

PRACTICE EXAM 16: ASE A7 SIMULATION

(50 QUESTIONS)

1. A vehicle's A/C system has both-sides-low gauge readings: low side 18 psi, high side 110 psi at 84°F ambient. The compressor cycles on for 8 seconds and off for 25 seconds. The vent temperature is 55°F. The system was last serviced two years ago. What is the MOST likely cause?

- A. A worn compressor with bypassing internal valves that cannot maintain the pressure differential needed for cooling
- B. A low refrigerant charge causing rapid cycling as the low-pressure switch trips from insufficient system mass
- C. A restricted orifice tube that is preventing adequate refrigerant from reaching the evaporator at the correct rate
- D. A condenser fan operating at reduced speed that is limiting heat rejection and artificially lowering both pressures

2. Technician A says that the receiver-drier in a TXV system stores excess liquid refrigerant to ensure a steady supply reaches the expansion valve under varying operating conditions. Technician B says that the receiver-drier's desiccant absorbs moisture that would otherwise freeze at the TXV valve seat and cause intermittent restriction. Who is correct?

- A. Technician A only, because the desiccant serves as a filtration medium rather than a moisture absorption agent
- B. Technician B only, because the receiver-drier does not have any liquid storage function within the circuit
- C. Neither Technician A nor Technician B, because the receiver-drier only serves as a refrigerant filter in the circuit
- D. Both Technician A and Technician B are correct about the dual functions of the receiver-drier component

3. A vehicle's blower motor operates on speeds 1, 2, and 3 but does not operate on HIGH. This vehicle uses a blower motor resistor block with a dedicated high-speed relay that bypasses the resistor for maximum speed. What should the technician check FIRST?

- A. The high-speed relay and its associated fuse, since the relay circuit is independent of the resistor used for lower speeds
- B. The blower motor resistor block for a burned-open element that specifically controls the high-speed circuit path
- C. The blower motor itself for an internal winding fault that prevents operation at the maximum current draw level
- D. The HVAC control module output for a failed high-speed command signal that activates the bypass relay

4. A vehicle's A/C system was recently recharged after a condenser replacement following front-end collision damage. The vent temperature reaches 43°F and all gauge readings are normal. However, after three days, the customer returns with a vent temperature of 52°F. The technician recovers 18 ounces from a 22-ounce system. Where should the technician focus the leak search?

- A. The evaporator core for impact damage transmitted through the refrigerant lines from the collision force
- B. The compressor shaft seal for a slow seep that was coincidentally disturbed during the condenser service
- C. The new condenser and all fittings disturbed during the collision repair for an improperly seated O-ring or connection
- D. The accumulator for a crack caused by system pressure spikes that occurred when the original condenser ruptured

5. On a vehicle with electronic HVAC controls, the scan tool shows the blend door actuator commanded to 70% and the actual position feedback reads 70%. However, the vent temperature from the center vent measures only 85°F. The engine coolant temperature is 205°F and the heater supply hose is hot. What is the MOST likely cause?

- A. A faulty position feedback potentiometer that is reporting 70% while the door is actually at a lower percentage
- B. A heater control valve stuck partially closed that is limiting the volume of hot coolant reaching the heater core
- C. The HVAC module is commanding 70% correctly but the in-car sensor is reading warmer than actual cabin temperature

D. The blend door actuator has stripped gears and the door is at a different position than the 70% reported

6. A vehicle's engine temperature gauge reads normal at 200°F, but the customer reports that the heater produces hot air only when the vehicle is moving and the heat drops to lukewarm within 60 seconds of stopping at a red light. The engine temperature remains at 200°F during this transition. Both heater hoses are hot while moving. What is the MOST likely cause?

A. A thermostat that is opening too wide at idle, reducing coolant temperature available to the heater core

B. A partially restricted heater core that passes adequate flow at higher RPM but not at the reduced pump speed of idle

C. A failing engine coolant temperature sensor that reads correctly while moving but lags during idle conditions

D. A water pump with an eroded impeller that delivers adequate flow at driving RPM but marginal flow at idle speed

7. A technician removes an orifice tube from a vehicle and observes the following: the inlet screen is coated with a greenish-brown residue, and small green crystalline particles are embedded in the screen mesh. No metallic debris is present. What does this specific green contamination MOST likely indicate?

A. Desiccant breakdown from the accumulator, where deteriorated molecular sieve beads have released into the system

B. Copper corrosion from deteriorating evaporator or condenser tubes that has dissolved into the circulating refrigerant

C. Normal mineral deposit accumulation that occurs over time as the refrigerant interacts with the aluminum tubing

D. An incompatible refrigerant oil that has chemically reacted with the R-134a and produced corrosive byproducts

8. A vehicle has a confirmed heater core leak. The customer declines repair due to the labor cost but wants the heater core bypassed so the A/C system can continue to function during summer. The technician loops the two heater hoses together at the firewall using a bypass connector. What potential consequence should the technician warn the customer about?

- A. The A/C compressor will not engage because the HVAC module requires heater core temperature feedback data
- B. The defrost system will not dehumidify properly because the A/C evaporator alone cannot clear fog without heated air
- C. The engine will overheat because the heater core serves as a secondary heat exchanger for the cooling system
- D. The bypass will cause the blend door to remain at full cold permanently, preventing any mid-range temperature control

9. On a vehicle with automatic temperature control, the scan tool shows the sun load sensor reading 4.5V (maximum output). The vehicle is parked in full shade with no direct sunlight. The ambient temperature is 75°F. What effect will this false high reading have on system operation?

- A. The module will disable the compressor entirely because it interprets maximum sun load as a sensor malfunction
- B. The module will default to recirculation mode only because maximum sun load triggers an air quality protection override
- C. The module will command excessive cooling output because it believes the vehicle is receiving maximum solar radiation
- D. The module will ignore the sun load sensor completely and rely only on the in-car temperature sensor for control

10. A technician is diagnosing an A/C system with the following condition: the compressor engages and operates continuously without cycling. The low-side pressure is 40 psi and the high-side is 225 psi at 86°F ambient. The vent temperature is 42°F. The customer reports the compressor "never shuts off." What should the technician conclude?

- A. The system may be slightly overcharged, keeping the low-side pressure perpetually above the cycling switch cutout point
- B. The compressor has a seized clutch that does not disengage when the module commands it off during cycling
- C. The cycling switch contacts have welded closed and the compressor runs regardless of low-side pressure level

D. Normal system operation because TXV-equipped systems often run the compressor continuously without cycling

11. A vehicle has an engine cooling system with a 195°F thermostat. The technician removes the thermostat for bench testing and heats it in a pot of water with a thermometer. The thermostat begins to open at 188°F. Is this thermostat functioning within acceptable tolerances?

A. Yes — thermostats are allowed $\pm 15^\circ\text{F}$ tolerance from their stamped rating due to wax element manufacturing variation

B. No — the thermostat must open at exactly 195°F with zero tolerance, and 188°F is significantly below specification

C. Yes — but only if the thermostat reaches full open by 210°F, which would indicate the wax element is still functional

D. No — a thermostat opening 7°F below its rated temperature will prevent the engine from reaching full operating temperature

12. A vehicle has a TXV-equipped A/C system. The technician observes heavy frost on the suction line from the evaporator to the compressor and on the accumulator body. The low-side pressure is 20 psi and the vent temperature is 38°F at 80°F ambient. The evaporator temperature sensor reads 28°F. What is the MOST likely cause?

A. A critically low refrigerant charge that causes the small amount of refrigerant to flash-freeze at the evaporator outlet

B. Normal operation during maximum demand conditions where the evaporator runs at its coldest safe temperature

C. A failed evaporator temperature sensor or freeze protection circuit that is not cycling the compressor off before freeze-up

D. A severely overcharged system that is flooding the evaporator with excess liquid that extends into the suction line

13. A vehicle's A/C performance degrades noticeably during the second hour of a long road trip but works well during the first hour. The vent temperature starts at 42°F but gradually rises to 54°F after 90 minutes of continuous highway driving. Stopping the vehicle and idling for 10 minutes restores 44°F vent temperature. What is the MOST likely cause?

- A. Progressive condenser heat-soak during extended highway driving as engine bay temperatures steadily increase
- B. A compressor clutch coil that weakens as it heats during extended operation and begins slipping intermittently
- C. A variable displacement compressor that reduces output as internal temperature rises during extended operation
- D. A TXV sensing bulb that loses its charge gradually when heated and eventually restricts refrigerant flow

14. On a vehicle with electronic HVAC controls, the customer reports that the A/C compressor engages when the windshield wiper switch is activated. No other wiring modifications have been made to the vehicle. What is the MOST likely cause?

- A. Normal vehicle programming where the module activates the compressor in conjunction with the wipers to keep the windshield clear
- B. A wiring harness connector that has been swapped between the wiper and A/C circuits during a previous repair
- C. A short between the wiper motor circuit and the A/C compressor clutch circuit in the steering column harness area
- D. An HVAC module software feature that automatically engages the compressor during detected rainy conditions to dehumidify

15. A technician measures the resistance of an A/C compressor clutch coil with the connector unplugged. The DMM reads OL (over limit). What does this reading indicate?

- A. The clutch coil resistance is too high and the coil should be replaced because it cannot generate adequate magnetic force
- B. The clutch coil winding has an internal open circuit and must be replaced because no current can flow through it
- C. The reading is normal for a disconnected clutch coil because the DMM cannot measure through the electromagnetic field
- D. The coil is shorted internally and the OL reading indicates the DMM's fuse has blown from the excessive current draw

16. A vehicle's heater core was replaced one month ago. The customer returns complaining that the heat output is decreasing again. The coolant level is slightly low. Both heater hoses are warm but the supply hose is notably cooler than expected — approximately 170°F when the engine is at 205°F. What is the MOST likely cause?

- A. The replacement heater core is a defective unit with undersized tubes that are progressively restricting flow
- B. A failing water pump that is losing impeller efficiency and cannot maintain adequate flow to the heater core
- C. The cooling system was not properly flushed before the new core was installed, and residual contamination is clogging it
- D. The thermostat was damaged during the heater core replacement and is now opening at a lower temperature

17. Technician A says that when charging a system through the low-side port with the compressor running, the refrigerant can should be held upright to introduce vapor rather than liquid. Technician B says that liquid refrigerant entering the compressor through the low-side suction port can cause immediate hydraulic damage to the internal components. Who is correct?

- A. Both Technician A and Technician B are correct about proper low-side charging technique and liquid slugging risk
- B. Technician A only, because modern compressors are designed to handle small amounts of liquid during charging
- C. Technician B only, because the can orientation does not affect whether liquid or vapor enters the service port
- D. Neither Technician A nor Technician B, because liquid charging through the low side is the preferred method

18. A vehicle has an A/C system that cools normally during a performance test in the shop. However, the customer reports the A/C stops cooling completely during extended stop-and-go traffic on hot days. The problem resolves as soon as the vehicle reaches highway speed. What additional test should the technician perform to recreate the complaint?

- A. Block the condenser airflow with cardboard and run the engine at idle with the A/C on to simulate traffic conditions
- B. Increase the engine RPM to 3,000 and monitor pressures to simulate the compressor output during highway driving
- C. Test the system only in the morning before the shop reaches its daytime temperature to replicate the cooler condition
- D. Run the engine at idle with the A/C on maximum for 20–30 minutes while monitoring pressures and condenser fan operation

19. On a vehicle with vacuum-operated HVAC controls, the driver reports that the mode selection works correctly during normal driving but switches to defrost-only during hard acceleration uphill. What does this symptom indicate?

- A. The mode door actuator diaphragms have weakened and cannot hold position against engine vibration during acceleration
- B. The vacuum check valve or reservoir is not maintaining adequate stored vacuum during periods of low manifold vacuum
- C. The HVAC control panel's vacuum switching valve is sticking open during high-throttle inputs and equalizing pressure
- D. The engine's PCV system is drawing excessive vacuum from the HVAC supply line during wide-open throttle events

20. A technician retrieves DTCs from a vehicle's HVAC module and finds U0100 — Lost Communication with ECM. The A/C compressor does not engage. After the CAN bus communication issue is repaired and the code is cleared, the A/C system works normally. Why did the communication loss prevent A/C operation?

- A. The HVAC module requires ECM data such as engine RPM and coolant temperature to authorize compressor engagement
- B. The ECM directly controls the compressor clutch relay and the HVAC module cannot override this control path
- C. The CAN bus fault caused a voltage spike that blew the A/C compressor clutch fuse in the underhood fuse box

D. The HVAC module enters a failsafe mode during any communication fault that disables all output functions entirely

21. A vehicle's cooling system has been drained and refilled after a radiator replacement. The engine reaches 200°F and the heater produces hot air. However, the customer returns one week later reporting that the coolant level has dropped below the MIN mark on the reservoir. There are no visible external leaks and the pressure test holds at 16 psi. What is the MOST likely explanation?

A. The new radiator has a defect in its internal tube joints that only leaks during thermal cycling after extended use

B. A head gasket breach was caused by the overheating that necessitated the original radiator replacement visit

C. Residual air pockets trapped during the refill are gradually working their way out of the system through the reservoir

D. The pressure cap's vacuum valve has failed and is not drawing coolant back from the reservoir during cooldown

22. A vehicle's A/C system produces a rhythmic thumping or knocking sound from the engine compartment every 2–3 seconds. The sound is present only when the compressor is engaged and the frequency does not change with engine RPM. Gauge pressures oscillate slightly in sync with the thumping. What is the MOST likely cause?

A. A worn serpentine belt that slips rhythmically on the compressor pulley producing a cyclic knocking vibration

B. A loose compressor mounting bracket that amplifies the normal compressor vibration into an audible knock

C. A failing compressor with broken reed valves that produce hydraulic shock during each compression stroke

D. Liquid slugging at the compressor inlet caused by a flooded evaporator sending liquid refrigerant into the suction

23. A vehicle has a heater performance complaint. The technician measures the following temperatures at the firewall heater hoses: supply hose 200°F, return hose 195°F. The engine coolant temperature is

205°F. The floor vent temperature is only 105°F. What does the small 5°F differential between the supply and return hoses indicate?

- A. The heater core has a restriction that is limiting flow, which should produce a large temperature differential
- B. Coolant is flowing quickly through the heater core but not enough heat is being transferred to the passing air
- C. The thermostat is partially stuck closed and the reduced flow is causing the small temperature differential
- D. The heater core has been bypassed and the warm return hose reading is from residual heat in the pipe

24. A technician is diagnosing an ATC system where the customer reports the system always blows cold air regardless of the temperature setting. The scan tool shows the blend door commanded to 0% (full cold) with the temperature set to 78°F. The in-car sensor reads 62°F and the ambient sensor reads 40°F. What is the MOST likely explanation for the module commanding full cold?

- A. The in-car sensor reading of 62°F is below the 78°F set point, but the module should be commanding heat — indicating a failed module or sensor
- B. The blend door actuator has failed at the full cold position and the module's command simply matches the stuck position
- C. The ambient temperature of 40°F triggers a cold-weather override that disables the blend door heating function
- D. The scan tool is displaying incorrect commanded position data due to a communication protocol mismatch

25. On a vehicle with electronic HVAC controls, the technician performs a blend door actuator calibration. During calibration, the scan tool displays "Calibration complete — range 5% to 92%." The expected range is 0% to 100%. What does this reduced calibration range MOST likely indicate?

- A. The new actuator's motor cannot generate enough torque to drive the blend door to its full mechanical endpoints
- B. The HVAC control module software has a calibration offset built in that intentionally limits the door's travel range

C. Physical obstructions or misalignment are preventing the blend door from reaching its full cold and full hot stops

D. Normal calibration results because manufacturing tolerances in the actuator gears always produce reduced travel

26. A vehicle has an A/C system that was working normally until a body shop repaired minor front-end damage and replaced the front bumper cover assembly. After the body shop work, the A/C vent temperature has risen from 42°F to 50°F. Gauge pressures show both the high-side and low-side are slightly higher than normal. What should the technician inspect?

A. The condenser for physical damage from the collision that the body shop may have missed during the repair

B. Whether the body shop reinstalled all condenser air deflectors, seals, and ducting that direct airflow through the condenser

C. The refrigerant charge level because the body shop may have accidentally disconnected a line and lost charge

D. The compressor mounting brackets for misalignment that the collision impact may have shifted out of position

27. Technician A says that an A/C system should be evacuated to a minimum of 500 microns before charging to ensure adequate moisture removal. Technician B says that if the micron gauge reading rises steadily past 1,500 microns during the vacuum decay test with the pump off, a leak is indicated. Who is correct?

A. Technician A only, because any reading that rises during the decay test simply indicates residual moisture boiling off

B. Technician B only, because the 500-micron target is outdated and modern systems only require 1,000 microns

C. Neither Technician A nor Technician B, because evacuation depth is determined by pump capacity not by microns

D. Both Technician A and Technician B are correct about the evacuation target and the vacuum decay leak indication

28. A vehicle's A/C system has the following condition: the low-side suction line is sweating (moist condensation on the surface) from the evaporator outlet to approximately 12 inches along the line toward the compressor. The remaining suction line to the compressor is dry and warm. There is no frost. System pressures and vent temperature are normal. What does this partial sweating pattern indicate?

- A. A refrigerant undercharge that is only partially filling the evaporator, causing cold refrigerant to only extend partway
- B. An air leak in the suction line that is introducing warm air and preventing the full line from reaching dew point
- C. Normal operation — the suction line is coldest near the evaporator outlet and gradually warms as it absorbs heat from the engine bay
- D. A partially restricted TXV that is not allowing adequate flow, creating a cold zone only near the evaporator outlet

29. A vehicle's scan tool shows the HVAC module commanding the A/C compressor clutch relay OFF. The A/C button is pressed. The ambient temperature is 82°F. The engine coolant temperature is 195°F. The evaporator temperature reads 36°F. The A/C pressure sensor reads 88 psi (normal static). What is preventing the module from commanding the relay ON?

- A. The evaporator temperature of 36°F is below the module's freeze protection threshold, preventing compressor engagement
- B. The A/C pressure sensor reading of 88 psi is at the lower boundary of the module's minimum engagement window
- C. The engine coolant temperature of 195°F has not reached the minimum threshold required for compressor authorization
- D. The ambient temperature of 82°F is triggering a low-ambient lockout feature programmed into the HVAC module

30. On a vehicle with electronic HVAC controls, the technician finds that all HVAC functions work correctly when tested with the scan tool bidirectional controls. However, no functions respond to any button on the dashboard control panel — temperature, fan speed, mode, A/C, and recirculation all produce no response. What is the MOST likely cause?

- A. Multiple simultaneous HVAC actuator failures that prevent all functions from responding to control panel inputs
- B. A CAN bus communication fault between the control panel and the HVAC module blocking all command signals
- C. A failed HVAC control module that can only execute commands from the scan tool diagnostic interface
- D. A faulty HVAC control panel assembly that is not transmitting any button press signals to the HVAC module

31. A vehicle has an A/C system where the condenser was replaced after a front-end collision. The new condenser is a parallel flow design with an integrated sub-cool section and receiver-drier. After proper evacuation and charging, the vent temperature reaches 42°F. Two weeks later, the customer returns with 48°F vent temperatures. The technician recovers 20 ounces from a 22-ounce system. What is the MOST probable leak source?

- A. A pinhole in the new condenser from a manufacturing defect that was not detectable during initial pressure testing
- B. An O-ring at one of the condenser fittings that was not properly lubricated or was pinched during installation
- C. The evaporator developing a coincidental leak at the same time the condenser was replaced during collision repair
- D. The compressor shaft seal that was disturbed by the pressure changes during the system recovery and recharge

32. A technician is testing the A/C compressor clutch coil circuit. With the clutch engaged and the system operating, the technician measures voltage at the clutch coil positive terminal and reads 11.4V. Battery voltage with the engine running is 14.2V. What does the 2.8V difference indicate?

- A. Excessive voltage drop in the power supply circuit between the battery and the clutch coil reducing current and magnetic force
- B. Normal voltage reduction that occurs as the clutch coil's electromagnetic field generates back-EMF during operation
- C. The charging system is not maintaining adequate output voltage under the combined load of all vehicle accessories

D. The clutch coil has developed a partial internal short that is pulling the supply voltage down at the connector

33. A vehicle's A/C system has been diagnosed with moisture contamination. The technician replaces the accumulator (which contains fresh desiccant), evacuates the system to 480 microns, and recharges with the specified amount of R-134a. One week later, the customer returns with intermittent cooling loss — the system works for 20 minutes, then stops cooling for 5 minutes, then resumes. What is the MOST likely cause?

A. The new accumulator's desiccant was defective and did not absorb the moisture present before the evacuation

B. A leak developed at the new accumulator fitting that is allowing atmospheric moisture to re-enter the system

C. Residual moisture remains in the system because the evacuation was insufficient to remove all contamination

D. The orifice tube has degraded from the original moisture exposure and should have been replaced during service

34. Technician A says that the purpose of the compressor's discharge service valve (Schrader valve) on the high-side port is to allow technicians to connect manifold gauges for pressure diagnosis. Technician B says that the suction service valve (Schrader valve) on the low-side port serves the same purpose and is also the port used for adding refrigerant during charging with the compressor running. Who is correct?

A. Technician A only, because refrigerant should only be added through the high-side port during charging procedures

B. Technician B only, because the high-side port is only used for recovery and should never be used for diagnosis

C. Neither Technician A nor Technician B, because Schrader valves serve as pressure relief devices not service access

D. Both Technician A and Technician B are correct about the diagnostic and service functions of the system service ports

35. On a vehicle with electronic HVAC controls, the A/C pressure sensor signal wire is shorted to the 5V reference wire inside the wiring harness. What reading will the HVAC module see and how will it respond?

- A. The module will see 0V and interpret this as zero system pressure, preventing compressor engagement for low-charge protection
- B. The module will see 5V (above the normal 0.5–4.5V range) and set a DTC while disabling the compressor for circuit protection
- C. The module will see 2.5V (mid-range) and interpret this as a normal operating pressure, allowing normal system function
- D. The module will see a rapidly fluctuating voltage that produces erratic compressor cycling and intermittent cooling

36. A vehicle's engine reaches operating temperature of 202°F. The heater supply hose at the firewall measures 200°F and the return hose measures 155°F. The customer complains of insufficient heater output. The floor vent temperature is 112°F. What does the 45°F differential between the supply and return hose temperatures indicate?

- A. The heater core is partially restricted — the coolant spends too long inside the core losing heat because flow rate is reduced
- B. Normal heater core operation with excellent heat transfer from the coolant to the air passing through the core fins
- C. The thermostat is stuck partially open and the reduced coolant flow is causing excessive heat loss at the core
- D. The water pump impeller is eroded and the reduced flow rate allows the coolant to lose too much heat in the core

37. A vehicle has an intermittent A/C complaint where the cooling stops for 10–15 seconds approximately every 5 minutes, then resumes. The compressor runs continuously during these events — it does not cycle off. The low-side pressure remains stable. The scan tool shows the blend door position jumping from 10% (near cold) to 65% (mid-range) during each warm event, then returning to 10%. What is the MOST likely cause?

- A. A refrigerant charge that is marginally low and causes intermittent evaporator starvation every few minutes
- B. A TXV that is hunting due to a poorly mounted sensing bulb on the suction line near the evaporator outlet
- C. An intermittent blend door actuator fault that is causing the door to shift position periodically without command
- D. The HVAC module intermittently receiving a false in-car sensor reading that causes it to command the door warmer

38. A vehicle's cooling fan runs continuously at high speed from the moment the engine is started on a cold morning. The engine coolant temperature sensor signal wire has been damaged by a rodent. The wire is shorted to battery voltage. What temperature does the module read from this shorted sensor circuit?

- A. The module reads 0°F (minimum temperature) because the voltage is pulled to the bottom of the NTC sensor range
- B. The module reads maximum temperature because the shorted-to-voltage signal drives the reading to its upper limit
- C. The module reads the actual coolant temperature because the short to voltage does not affect the NTC circuit function
- D. The module reads -40°F (default error value) because the voltage exceeds the expected sensor signal range

39. A vehicle's A/C system has been properly charged. The technician observes that when the A/C is first turned on, the low-side pressure drops quickly from the 90 psi static reading to 28 psi within 10 seconds. The high-side rises from 90 psi to 195 psi in the same period. The vent temperature drops to 42°F within 2 minutes. What do these rapid pressure changes upon initial engagement indicate?

- A. The compressor is developing excessive pressure differential that indicates an impending internal valve failure
- B. The rapid low-side drop and high-side rise indicate the orifice tube is partially restricted and creating back-pressure
- C. The quick response time suggests the system was recently overcharged and the excess mass responds faster than normal

D. The compressor is pumping effectively and the metering device is creating the correct pressure separation rapidly

40. On a vehicle with ATC, the driver sets the temperature to 72°F. The in-car sensor reads 95°F (vehicle was parked in the sun). The module commands: compressor ON, blend door 0% (full cold), blower HIGH, recirculation mode, panel vent delivery. As the cabin cools to 75°F, the module adjusts: blend door moves to 15%, blower drops to medium, switches to fresh air. What control strategy does this demonstrate?

A. Closed-loop proportional control where the module continuously adjusts output intensity based on the shrinking error between set and actual temperature

B. Open-loop programmed control where the module follows a fixed time-based sequence regardless of sensor feedback

C. Binary hysteresis control where the module alternates between full cooling and off based on temperature deadband

D. Feedforward predictive control where the module anticipates temperature changes before the sensor detects them

41. A vehicle's A/C system has been working normally for three years. The customer notices that the cabin takes longer to cool during the pull-down period than it did when the vehicle was new, but once cooled, the system maintains temperature correctly. Gauge readings during the pull-down show normal pressures. The vent temperature reaches 42°F after 8 minutes. What should the technician check?

A. The refrigerant charge for a marginal loss that reduces the system's total BTU capacity during high-demand pull-down

B. The compressor for reduced output capacity from internal wear that limits maximum cooling during initial pull-down

C. The cabin air filter and condenser face for gradual dirt and debris accumulation that reduces airflow through both components

D. The evaporator for internal corrosion that reduces heat transfer efficiency during the initial high-demand cooling phase

42. On a vehicle with electronic HVAC controls, the technician finds the following: the scan tool communicates with the HVAC module, all sensor readings appear normal, all actuators respond to

bidirectional commands, but the A/C compressor will not engage during normal operation or through the scan tool's bidirectional compressor test. The clutch relay does not click during either test. What should the technician check?

- A. The compressor clutch coil resistance to determine if the coil has developed an open circuit preventing engagement
- B. The HVAC module software version for a known calibration error that prevents compressor command in certain conditions
- C. The A/C refrigerant pressure for a zero-charge condition that the module does not display as a fault on the scan tool
- D. The relay and its circuit — fuse, power supply, and the wiring from the module's output to the relay coil terminals

43. A vehicle has been brought in for an annual A/C performance check. The system was last serviced 14 months ago. The technician recovers 21.5 ounces from a system specified at 22 ounces. No cooling complaints are present and the vent temperature reaches 42°F. What should the technician do with the recovered refrigerant?

- A. Dispose of the recovered refrigerant as contaminated since it has been in service for over a year and has degraded
- B. Evacuate the system and recharge with the same recovered refrigerant since 21.5 ounces is within normal tolerance
- C. Top off the system with 0.5 ounces of fresh refrigerant to bring the charge to the exact 22-ounce specification
- D. Blend the recovered refrigerant with fresh R-134a to ensure any degraded molecules are diluted below harm threshold

44. Technician A says that a cycling clutch orifice tube system prevents evaporator freeze-up by cycling the compressor off when the low-side pressure drops below a preset threshold. Technician B says that in a TXV system, evaporator freeze-up is prevented primarily by the TXV's ability to reduce refrigerant flow when the evaporator temperature drops. Who is correct?

- A. Technician A only, because TXV systems also rely on a separate freeze protection sensor rather than the TXV itself

B. Both Technician A and Technician B, because each system type uses the described method for freeze protection

C. Technician B only, because orifice tube systems use an evaporator temperature sensor rather than pressure-based cycling

D. Neither Technician A nor Technician B, because all modern systems use a defrost timer to prevent evaporator freeze

45. On a vehicle with electronic HVAC, the technician finds that the mode doors respond to all dashboard button presses except the BI-LEVEL selection. Pressing the BI-LEVEL button produces no change — the system stays in whatever mode was previously selected. All other modes — PANEL, FLOOR, DEFROST, and FLOOR/DEFROST — work correctly. What is the MOST likely cause?

A. A failed mode door actuator that cannot achieve the specific bi-level position required for split upper/lower delivery

B. An HVAC module software fault that has corrupted the bi-level mode mapping in its operating program logic

C. A mechanical obstruction inside the HVAC housing that prevents the mode door from reaching the bi-level position

D. A faulty BI-LEVEL button or its specific circuit on the control panel that is not sending the bi-level request signal

46. A vehicle's A/C system has normal gauge readings and a vent temperature of 43°F at 80°F ambient. The customer reports hearing a hissing or rushing sound from the center dashboard area immediately after the engine is shut off. The sound lasts approximately 45 seconds and then stops. What is this sound?

A. A refrigerant leak at the evaporator fitting that becomes audible when the blower motor noise stops at engine shutdown

B. Residual air movement through the HVAC ductwork as the blower fan coasts to a stop after the engine is turned off

C. Normal pressure equalization as high-side and low-side refrigerant pressures balance through the metering device

D. The evaporator condensation drain releasing accumulated water that was held by blower air pressure during operation

47. A vehicle's cooling system pressure cap is rated at 16 psi. The technician pressure tests the cap and it holds 16 psi without releasing. However, when the technician releases the tester pressure and allows the system to create a vacuum, the cap's vacuum valve does not open — coolant is not drawn back from the reservoir during cooldown. What will this failed vacuum valve cause over time?

- A. Gradually decreasing coolant level in the radiator as coolant is pushed out during heating but not drawn back during cooling
- B. Engine overheating because the vacuum prevents proper coolant circulation through the radiator during operation
- C. Heater core failure because the vacuum creates a pressure imbalance that stresses the core's internal tube joints
- D. No measurable effect because the vacuum valve is a redundant safety feature that is not essential for operation

48. Technician A says that the condenser should always be inspected for bent fins and cleaned of debris during any A/C performance complaint diagnosis. Technician B says that even 20–30% of the condenser face blocked by bent fins or debris can noticeably reduce cooling performance on hot days. Who is correct?

- A. Technician A only, because condenser blockage below 50% does not produce any measurable performance reduction
- B. Both Technician A and Technician B are correct about the importance of condenser inspection and the impact of blockage
- C. Technician B only, because condenser inspection is only necessary when gauge readings show abnormally high pressures
- D. Neither Technician A nor Technician B, because condenser condition has minimal impact on modern high-efficiency systems

49. A vehicle has a confirmed A/C refrigerant leak at the high-side service port Schrader valve. The technician replaces the Schrader valve core using a valve core removal tool that does not require full refrigerant recovery. After replacing the core, the technician verifies no leak at the port. What additional service step is important after this repair?

- A. Recover all refrigerant, evacuate the system, and recharge since the brief opening may have introduced moisture
- B. Add 2 ounces of refrigerant to compensate for the small amount lost during the Schrader valve core replacement
- C. Replace the service port cap with a new cap containing an O-ring seal as the primary environmental barrier
- D. Verify the system charge is still within specification by checking subcooling and superheat after the core replacement

50. A vehicle has an A/C system that was serviced 6 months ago. The customer reports that the cooling has gradually diminished. The technician recovers 17 ounces from a 22-ounce system — a loss of 5 ounces in 6 months. After performing a thorough leak test, the technician finds UV dye traces at the Schrader valve core on the low-side service port. What should the technician do?

- A. Replace the entire low-side service port assembly since the Schrader valve housing may also be damaged
- B. Tighten the service port cap more firmly since the cap O-ring is the primary refrigerant seal for the port
- C. Replace the Schrader valve core, install a new O-ring cap, evacuate the system, and recharge to specification
- D. Add 5 ounces of refrigerant to restore the full charge and monitor for continued loss over the next month

Practice Exam 16: Answer Key and Explanations

1. B — Both-sides-low pressures (18 psi low / 110 psi high) with rapid compressor cycling (8 seconds on, 25 seconds off) is the classic signature of a low refrigerant charge in a cycling clutch system. The compressor engages, quickly drops the already-low suction pressure below the cycling switch cutout threshold, disengages, and the pressure slowly creeps back up before the cycle repeats. The extended off-time (25 seconds) relative to on-time (8 seconds) confirms insufficient refrigerant mass to sustain normal operating pressures.

2. D — Both technicians correctly describe the dual functions of the receiver-drier. Technician A is right that the receiver-drier stores excess liquid refrigerant, acting as a buffer to ensure the TXV always receives a steady supply of liquid under varying load conditions. Technician B is right that the internal

desiccant absorbs moisture from the refrigerant — moisture that would otherwise freeze at the TXV's precision valve seat during metering, creating intermittent restrictions that disrupt cooling.

3. A — On this vehicle, the high-speed blower circuit uses a dedicated relay that bypasses the resistor block entirely. Speeds 1–3 work through the resistor block (proven functional), so the motor, ground, and lower-speed circuits are all good. The dedicated high-speed relay, its fuse, or the wiring from the control panel to the relay coil is the independent circuit that must be checked. The resistor block is not involved in the high-speed circuit at all.

4. C — A 4-ounce charge loss within three days of a condenser replacement points directly to a fitting or connection that was disturbed during the collision repair. The new condenser's inlet and outlet fittings, the liquid line and suction line connections, and any service port O-rings that were accessed during the service are the most likely leak sources. An improperly seated, pinched, or unlubricated O-ring at any of these recently assembled connections would produce exactly this rapid post-service charge loss.

5. B — The scan tool confirms the blend door is at 70% (near hot) and the feedback matches — the air management system appears to be functioning correctly. Engine coolant is at 205°F and the supply hose is hot, confirming adequate heat is available. Yet the vent temperature is only 85°F at a 70% blend position — significantly cooler than expected. A heater control valve stuck partially closed limits the volume of hot coolant flowing through the heater core, reducing the heat energy available even though the blend door directs air through the core.

6. D — Heat that works while driving but drops to lukewarm within 60 seconds of stopping — with the engine temperature remaining stable at 200°F — points to a water pump with an eroded impeller. At driving RPM, the faster pump speed compensates for the damaged impeller and pushes adequate coolant volume through the heater core. At idle's lower RPM, the reduced pump speed combined with the eroded impeller produces insufficient flow for full heat transfer. The stable engine temperature eliminates the thermostat as a cause.

7. A — Greenish-brown residue with green crystalline particles on the orifice tube screen — without metallic debris — is characteristic of deteriorated desiccant material from the accumulator. Molecular sieve desiccant beads break down over time, releasing bead fragments and dust that circulate with the refrigerant and collect on the orifice tube's screen. The green tint is typical of certain desiccant compositions. The accumulator must be replaced and the system flushed to remove circulating desiccant contamination.

8. B — With the heater core bypassed, the defrost system loses its ability to deliver heated air to the windshield. While the A/C compressor dehumidifies the air through the evaporator, the defrost function relies on warm air to both clear existing fog and maintain the windshield above the dew point. Cold dehumidified air alone may be insufficient to clear heavy fog or frost — especially in cold weather — because the cold air cools the glass further, potentially making condensation worse. The customer should understand this safety limitation.

9. C — A sun load sensor reading maximum voltage (4.5V) while the vehicle is in full shade tells the ATC module the vehicle is receiving intense solar radiation. The module adds cooling demand to compensate for the perceived solar heat load — commanding the compressor to run harder, the blower at higher speed, and the blend door toward colder positions than the actual conditions require. The cabin will be overcooled because the module is fighting a heat load that does not exist.

10. A — The system produces excellent cooling (42°F vent temperature) with normal pressures (40 psi low / 225 psi high at 86°F). The only symptom is continuous compressor operation without cycling. In a cycling clutch system, the compressor should cycle off when the low-side pressure drops to the cutout point (typically 23–28 psi). A low-side pressure that remains steady at 40 psi never reaches the cutout threshold, likely because the system is slightly overcharged — the excess refrigerant mass keeps the low side elevated.

11. D — A thermostat rated at 195°F that begins opening at 188°F is 7°F below its rated specification. While a $\pm 2^\circ\text{F}$ – 3°F tolerance is considered acceptable manufacturing variation, 7°F is significantly outside this range. A thermostat opening prematurely at 188°F allows coolant to reach the radiator before the engine warms fully, resulting in an engine that stabilizes at a lower-than-designed operating temperature. This reduced coolant temperature directly diminishes heater output, particularly in cold weather.

12. C — Heavy frost extending from the evaporator along the suction line and across the accumulator — with an evaporator temperature sensor reading 28°F (below the 32°F freeze protection threshold) — confirms the freeze protection system has failed. The evaporator temperature sensor or its circuit should be triggering the module to disengage the compressor before the evaporator drops below 32°F. A failed sensor reading warmer than actual, a stuck cycling switch, or a module fault allows overcooling that floods liquid into the suction line.

13. A — Performance that degrades progressively over extended highway driving and recovers after stopping and idling points to progressive condenser heat-soak. During sustained highway driving, the engine bay temperature steadily increases from engine heat, exhaust radiation, and road-surface radiation. This progressively warmer environment around the condenser reduces the temperature

differential needed for effective heat rejection, gradually raising high-side pressure and degrading cooling. At idle, reduced engine heat output and lower condenser loading allow recovery.

14. D — Several modern vehicles include an HVAC module feature that automatically engages the A/C compressor when the windshield wipers are activated. The logic is that rain conditions produce high humidity that fogs the windshield — engaging the compressor dehumidifies the air to maintain windshield clarity without requiring the driver to manually select defrost or A/C. This is a programmed convenience and safety feature, not a wiring fault or coincidental activation.

15. B — An OL (over limit / infinite resistance) reading between the clutch coil terminals with the connector unplugged indicates the coil winding has an internal open circuit — the wire inside the coil is broken. No current can flow through a broken winding regardless of the voltage applied, so the clutch cannot generate a magnetic field and will not engage. The coil or clutch assembly must be replaced.

16. C — A heater core that begins losing performance within one month of installation — with the supply hose running cooler than expected (170°F vs. 205°F engine temp) — indicates the core's internal passages are being restricted. A 35°F temperature drop between the engine and the supply hose suggests something is blocking flow before the coolant even reaches the core. If the cooling system was not properly flushed before installing the new core, residual corrosion, sludge, and deposits from the old system migrate to and progressively clog the new core.

17. A — Both technicians describe correct and important principles. Technician A is right that the refrigerant can should be held upright when charging through the low-side port with the compressor running — upright orientation releases vapor from the top of the can rather than liquid from the bottom. Technician B is right that liquid refrigerant entering the compressor's suction port creates hydraulic lock — the incompressible liquid slams against the pistons or scrolls, causing immediate mechanical damage to reed valves, connecting rods, or scroll elements.

18. D — The customer's complaint occurs during extended idling in hot traffic — conditions that cannot be replicated by brief shop testing at highway RPM. Running the engine at idle with the A/C on maximum for 20–30 minutes while monitoring gauge pressures and condenser fan operation simulates the stop-and-go traffic conditions that trigger the complaint. This extended idle test reveals whether the condenser fan fails to operate at high speed, runs intermittently, or cannot reject enough heat at idle airflow rates.

19. B — During hard acceleration uphill, the throttle is wide open and engine intake manifold vacuum drops near zero. The vacuum check valve between the manifold and the HVAC vacuum reservoir should

maintain stored vacuum for the actuators during these low-vacuum events. If the check valve has failed or the reservoir has a leak, the stored vacuum bleeds back to the manifold during WOT acceleration, depleting the supply to the mode door actuators. Without vacuum, the spring-loaded mode doors default to defrost position.

20. A — The HVAC module relies on ECM data to authorize compressor engagement — specifically engine RPM (confirming the engine is running), coolant temperature (confirming adequate warm-up and no overheating), and engine load data (for compressor cycling strategy). Without this data due to the CAN bus communication loss, the module cannot verify that conditions are safe for compressor operation and withholds the engagement command as a protective measure.

21. C — A coolant level that drops below MIN within one week of a drain-and-refill service — with no visible leaks and a pressure test that holds — is most commonly caused by residual air pockets working out of the system. Air trapped during the refill gradually migrates to the highest point and escapes through the degas bottle or reservoir, causing the coolant level to drop as liquid replaces the air voids throughout the engine block, heater core, and hoses. The level stabilizes permanently once all air is purged.

22. D — A rhythmic thumping synchronized with oscillating gauge pressures — present only when the compressor is engaged — indicates liquid refrigerant is intermittently entering the compressor. The compressor attempts to compress this incompressible liquid, producing hydraulic shock against the pistons or scrolls with each stroke. The thumping frequency does not change with engine RPM because it follows the compressor's internal cycling rate. A flooded evaporator from a stuck-open TXV or severe overcharge is the most common cause.

23. B — A supply hose at 200°F with a return hose at 195°F — only a 5°F differential — indicates coolant is flowing rapidly through the heater core without losing much heat. However, the floor vent temperature is only 105°F. The small temperature differential confirms adequate flow (eliminating restriction as a cause), but the low vent temperature means the heat is not being transferred to the air. The most likely cause is insufficient airflow through the core, a blend door not fully directing air through the heater core path, or a core with reduced external fin surface contact.

24. A — The in-car sensor reads 62°F — 16°F below the 78°F set point — meaning the cabin is significantly colder than desired. The module should be commanding heat (blend door toward hot) to warm the cabin up to 78°F, not commanding full cold. Yet the module commands 0% (full cold), which will make the cold cabin even colder. This contradictory behavior — commanding cooling when heating is needed — indicates either the HVAC module's control logic has failed or the in-car sensor data is being misinterpreted by the module.

25. C — A calibration range of 5%–92% instead of the expected 0%–100% means the blend door could not reach its full mechanical endpoints during the calibration sweep. The actuator hit a physical stop before reaching the electrical end-of-range in both directions. Physical obstructions inside the HVAC housing — dislodged foam, shifted components, misaligned door pivot, or debris — prevent the door from completing its full travel. The obstruction must be identified and cleared before recalibrating.

26. B — Both-sides-slightly-high pressures with a warmer vent temperature after body shop bumper cover replacement — on a system that was working normally before — points to a condenser airflow issue. Many vehicles use air deflectors, foam seals, and plastic ducting behind the bumper cover that direct incoming air through the condenser rather than around it. If the body shop did not reinstall these components correctly, some air bypasses the condenser, reducing heat rejection and raising both pressures.

27. D — Both technicians describe correct evacuation principles. Technician A is right that the system should be evacuated to a minimum of 500 microns — this vacuum depth ensures moisture boils at room temperature and can be extracted by the pump. Technician B is right that during the vacuum decay test (pump off, valves closed), a steadily rising reading past 1,500 microns indicates a leak — air is entering the system and the rising pressure cannot be explained by residual moisture alone, which would stabilize.

28. C — Sweating (moisture condensation on the outer surface) on the suction line near the evaporator outlet that gradually disappears along the line toward the compressor is normal operating behavior. The suction line is coldest where it exits the evaporator (closest to the cold refrigerant source) and gradually warms as it runs through the hot engine compartment absorbing ambient heat. The dew point is reached on the cold section near the evaporator but not on the warmer section closer to the compressor.

29. A — The evaporator temperature reads 36°F — which may be at or near the module's freeze protection threshold (typically 32°F–37°F depending on the vehicle manufacturer). The module prevents compressor engagement to protect the evaporator from freezing. All other parameters — ambient temperature, coolant temperature, A/C pressure, and A/C button status — are within normal engagement limits. The evaporator temperature signal is the specific parameter that is blocking the module from commanding the relay ON.

30. D — All actuators respond correctly to scan tool bidirectional commands, proving the HVAC module, the communication bus, and every actuator are functional. Every control panel button produces no response — temperature, fan, mode, A/C, and recirculation all fail simultaneously. This complete loss of all panel input while all downstream systems work eliminates individual actuator failures and

module faults. The control panel assembly itself has failed — its internal circuit board or communication interface is not transmitting any button press signals to the module.

31. B — A 2-ounce charge loss within two weeks of a condenser replacement points to a fitting disturbed during the service. The most common post-service leak source is an O-ring at one of the condenser's inlet or outlet connections that was pinched during installation, not properly lubricated with refrigerant oil, or was the wrong size. A new condenser manufacturing defect is possible but statistically far less likely than a technician-created connection leak. Focus the leak search on every joint that was assembled during the repair.

32. A — Battery voltage is 14.2V but only 11.4V reaches the clutch coil — a 2.8V loss in the power supply circuit. This far exceeds the maximum acceptable 0.5V total voltage drop for a power-side circuit. The 2.8V is being consumed by unwanted resistance somewhere between the battery and the clutch coil — a corroded fuse terminal, burned relay contacts, a high-resistance pressure switch, a damaged wire, or a loose connector. This reduced voltage produces less current through the coil, weakening the magnetic field.

33. C — The intermittent 20-minutes-on, 5-minutes-off cooling pattern is the classic symptom of moisture freezing at the metering device. Residual moisture that was not fully removed during the evacuation gradually freezes into an ice plug at the cold orifice tube or TXV, blocking refrigerant flow and stopping cooling. After 5 minutes without cold refrigerant flow, the ice melts, flow resumes, and cooling returns — repeating the cycle. The 480-micron evacuation was close to the 500-micron target but may not have been sustained long enough to fully extract all moisture.

34. D — Both technicians correctly describe the functions of the service port Schrader valves. Technician A is right that the high-side service valve allows connection of manifold gauges for pressure diagnosis of the discharge (high) side. Technician B is right that the low-side service valve serves the same diagnostic purpose and is also the port through which refrigerant vapor is added during charging with the compressor running — vapor enters the low-pressure suction side safely without risk of liquid slugging.

35. B — With the pressure sensor signal wire shorted to the 5V reference wire, the sensor signal is pulled to 5V — above the normal 0.5V–4.5V operating range. The module recognizes this out-of-range voltage as a circuit fault rather than a valid pressure reading. It cannot determine actual system pressure from the 5V signal, so it sets a DTC for the pressure sensor circuit and disables the compressor as a protective measure since it cannot verify safe operating conditions.

36. A — A 45°F differential between the supply hose (200°F) and the return hose (155°F) indicates the coolant is spending an abnormally long time inside the heater core, losing excessive heat because the flow rate is reduced. A properly flowing heater core typically shows a 20°F–40°F differential. The larger differential combined with only 112°F floor vent temperature confirms the heater core has a partial internal restriction — coolant passes through but at reduced volume, limiting total heat delivery despite the hot supply temperature.

37. C — The compressor runs continuously and low-side pressure remains stable — eliminating refrigerant system issues. The scan tool shows the blend door jumping from 10% (cold) to 65% (mid-range) during each warm event. This door position change explains the temperature fluctuation directly — when the door shifts to 65%, warm air mixes with the cold, raising the vent temperature. An intermittent blend door actuator fault — such as a loose connector, failing motor, or stripped gears that periodically skip — would produce these random position shifts.

38. B — In an NTC sensor circuit, a short to battery voltage on the signal wire drives the signal to maximum voltage. In an NTC voltage divider configuration, maximum voltage at the signal line corresponds to minimum resistance, which the module interprets as maximum temperature. The module sees what it believes is a dangerously high coolant temperature and commands the cooling fan to maximum speed as an emergency protective response — even though the engine is cold on startup.

39. D — The low-side pressure dropping quickly from 90 psi static to 28 psi within 10 seconds, while the high-side rises from 90 psi to 195 psi in the same period, demonstrates effective compressor operation. The compressor rapidly separates the balanced static pressures into the distinct high-side and low-side operating zones. The quick pressure separation confirms the compressor is pumping effectively and the metering device is creating the proper flow restriction. The 42°F vent temperature within 2 minutes confirms excellent overall system response.

40. A — The module starts with maximum output (compressor ON, full cold, high blower, recirculation) when the error between set temperature (72°F) and actual temperature (95°F) is large (23°F). As the cabin cools toward the target, the module proportionally reduces its output — moving the blend door warmer, reducing blower speed, and switching to fresh air. This continuous adjustment based on the shrinking error signal is the definition of closed-loop proportional control — output intensity matches the magnitude of the remaining error.

41. C — The system eventually reaches 42°F vent temperature with normal pressures — confirming the refrigeration system is functioning correctly. The only symptom is a longer pull-down time than when new. Over three years, the cabin air filter gradually accumulates dust and debris, reducing total airflow through the evaporator. The condenser face similarly collects road grime, bug residue, and debris

between the fins, reducing heat rejection capacity. Both forms of gradual contamination slow the initial pull-down without affecting steady-state performance.

42. D — The scan tool communicates with the module, sensors read normally, and actuators respond to bidirectional commands — the module's processor, inputs, and outputs all appear functional. Yet the compressor clutch relay does not click during either normal operation or bidirectional testing. Since the module should be commanding the relay during the bidirectional test, and the relay does not respond, the fault is in the circuit between the module and the relay — the relay itself (failed coil), the relay fuse, the power supply to the relay, or the wiring from the module's output terminal to the relay coil.

43. B — Recovering 21.5 ounces from a 22-ounce system represents only a 0.5-ounce difference — well within the normal tolerance of recovery machine measurement accuracy (typically ± 1 – 2 ounces) and the expected annual permeation loss through hoses and seals. The system cools well at 42°F with no complaints. The correct procedure is to evacuate the system and recharge with the same recovered refrigerant (assuming it passes purity testing), since the charge is essentially complete and the refrigerant has not degraded.

44. A — Technician A correctly describes how CCOT systems prevent freeze-up: the cycling clutch pressure switch (or evaporator temperature sensor) cycles the compressor off when the low-side pressure drops below a preset threshold corresponding to near-freezing evaporator temperature. Technician B is incorrect because while TXVs do reduce flow as evaporator temperature drops (the sensing bulb pressure decreases), most TXV systems still rely on a separate evaporator temperature sensor or freeze protection switch to prevent freeze-up — the TXV alone is not a reliable freeze protection mechanism.

45. D — All other mode positions (PANEL, FLOOR, DEFROST, FLOOR/DEFROST) work correctly, proving the mode door actuator, HVAC module, and communication pathway are functional. Only the BI-LEVEL selection produces no response. Since the actuator can physically reach all other positions, a mechanical obstruction at the bi-level position is unlikely. The isolated failure of a single button while all others work points to the BI-LEVEL button itself or its dedicated signal circuit on the control panel assembly.

46. C — A hissing or rushing sound from the dashboard area lasting approximately 45 seconds after engine shutdown — with the system cooling normally during operation — is the normal sound of refrigerant pressure equalization. When the compressor stops, the high-side pressure (typically 180–250 psi) and low-side pressure (typically 25–40 psi) equalize through the metering device. This pressure-driven flow through the orifice tube or TXV produces an audible hiss until both sides reach equilibrium, typically within 30–90 seconds.

47. A — The vacuum valve (negative pressure valve) on the cap should open during cooldown to allow atmospheric pressure to push coolant from the reservoir back into the radiator as the cooling system contracts. Without this valve functioning, air enters the cooling system instead of coolant during each cooldown cycle. Over time, the coolant level in the radiator progressively drops (pushed out during heating but not replaced during cooling) while the reservoir level rises, eventually causing air pockets and potential overheating.

48. B — Both technicians describe important diagnostic principles. Technician A is right that the condenser should be inspected for physical condition and cleanliness during any A/C performance complaint — it is the most exposed and vulnerable heat exchanger in the system. Technician B is right that even 20–30% condenser face blockage from bent fins or debris can measurably reduce cooling performance, particularly on hot days when the condenser is already operating near its maximum capacity.

49. D — After replacing the Schrader valve core (which may have allowed a small amount of refrigerant to escape during the procedure), the most important follow-up step is verifying the system charge is still within specification. Checking subcooling and superheat confirms whether the remaining charge is adequate for proper system operation. If both values are within normal range, no additional refrigerant is needed. If either value is outside specification, a measured amount of refrigerant should be added to restore the correct charge.

50. C — UV dye traces at the low-side Schrader valve core confirm this as the leak source. The Schrader valve core must be replaced to seal the leak. A new service port cap with an intact O-ring seal should be installed as the primary environmental barrier. After the core replacement, the system must be evacuated (to remove any air and moisture that entered through the leak over six months) and recharged with the full specified amount of pure R-134a by weight.