFF. The A/C button is pressed, the engine is at operating temperature, and the ambient temperature is 80°F. The evaporator temperature reads 35°F. The A/C pressure sensor reads 0.4V. The normal sensor range is 0.5V–4.5V. Why is the module not commanding the relay?

A. The evaporator temperature of 35°F is below the module's freeze protection threshold of 32°F, blocking engagement

B. The A/C button signal is not reaching the module due to a control panel circuit fault preventing the request

C. The engine coolant temperature has not reached the minimum threshold required for compressor authorization

D. The pressure sensor signal of 0.4V is below the valid operating range, and the module interprets it as a circuit fault

28. Technician A says that when evacuating a system, the micron gauge should be connected at the vehicle's service port — not at the vacuum pump — for the most accurate reading of the system's actual vacuum depth. Technician B says that the vacuum decay test after turning off the pump should show the micron gauge stabilizing below 500 microns within 5 minutes to pass. Who is correct?

A. Both Technician A and Technician B are correct about micron gauge placement and vacuum decay test criteria

B. Technician A only, because the vacuum decay test should stabilize below 1,000 microns rather than 500 microns

C. Technician B only, because the micron gauge location does not significantly affect the accuracy of the reading

D. Neither Technician A nor Technician B, because vacuum depth testing is not required for modern A/C service

29. A vehicle's A/C system was recently serviced. The customer returns after three weeks reporting that the A/C performance has decreased. The technician recovers the refrigerant and obtains 18 ounces from a 22-ounce system. An electronic leak test at all accessible fittings finds no leaks. UV dye inspection shows no fluorescence at any external component. Where should the technician look next?

A. The compressor shaft seal, which only leaks dynamically during operation and may seal when the system is off

B. The condenser for a micro-crack that is too small for electronic detection but allows slow molecular permeation

C. The evaporator inside the HVAC housing, which is inaccessible to standard external leak detection methods

D. The manifold gauge connections, which may have introduced the leak during the previous service procedure

30. A vehicle's ATC system has the following scan tool data: set temperature 72°F, in-car sensor 72°F, blend door commanded 22%, blend door actual 22%. The system maintains temperature correctly. The customer's only complaint is a faint continuous buzzing from behind the dashboard. The noise does not change with any control setting. What is the MOST likely source?

A. The blend door actuator motor continuously energized to hold the commanded position against airflow pressure on the door

B. A refrigerant flow noise through the evaporator that is amplified by the HVAC housing into the cabin space

C. The in-car temperature sensor aspirator fan motor that has developed bearing wear and produces audible noise

D. An intermittent electrical fault in the compressor clutch coil that creates electromagnetic buzzing at the relay

31. A vehicle's heater core was flushed to restore heat output. After the flush, the heater produces hot air for approximately 20 minutes. After 20 minutes, the heat output drops to lukewarm. Shutting off the engine for 10 minutes and restarting restores hot air again for another 20-minute cycle. What does this pattern indicate?

A. The flush dislodged loose debris that has now settled against the heater core outlet and progressively blocks flow

B. The heater core flush was partially successful — debris was loosened but not fully removed, and it recirculates and blocks flow during operation

C. The thermostat is sticking closed for 20 minutes and then opening suddenly, dropping coolant temperature to the heater

D. An air pocket was introduced during the flush that circulates through the heater core on a 20-minute thermal cycle

32. On a vehicle with electronic HVAC, the technician retrieves DTC B0270 — Air Inlet Door Actuator Circuit Malfunction. The scan tool bidirectional test commands the air inlet door to the RECIRCULATION position. The motor is heard running but the position feedback does not change from 95% (fresh air). What is the MOST likely cause?

A. Stripped gears inside the air inlet door actuator that allow the motor to spin without turning the output shaft

B. A physically seized air inlet door that the actuator motor cannot overcome despite generating adequate torque

C. A wiring fault between the module and actuator that reduces motor voltage below the level needed to move the door

D. A failed position feedback potentiometer sending a fixed reading while the door actually moves to recirculation

33. A vehicle has a TXV-equipped A/C system. After a compressor replacement, the system is evacuated, charged to specification, and tested. The low-side pressure is 38 psi and the high-side is 205 psi at 84°F ambient. The vent temperature is 46°F. Superheat measures 6°F. What does this low superheat value indicate?

A. The system is undercharged and the TXV is compensating by opening wider to increase flow to the evaporator

B. The compressor displacement is too low and is not pulling enough refrigerant from the evaporator to increase superheat

C. The TXV is feeding slightly more refrigerant than optimal, which could risk liquid reaching the compressor over time

D. Normal post-replacement behavior where the TXV takes several days to calibrate to the new compressor's output

34. A vehicle's A/C system has both-sides-high gauge readings: low side 52 psi, high side 340 psi at 90°F ambient. The condenser fans are operating at high speed. The condenser face is clean with no debris. The system was recently recharged. What is the MOST likely cause?

A. A restricted evaporator that cannot absorb adequate heat, causing both pressures to rise above normal range

B. An overcharge or non-condensable gases (air) introduced during the recent recharge procedure

C. A stuck-closed TXV that is preventing refrigerant from entering the evaporator and creating high-side backup

D. A failing compressor that is generating excessive discharge pressure from internal valve plate damage

35. On a vehicle with electronic HVAC controls, the mode door actuator was recently replaced. The technician performed a successful calibration. One week later, the customer reports that the mode selection occasionally jumps from PANEL to DEFROST without input and then returns to PANEL after a few seconds. No DTCs are stored. What should the technician suspect?

A. A faulty replacement actuator with an intermittent motor winding that drops out briefly under temperature changes

B. An intermittent CAN bus fault that corrupts the mode door position command for brief periods before recovering

C. A software glitch in the HVAC control module that was introduced when the actuator calibration was performed

D. A loose or intermittent electrical connection at the actuator connector that causes brief communication dropouts

36. A vehicle has an engine that reaches operating temperature of 200°F. The heater produces excellent heat. The cooling system holds 16 psi during a pressure test. However, the customer reports finding small spots of dried coolant residue on the garage floor beneath the front of the vehicle each morning. The spots are in a different location than the A/C condensation drip. What should the technician investigate?

A. The water pump weep hole for slow seepage that drips during operation and leaves residue after the vehicle parks

B. The radiator cap seal for deterioration that allows slow vaporization of coolant around the cap during thermal cycling

C. The condenser drain fitting for coolant contamination that would indicate a leak between the cooling and A/C systems

D. The heater hose connections at the firewall for a slow external seep that drips while the vehicle is stationary

37. A vehicle's A/C system has a confirmed R-134a charge. The technician needs to check for leaks using nitrogen. What is the correct procedure for pressurizing the system with nitrogen for leak detection?

A. Add nitrogen directly to the fully charged system to boost the pressure above normal for more sensitive detection

B. Pressurize with nitrogen to the maximum relief valve setting of 500 psi for the most sensitive leak detection

C. Recover the refrigerant first, then pressurize with dry nitrogen to approximately 150–200 psi for leak detection

D. Mix nitrogen with the existing refrigerant charge to create a tracer gas mixture that is easier to detect

38. A vehicle has a dual-zone ATC system. The driver side is set to 68°F and cools correctly. The passenger side is set to 78°F and heats correctly. The rear seat passenger directly behind the driver reports being uncomfortably cold. What is the MOST likely explanation?

A. A failed rear auxiliary A/C system that is defaulting to maximum cold and overcooling the rear cabin space

B. Cold air from the driver-side zone migrates rearward through the cabin because the two zones are not physically isolated

C. The floor ductwork for the rear passenger area is routed from the driver-side zone rather than the passenger side

D. A leak in the HVAC housing is directing cold air from the evaporator directly into the rear passenger foot area

39. A vehicle's cooling system uses HOAT (hybrid organic acid technology) coolant with a recommended service life of 5 years or 150,000 miles. The vehicle is 3 years old with 40,000 miles. The technician tests the coolant and finds: freeze point −34°F, pH 9.0, inhibitor reserve shows adequate protection. The coolant appears clean and bright orange. What should the technician recommend?

A. The coolant is in good condition and within its service life — no replacement is needed at this time

B. Replace the coolant because the pH of 9.0 is too alkaline and indicates the inhibitors are nearly exhausted

C. Flush and replace the coolant because three years is the maximum safe interval regardless of the test results

D. Add a supplemental coolant additive to boost the inhibitor reserve even though the test shows adequate levels

40. On a vehicle with an ATC system, the scan tool shows the HVAC module commanding the A/C clutch relay ON. The relay clicks audibly. The technician measures 12.2V at the compressor clutch coil positive terminal and 0.1V at the clutch coil ground terminal. The clutch does not engage. What is the MOST likely cause?

A. The relay contacts are failing and not passing adequate voltage through to the clutch coil power supply circuit

B. The 0.1V ground reading indicates the ground circuit has excessive resistance preventing adequate current flow

C. The module's relay driver circuit is providing inadequate ground signal to energize the relay coil properly

D. The clutch coil has failed with an internal open circuit — voltage is present but no current flows through the winding

41. A vehicle's A/C system has been properly charged. The technician performs a performance test and measures the following: vent temperature 43°F from the center vent, 43°F from the driver-side vent, 43°F from the passenger-side vent, and 55°F from the far-right outboard vent. What is the MOST likely cause of the warmer far-right vent?

A. A partial evaporator restriction on the right side that is reducing refrigerant flow to that section of the core

B. An uneven blend door that allows more warm air to pass on the right side of the HVAC housing partition

C. A low refrigerant charge that cannot sustain adequate cooling to all four vent outlets simultaneously

D. The far-right vent receives air through a longer duct run that absorbs heat from surrounding dashboard components

42. A vehicle's cooling system has the following conditions: engine reaches 200°F, both heater hoses hot, blend door at full hot, blower at maximum, floor vent temperature 140°F. The customer is satisfied with the heating. The technician notices a faint sweet smell inside the cabin that the customer has not reported. What should the technician do?

A. Nothing — a faint sweet smell is normal for new coolant types and will dissipate within a few weeks of service

B. Mention to the customer that coolant smell was detected and is often an early indicator of a developing heater core leak

C. Ignore the smell since the customer has no heating complaint and the system pressure test shows no leak

D. Immediately condemn the heater core and schedule replacement since any coolant odor confirms an active leak

43. A vehicle's A/C compressor is a clutchless variable displacement design controlled by an electronic displacement control valve. The scan tool shows displacement commanded at 100% but the A/C system produces only marginal cooling. The low-side pressure is 42 psi and the high-side is 155 psi at 88°F ambient. What is the MOST likely cause?

A. A failed TXV stuck in the partially closed position that is restricting refrigerant flow into the evaporator

B. A stuck displacement control valve that is not responding to the module's maximum displacement command

C. A low refrigerant charge that produces adequate pressures but insufficient total refrigerant mass for full cooling

D. A condenser fan operating at reduced speed that is limiting heat rejection and reducing system efficiency

44. Technician A says that EPA Section 609 certification is required for any technician who services motor vehicle A/C systems involving refrigerant handling. Technician B says that venting refrigerant to the atmosphere is prohibited by law regardless of the refrigerant type or the reason for the release. Who is correct?

A. Both Technician A and Technician B are correct about certification requirements and venting prohibitions

B. Technician A only, because small amounts of refrigerant can be legally vented during service port disconnections

C. Technician B only, because EPA Section 609 certification is only required for technicians working on fleet vehicles

D. Neither Technician A nor Technician B, because refrigerant handling regulations apply only to commercial facilities

45. A vehicle's A/C system was recently recharged after an evaporator replacement. The system cools well. Three days later, the customer returns with a vent temperature of 50°F instead of the initial 42°F. The technician recovers 19 ounces from a 22-ounce system. The evaporator area shows no UV dye. What is the MOST likely leak source?

A. A pinhole leak in the new evaporator from a manufacturing defect that has not yet accumulated enough dye

B. A slow leak at the evaporator inlet or outlet fitting where the O-ring may have been pinched during installation

C. A fitting disturbed during the evaporator installation, such as an inlet or outlet O-ring that was pinched or not lubricated

D. The condenser has developed a simultaneous stone-damage leak coincidentally at the same time as the service

46. A vehicle's engine thermostat is rated at 195°F. The technician removes the thermostat and bench tests it in heated water with a thermometer. The thermostat begins to open at 194°F, is fully open at 215°F, and the valve opens approximately 3/8 inch at full opening. What should the technician conclude?

A. The thermostat is functioning within specification — opening temperature, full-open temperature, and valve travel are all normal

B. The full-open temperature of 215°F is too high and the thermostat should be replaced to prevent overheating risk

C. The valve opening of 3/8 inch is insufficient and the thermostat restricts flow even at full open position

D. The opening temperature of 194°F is below the 195°F rating and indicates a weakened wax element requiring replacement

47. On a vehicle with an orifice tube system, the compressor cycles off normally when the low-side pressure drops to the cycling switch cutout point. However, the compressor takes 45 seconds to re-engage after cycling off instead of the typical 15–20 seconds. What could cause this extended off-cycle time?

A. A restricted orifice tube that is slowing the rate at which the low-side pressure rises to the cut-in threshold

B. A low refrigerant charge that causes the low-side pressure to rise more slowly after the compressor cycles off

C. A faulty cycling switch with a cut-in pressure set higher than the standard specification for this system

D. A restricted condenser that prevents the high-side pressure from equalizing quickly enough during the off cycle

48. A vehicle has an A/C system where the compressor clutch engages but the low-side pressure does not drop below 55 psi and the high-side pressure does not rise above 65 psi. The vent temperature is ambient — no cooling. The system was recently charged to specification. What is the MOST likely cause?

A. A massive refrigerant overcharge that has equalized pressures by flooding every component in the system

B. A stuck-wide-open TXV that has eliminated the metering restriction needed to create a pressure differential

C. A restricted condenser that is preventing the compressor from pushing refrigerant through to the high side

D. A compressor with total internal failure — the shaft turns but no compression occurs due to broken internals

49. A vehicle's heater works well when the blower is on LOW but the heat output decreases noticeably when the blower is set to HIGH. The engine temperature remains stable at 200°F regardless of blower speed. Both heater hoses remain hot at all blower speeds. What is the MOST likely cause?

A. The blower motor is drawing excessive current on HIGH that causes a voltage drop reducing the blend door actuator's hold

B. The heater control valve cannot flow enough coolant to sustain heat output at the higher airflow rate on the high setting

C. The heater core cannot transfer heat fast enough to warm the higher volume of air at maximum blower speed

D. A partially restricted cabin air filter that creates turbulence at high airflow rates and reduces effective heat transfer

50. A vehicle's A/C system has been properly serviced — charged to specification, leak tested, and performance tested. All parameters are within normal range. The final vent temperature is 42°F at 82°F ambient. The technician documents all readings. What is the single most important step before returning the vehicle to the customer?

A. Verify the condenser fan operates at the correct activation temperature and the compressor clutch engages and releases normally during a final operational check

B. Perform a 30-minute extended run to verify the system maintains stable pressures and temperatures over time

C. Print the scan tool data report and attach it to the repair order for the customer's records and future reference

D. Test drive the vehicle for 15 minutes to verify the system performs correctly under real-world driving conditions

Practice Exam 15: Answer Key and Explanations

1. C — Every measured parameter confirms the system is properly charged and performing at its designed capability: pressures are normal for 88°F ambient, vent temperature of 44°F represents excellent cooling, subcooling of 14°F confirms adequate liquid production, and superheat of 10°F confirms proper metering device operation. Adding refrigerant above the manufacturer's specification creates an overcharge that floods the condenser with excess liquid, raises high-side pressure, and actually degrades cooling performance.

2. A — Clear amber oil with no discoloration, particles, or burnt odor indicates the compressor's internal surfaces have not experienced thermal damage or abnormal mechanical wear. The 4-ounce charge loss occurred gradually over four months — slowly enough that the remaining refrigerant continued circulating sufficient oil to maintain adequate lubrication throughout the leak period. If the leak had been rapid or the system had run severely depleted, the oil would show dark discoloration from overheating.

3. D — The module commands the relay ON but no click is heard. Power is present at terminal 86 (12V supply) and the module provides ground at terminal 85. Despite both coil circuit requirements being met, the relay does not actuate. The relay coil itself has failed internally — an open winding prevents

current from flowing through the coil even with proper power and ground present. The relay must be replaced. The fact that all upstream signals are correct isolates the fault to the relay component itself.

4. B — In defrost mode, the HVAC system is designed to direct the majority of airflow — typically 80% or more — to the windshield defrost outlets for maximum windshield clearing effectiveness. Only a small percentage of airflow is directed to the floor vents in defrost mode as a supplementary comfort feature. The reduced floor output the customer notices is normal design behavior, not a malfunction. Each mode has a specific airflow distribution ratio designed for its intended function.

5. B — The sensor reads 3,200 ohms and the manufacturer's resistance-temperature chart confirms that 3,200 ohms corresponds to 75°F — the current shop temperature. This exact match between the measured resistance and the expected resistance at the known ambient temperature confirms the NTC thermistor element is functioning correctly. The sensor produces the correct resistance value for its thermal environment, eliminating it as the cause of any temperature-related HVAC complaint.

6. A — A system operating with a low charge for several months ran with progressively decreasing oil circulation — as refrigerant leaked out, less oil was carried to the compressor. The extended period of insufficient lubrication caused progressive wear to internal bearings, seals, and precision surfaces. Recharging restored refrigerant flow and cooling performance, but the mechanical damage from months of marginal lubrication is permanent. The compressor noise will likely worsen over time and eventually require compressor replacement.

7. D — Both technicians correctly describe aspects of variable displacement compressor technology. Technician A is right that the swashplate (wobble plate) angle determines the piston stroke length and therefore the pumping displacement — a steeper angle produces longer strokes and more displacement. Technician B is right that many modern variable displacement compressors use an electronically controlled solenoid valve commanded by the HVAC module to regulate the internal crankcase pressure that determines swashplate angle.

8. C — The system maintains the correct 70°F temperature and the evaporator is cooling properly at 36°F — the refrigeration and temperature control systems are functioning correctly. However, humid air in the cabin indicates the evaporator is not adequately dehumidifying the incoming air. With the recirculation door stuck in the fresh air position, the system continuously draws in humid outside air at 80°F instead of recirculating the progressively drier cabin air. The evaporator cannot remove moisture fast enough from the constant inflow of fresh humid air.

9. A — The pressure cap tests correctly (eliminating a weak cap), the combustion gas test is negative (eliminating a head gasket breach), and no external leaks are visible. A degas bottle — which operates under full system pressure — can develop hairline cracks in its plastic walls from thermal cycling and age. These micro-cracks allow pressurized coolant to seep through the plastic wall where it evaporates on the warm surface before pooling visibly. Careful inspection under bright light and hand-feeling for dampness along all bottle surfaces may reveal the leak.

10. B — The blend door position changing from 60% to 55% over 15 minutes — without any driver input — is normal ATC closed-loop operation. As the cabin conditions gradually change (solar load shifts, engine compartment temperature stabilizes, passenger heat load changes), the in-car temperature sensor detects subtle temperature shifts and the module continuously adjusts the blend door to maintain the set temperature. This ongoing fine-tuning is exactly how closed-loop proportional control is designed to work.

11. D — Higher ambient temperatures directly reduce the A/C system's cooling capacity. At 98°F ambient, the condenser must reject heat into hotter air (smaller temperature differential), the engine compartment runs hotter (increasing heat soak), and the cabin absorbs more solar radiation. These factors naturally produce warmer vent temperatures than the same system achieves at 75°F ambient. The 10°F vent temperature difference between 75°F and 98°F ambient conditions is within the expected performance variation and is not a system fault.

12. B — Fine metallic particles with a silver color — without sludge or desiccant material — indicate fresh aluminum wear debris from the compressor's internal moving parts. The absence of oil degradation products (brown sludge) and the clean metallic appearance suggest this is recent active wear, not long-term accumulated residue. A compressor with failing bearings, worn piston shoes, or deteriorating scroll surfaces releases these particles into the refrigerant stream. The compressor should be inspected and likely replaced before catastrophic failure occurs.

13. C — Both the electronic pressure sensor and the manifold gauge independently read 0 psi at the same port, confirming the reading is accurate — the system truly has zero pressure. At 82°F ambient, a charged R-134a system should show approximately 90 psi static pressure. Zero pressure means the system has lost its entire refrigerant charge through a leak. The system must be leak tested (with nitrogen pressure), the leak repaired, and the system properly evacuated and recharged.

14. A — With the A/C on, the condenser — mounted directly in front of the radiator — rejects significant heat into the air passing through to the radiator. At idle in heavy traffic, there is no ram air — only the cooling fans provide airflow. The combined heat load of the engine plus the condenser's

rejected heat exceeds what the cooling system can dissipate at idle airflow rates. Without the A/C, the condenser adds no heat and the cooling system handles the engine's heat alone without issue.

15. D — The scan tool bidirectional test proves the recirculation actuator, the HVAC module's output circuit, and the communication pathway are all functional — the actuator responds correctly to direct commands. All other control panel buttons work normally, proving the panel communicates with the module for those functions. Only the recirculation button produces no response, isolating the fault to that specific button or its dedicated signal circuit on the control panel assembly.

16. C — A 5°F temperature increase along the liquid line from the condenser outlet to the TXV inlet is caused by heat absorption from the hot engine compartment environment. The liquid line runs through the engine bay near hot components — the exhaust manifold, engine block, and other heat sources radiate and conduct warmth into the liquid line. While some heat gain is normal and acceptable, routing the line near the exhaust manifold accelerates this effect. Rerouting or insulating the line reduces the unwanted heat gain.

17. A — Technician A correctly describes the superheat calculation method: measure the actual suction line temperature at the evaporator outlet with a thermometer, look up the saturation (boiling) temperature on the P-T chart at the measured low-side pressure, and subtract the saturation temperature from the actual temperature. The difference is superheat. Technician B is incorrect because superheat is routinely calculated from these two readily available measurements — no dedicated superheat gauge is required.

18. B — The new symptom — panel mode intermittently dropping to defrost — appeared after the technician worked on an adjacent vacuum hose. During the repair, the technician likely contacted, pulled, or stressed a nearby hose in the vacuum circuit serving the panel mode actuator. A small nick, kink, or partial separation at a connection point would cause an intermittent vacuum leak that periodically depletes the panel actuator's vacuum, allowing the door to default to defrost before vacuum slowly recovers and restores panel mode.

19. D — The supply hose at 198°F and the return hose at 190°F show only an 8°F differential — a small temperature drop indicating good coolant flow through the heater core. A floor vent temperature of 128°F with 200°F coolant represents a substantial heat delivery. Heater cores cannot deliver air at coolant temperature — heat transfer physics always produce outlet air 40°F–70°F below coolant temperature. A floor vent reading of 128°F is within the expected normal range for this coolant temperature and represents adequate heater performance.

20. C — The manifold gauge reads 210 psi (consistent with normal high-side pressure at 90°F ambient), confirming the system is operating correctly. The electronic sensor reads 320 psi — 110 psi higher than actual. The DTC P0533 (Circuit High) confirms the module detected the out-of-range high signal. The sensor is sending a falsely elevated reading that does not match reality. The sensor or its circuit must be repaired. The system itself is functioning normally as confirmed by the accurate manifold gauge readings.

21. C — Immediately following a cooling system drain and refill for water pump replacement, cold air from one zone while the other heats normally in a dual-zone system is the classic symptom of an air pocket trapped in one section of the heater core. During the refill, air was not fully purged from the passenger-side heater core passages. The air pocket blocks coolant flow on the affected side while the other side flows normally. Properly bleeding the cooling system will purge the air pocket and restore even heating.

22. C — A whistling noise from a specific vent that occurs only at moderate blower speeds — disappearing at both low and high speeds — is characteristic of a resonance phenomenon. A vent register flap, loose duct connection, or partially open damper vibrates at a specific airflow velocity range. Below that range, the airflow is insufficient to excite the vibration. Above it, the increased pressure holds the component firmly in position. This narrow speed-dependent noise window points to a mechanical resonance in the ductwork.

23. B — While annual recharging may temporarily restore cooling, each service cycle that opens the system introduces atmospheric air and moisture. The moisture reacts with the refrigerant and oil to form hydrofluoric acid that attacks aluminum components from the inside. The air raises high-side pressure and reduces efficiency. Over several annual top-offs without proper evacuation, the accumulated moisture and acid progressively damage the compressor, condenser, and other components — creating far more expensive repairs than the original evaporator replacement.

24. D — A very low low-side (15 psi) combined with a very high high-side (285 psi) creates an extreme pressure differential across the system. This pattern indicates a severe restriction at the metering device or in the liquid line between the condenser and evaporator. The restriction traps refrigerant on the high side (raising pressure dramatically) while starving the low side (dropping pressure). The restricted flow through the evaporator produces the warm 55°F vent temperature because insufficient refrigerant reaches the evaporator for adequate cooling.

25. A — In an NTC (Negative Temperature Coefficient) sensor circuit using a voltage divider, an open circuit produces maximum resistance. The module reads this infinite resistance as maximum voltage at the signal wire, which its calibration table interprets as the lowest possible temperature — typically

−40°F, the standard default for open NTC circuits. This −40°F reading may cause the module to activate a low-ambient lockout that prevents compressor engagement, explaining why the A/C does not work.

26. B — The evaporator has a fixed heat absorption capacity determined by its surface area, refrigerant flow, and the temperature differential between the air and the refrigerant. At LOW and MEDIUM blower speeds, the air moves slowly enough through the evaporator for full heat exchange — every molecule of air contacts the cold fins long enough to be thoroughly cooled. At HIGH speed, the greatly increased air volume passes through too quickly for complete heat transfer, and some air exits the evaporator without being fully cooled.

27. D — The A/C pressure sensor signal of 0.4V is below the sensor's valid operating range of 0.5V–4.5V. The module interprets any signal below 0.5V as a circuit fault — not as a valid pressure reading. The module cannot determine actual system pressure from an out-of-range signal, so it disables the compressor as a protective measure. The evaporator temperature of 35°F is above the typical 32°F freeze threshold and would not independently prevent engagement. The out-of-range pressure signal is the specific blocking condition.

28. A — Both technicians describe correct evacuation procedures. Technician A is right that the micron gauge must be connected at the vehicle's service port — not at the pump — because hose length and diameter create flow restriction that makes the pump-side reading appear deeper than the actual vacuum inside the system. Technician B is right that during the vacuum decay test (pump off, valves closed), the micron gauge should stabilize below 500 microns within 5 minutes, confirming no leaks and adequate moisture removal.

29. C — After exhausting all external electronic and UV dye detection methods without finding the 4-ounce leak, the most probable remaining source is the evaporator — sealed inside the HVAC housing where standard external detection cannot reach. The evaporator is the most common "undetectable" leak source because it cannot be visually inspected or scanned externally without removing access panels or inserting a probe into the housing. The technician should access the evaporator area directly for targeted leak detection.

30. A — A continuous faint buzzing from behind the dashboard that does not change with any control setting — while all positions match commands and the system works correctly — is characteristic of a blend door actuator motor that is continuously energized. The motor runs at low power to hold the door at its commanded position against the aerodynamic force of the airflow pressing on the door surface. Over time, actuator wear can make this holding current audible as a buzzing sound.

31. B — The pattern of 20 minutes of good heat followed by diminishing output — resolved by a brief engine-off period — indicates debris inside the heater core that circulates and progressively accumulates at a restriction point during operation. The flush loosened deposits but did not fully remove them. During operation, circulating coolant carries loose debris to a narrow passage where it accumulates and restricts flow. When the engine is stopped, the flow stops, the debris settles away from the restriction, and flow is temporarily restored upon restart.

32. A — The DTC indicates a circuit malfunction, the motor runs audibly (confirmed during the bidirectional test), but the position feedback remains fixed at 95% despite the command to move. The motor spins but the output shaft and feedback mechanism do not move — the classic signature of stripped internal gears. The motor's pinion gear turns freely without meshing with the reduction gears that drive the output shaft and the feedback potentiometer.

33. C — Superheat of 6°F is below the normal 8°F–12°F TXV specification, meaning the refrigerant leaving the evaporator is barely above its boiling point with very little vapor superheat. The TXV is feeding slightly more liquid refrigerant into the evaporator than optimal — the excess liquid does not fully boil before reaching the outlet. While 6°F is not critically low, continued operation at this level risks liquid refrigerant reaching the compressor during transient conditions, potentially causing slugging damage.

34. B — Both-sides-high pressures (52 psi low / 340 psi high) at 90°F ambient with a clean condenser and functioning fans — on a recently recharged system — point to either a refrigerant overcharge or non-condensable gases (air) introduced during the charging procedure. Excess refrigerant floods the condenser with liquid, reducing effective heat transfer area and raising high-side pressure. Air trapped in the system cannot condense and permanently elevates high-side pressure above the refrigerant-only level.

35. D — The mode door intermittently jumps from panel to defrost without input and then returns — a brief, random event with no DTCs. Since the actuator was recently replaced, the most likely cause is a loose or intermittent electrical connection at the actuator connector. A connector that was not fully seated, has a damaged locking tab, or has a bent terminal pin can momentarily lose contact under vibration. When communication drops, the actuator may default briefly to the defrost position before the connection re-establishes.

36. A — Small spots of dried coolant residue appearing on the garage floor each morning — in a different location than the A/C condensation drip — indicate a slow external coolant leak that drips during operation or shortly after shutdown. The water pump weep hole is designed as a leak indicator — when the internal shaft seal begins to fail, coolant seeps past the seal and exits through the weep hole.

The drip occurs during operation (when the system is pressurized) and the residue remains after the vehicle parks and the dripping stops.

37. C — The correct procedure for nitrogen leak testing requires first recovering all refrigerant from the system (EPA regulations prohibit venting refrigerant), then pressurizing with dry nitrogen to approximately 150–200 psi. This pressure is high enough to reveal leaks through soap-bubble testing or ultrasonic detection but low enough to avoid damaging system components. Never add nitrogen to a charged system (creates dangerous overpressure) and never pressurize to the relief valve setting (risks component damage).

38. B — Without rear auxiliary A/C, the front dual-zone system conditions only the front cabin area. The two front zones are not physically separated by a wall — they share the same cabin airspace. Cold air from the 68°F driver zone migrates rearward through natural air circulation and convection, cooling the rear area behind the driver. The passenger side at 78°F sends warmer air, but the rear seat passenger behind the driver receives the stronger influence of the colder driver-side output.

39. A — The coolant meets every evaluation criterion: freeze point of −34°F confirms a proper 50/50 concentration, pH of 9.0 is within the normal automotive coolant range (7.5–10.0), inhibitor reserve testing shows adequate protection remaining, and the appearance is clean and bright orange (matching HOAT specifications). At 3 years and 40,000 miles, the coolant is well within its recommended 5-year/150,000-mile service life. No replacement or supplemental treatment is needed at this time.

40. D — The relay clicks (coil energizes), 12.2V reaches the clutch coil positive terminal (adequate power supply), and the ground terminal reads 0.1V (confirming a good ground path with minimal voltage drop). Power and ground are both present at the coil terminals with appropriate voltage levels — yet the clutch does not engage. The only remaining explanation is that the coil winding itself has failed open internally. No current can flow through the broken winding despite having both power and ground available.

41. D — Three of the four vents produce identical 43°F air, confirming the evaporator, refrigerant charge, and blend door are functioning correctly. The single warmer outlet at the far-right position receives its air through a longer duct run that passes near heat-producing dashboard components. The extended path allows the cooled air to absorb conducted and radiated heat from the surrounding materials, raising its temperature by 12°F before reaching the vent outlet. This is a ductwork routing issue, not a refrigeration fault.

42. B — A faint sweet smell inside the cabin is the early warning sign of a developing heater core leak — ethylene glycol coolant has a distinctively sweet odor. Even though the customer has not noticed it and the system performs well, the technician has a professional obligation to inform the customer of the finding. Early detection allows the customer to monitor the situation and plan for repair before the leak progresses to visible coolant on the floor, windshield fogging, or system failure.

43. B — The module commands 100% displacement but the pressures (42 psi low / 155 psi high) are well below normal for 88°F ambient — the compressor is not pumping at full capacity. In a clutchless variable displacement compressor, the electronic displacement control valve regulates the swashplate angle. A valve stuck at reduced displacement ignores the maximum electrical command and keeps the swashplate at a shallow angle, producing minimal pumping output despite the shaft continuously turning.

44. A — Both technicians state correct regulatory facts. Technician A is right that EPA Section 609 certification is legally required for any technician who services motor vehicle A/C systems involving refrigerant recovery, recycling, or charging. Technician B is right that the Clean Air Act prohibits intentional venting of any refrigerant to the atmosphere — this applies to all refrigerant types (R-12, R-134a, R-1234yf, and all substitutes) and there are no exceptions for small quantities or service operations.

45. C — A 3-ounce charge loss within three days of an evaporator replacement points directly to a fitting that was disturbed during the recent service. The most common post-service leak source is an O-ring at the evaporator inlet or outlet connection that was pinched during installation, not properly lubricated with refrigerant oil, incorrectly sized, or cross-threaded. The absence of UV dye at the evaporator surface (rather than at the fitting) suggests the leak is at the connection point rather than through the evaporator core itself.

46. A — The thermostat begins opening at 194°F — within 1°F of its rated 195°F — which is well within normal manufacturing tolerance (±2°F–3°F). Full opening at 215°F (approximately 20°F above initial opening) is within the expected range for complete valve travel. The 3/8-inch valve opening provides adequate flow area for full coolant circulation through the radiator. All three measured parameters — opening temperature, full-open temperature, and valve travel — confirm the thermostat is functioning within specification.

47. B — After the compressor cycles off, the low-side pressure must rise from the cutout point back up to the cut-in point before the compressor re-engages. With a low refrigerant charge, less total refrigerant mass is available to equalize between the high and low sides during the off-cycle. The reduced mass means the low-side pressure rises more slowly because fewer refrigerant molecules are available to

migrate from the high side through the metering device. This slower pressure recovery extends the off-cycle time beyond normal.

48. D — Pressures of 55 psi low / 65 psi high are nearly equalized with only a 10 psi differential — the compressor shaft turns (the clutch is engaged) but virtually no compression occurs. The compressor has suffered complete internal failure — shattered reed valves, broken scroll elements, or a sheared internal coupling allow the shaft to rotate freely without compressing refrigerant from the low side to the high side. The pressure remains near the static equilibrium point because nothing is actively pumping.

49. C — The engine temperature remains stable at 200°F regardless of blower speed (eliminating thermostat and cooling system faults), and both heater hoses stay hot at all speeds (confirming adequate coolant supply). At LOW blower speed, the smaller volume of air passes slowly through the heater core and absorbs maximum heat per unit of air. At HIGH speed, the much larger air volume passes through too quickly for complete heat exchange — each unit of air contacts the hot fins for a shorter time and absorbs less heat, producing a lower outlet temperature.

50. A — After a complete A/C service with all parameters verified within specification, the final step before delivery is confirming the supporting systems function correctly under operational conditions. The condenser fan must activate at its correct temperature threshold (and at both speeds if equipped), and the compressor clutch must engage and disengage normally during cycling. These operational checks verify the complete integrated system — not just the static measurements — ensuring the customer will experience proper cooling in real-world driving.