PRACTICE EXAM 13: ASE A7 SIMULATION (50 QUESTIONS)

1. A technician is diagnosing an A/C performance complaint on a vehicle with a TXV system. The manifold gauges show low side 22 psi, high side 195 psi at 86°F ambient. The suction line at the evaporator outlet is slightly warm rather than cold. Superheat measures 25°F. The system charge was verified correct by weight. What is the MOST likely cause?

A. A condenser fan operating at reduced speed that is not rejecting adequate heat from the high side

B. An overcharged system where excess refrigerant is flooding the evaporator and raising the suction temperature

C. A restricted TXV that is not allowing adequate refrigerant flow into the evaporator, causing excessive superheat

D. A worn compressor with bypassing reed valves that cannot maintain the necessary pressure differential

2. Technician A says that when a compressor fails catastrophically, the entire system must be flushed or the non-flushable components replaced to remove debris before installing a new compressor. Technician B says that simply replacing the compressor and the accumulator or receiver-drier is sufficient after any compressor failure. Who is correct?

A. Technician B only, because the accumulator or receiver-drier filters any debris released by the failed compressor

B. Technician A only, because residual debris left in the system will destroy the replacement compressor rapidly

C. Both Technician A and Technician B, because the correct approach depends on the severity of the failure

D. Neither Technician A nor Technician B, because compressor debris does not damage other system components

3. On a vehicle with electronic HVAC controls, the blower motor does not operate on any speed setting. The technician checks the blower fuse and finds it blown. After replacing the fuse, the blower works normally for two days, then the fuse blows again. What should the technician investigate?

A. The HVAC control module for a software error that is commanding excessive blower speed and overcurrent

B. The blower motor relay for welded contacts that bypass the speed controller and cause overcurrent conditions

C. The cabin air filter for heavy debris loading that creates aerodynamic resistance and increases motor current

D. The blower motor for excessive current draw from worn brushes, shorted windings, or a dragging bearing

4. A vehicle's A/C system produces a vent temperature of 48°F at 90°F ambient. The customer insists the system should produce 38°F air. The technician's performance test shows: low side 36 psi, high side 230 psi, subcooling 15°F, superheat 11°F. All readings are within manufacturer specifications. What should the technician do?

A. Document the test results and explain to the customer that the system is performing within its designed specifications

B. Add 2 ounces of refrigerant to lower the vent temperature closer to the customer's expected 38°F target

C. Replace the orifice tube since even minor restriction could account for the 10°F difference from expectations

D. Clean the condenser thoroughly since even slight debris accumulation may reduce performance measurably

5. A vehicle with automatic temperature control has a DTC stored: U0155 — Lost Communication with HVAC Control Module. The scan tool cannot communicate with the HVAC module, but it communicates normally with the ECM, BCM, and all other modules. What is the MOST likely cause?

A. A complete CAN bus failure affecting all modules on the vehicle's communication network simultaneously

B. A failed scan tool adapter that is selectively blocking communication with the HVAC module's address

C. A failed body control module that serves as the communication gateway for all HVAC-related data

D. A fault specific to the HVAC module or its individual connection to the CAN bus network

6. A vehicle's heater produces adequate heat when driving at highway speed but the heat output drops significantly at idle. The engine temperature gauge shows 200°F at highway speed and 195°F at idle. Both heater hoses are hot at highway speed. At idle, the supply hose is hot but the return hose is noticeably cooler. What is the MOST likely cause?

A. A stuck-open thermostat that allows excessive coolant flow to the radiator at idle reducing heater supply

B. A partially restricted heater core that passes adequate flow at higher pump speed but restricts at idle flow rate

C. A failing water pump seal that allows air into the pump housing and reduces efficiency at low RPM only

D. A faulty engine temperature sensor that reads higher than actual at highway speed and lower at idle speeds

7. A technician is inspecting the orifice tube removed from a vehicle during an A/C service. The inlet screen has a thin coating of white crystalline material. No metallic particles are present. What does this white crystalline deposit MOST likely indicate?

A. Desiccant breakdown from the accumulator, where the desiccant bag has deteriorated and released bead material

B. Normal mineral deposit accumulation from the manufacturing process that occurs in all orifice tube systems

C. Refrigerant oil that has crystallized due to exposure to extremely cold temperatures during system operation

D. Calcium and scale buildup from coolant that has leaked into the A/C system through a shared heat exchanger

8. On a vehicle with electronic HVAC controls, the scan tool shows the following: blend door commanded 0% (full cold), blend door actual 0%, evaporator temp 36°F, compressor ON. The vent temperature from the center vent measures 62°F. All scan tool readings verified accurate with independent instruments. What is the MOST likely cause of the warm vent temperature?

A. A failed evaporator temperature sensor reading colder than actual, which is limiting compressor operation

B. A refrigerant undercharge that is preventing the evaporator from reaching its optimal cooling temperature

C. A heater control valve stuck open, allowing hot coolant to add unwanted heat to the air despite the cold blend position

D. A blend door actuator with stripped gears reporting false position feedback that matches the command signal

9. A vehicle's coolant reservoir cap is rated at 16 psi. The technician performs a pressure cap test and the cap releases pressure at 10 psi instead of 16 psi. What effect could this weak cap have on the vehicle's heating performance?

A. The lower system pressure reduces the coolant's boiling point, potentially allowing localized boiling that reduces heater core flow

B. The weak cap increases coolant flow rate through the heater core, which paradoxically reduces heat transfer time

C. The cap pressure has no effect on heating because the heater core operates on gravity flow not system pressure

D. The weak cap causes the water pump to cavitate continuously, reducing overall coolant circulation volume

10. A vehicle's A/C compressor engages and operates normally. However, the scan tool shows DTC P0530 — A/C Refrigerant Pressure Sensor Circuit. The scan tool live data shows the A/C pressure reading fluctuating between 0 psi and 350 psi randomly while the system operates normally with stable manifold gauge readings. What is the MOST likely cause?

A. The compressor's internal pressure pulsations are causing the sensor to read erratically at the mounting point

B. The manifold gauge set is dampening the actual pressure fluctuations that the faster sensor accurately detects

C. The HVAC control module is misprocessing the raw sensor voltage and producing calculated errors in the display

D. A faulty pressure sensor or its wiring that is producing an unstable signal due to an intermittent electrical fault

11. A vehicle's A/C system uses R-134a. The technician charges the system with 22 ounces by weight after a leak repair and evacuation. The system cools well initially. After one hour of continuous operation, the technician rechecks and finds the vent temperature has risen from 42°F to 46°F. The gauges show the high side has risen 15 psi from the initial reading. What is the MOST likely explanation?

A. Normal system behavior as the engine compartment and condenser heat-soak during extended operation

B. A recurring leak at the repaired fitting that is already allowing refrigerant to escape from the system

C. The compressor is losing internal efficiency as it heats up during prolonged operation under full load

D. Non-condensable gases that were introduced during charging are expanding as the system reaches temperature

12. A vehicle has an A/C system where the compressor clutch pulley wobbles visibly while spinning. The engine is running but the A/C is turned off. The wobble is approximately 1/8 inch of lateral movement visible at the pulley rim. What component has MOST likely failed?

A. The compressor mounting bracket has loosened, allowing the entire compressor body to shift on its mounts

B. The serpentine belt has stretched unevenly, causing one side of the belt to pull harder and tilt the pulley

C. The compressor shaft is bent from an internal mechanical failure that occurred during the last operation

D. The clutch pulley bearing has failed and is allowing excessive radial and axial play in the pulley assembly

13. A technician is diagnosing a vehicle where the A/C compressor clutch engages when a jumper wire is used to bypass the clutch relay, but does not engage during normal operation. The scan tool shows the HVAC module is commanding the relay ON. The technician measures 12.4V at relay terminal 86 and 0.3V at terminal 85 with the A/C requested. The relay does not click. What is the MOST likely cause?

A. The relay coil ground signal at terminal 85 is too high at 0.3V and indicates excessive module driver resistance

B. The relay coil has failed open internally — power and ground are present but no current flows through the coil

C. The HVAC module's relay driver circuit has failed and is not providing adequate ground for the relay coil

D. Terminal 86 voltage is insufficient because 12.4V is below the minimum 12.6V required for relay activation

14. A vehicle's cooling system was recently flushed and refilled. The customer returns complaining of a gurgling noise behind the dashboard and intermittent loss of heater output. The engine temperature gauge reads normally. What is the MOST likely cause?

A. The thermostat was damaged during the flush procedure and is sticking intermittently between positions

B. Air pockets trapped in the heater core during the refill procedure that are intermittently blocking coolant flow

C. The new coolant type is incompatible with the vehicle's heater core material and is generating gas bubbles

D. A failed water pump impeller that broke during the flushing procedure and is now restricting flow intermittently

15. On a vehicle with vacuum-operated mode doors, the technician connects a hand vacuum pump to the panel mode actuator and applies 18 inches of vacuum. The actuator moves the door to the panel position. After releasing the pump, the vacuum holds at 18 inches for over 5 minutes without any decay. The technician then checks the floor mode actuator using the same procedure. This actuator also holds vacuum perfectly. Yet the mode selection does not change between panel and floor during normal operation. What is the MOST likely cause?

A. Both actuator diaphragms have stiffened with age and require more vacuum than the engine can provide

B. The vacuum supply hose from the engine to the HVAC system has a restriction that limits vacuum delivery

C. The HVAC control panel's vacuum switching valve is not routing vacuum correctly between the two actuators

D. The vacuum reservoir has a crack that prevents adequate vacuum storage for simultaneous actuator operation

16. A vehicle's engine temperature stabilizes at 185°F on a cold winter day. The manufacturer specifies a 195°F thermostat. The customer complains of marginal heater output. The technician replaces the thermostat with a new 195°F unit. After the repair, the engine reaches 198°F and the heater produces excellent heat. What was wrong with the original thermostat?

A. The original thermostat had failed partially open or was the wrong rating, allowing premature coolant flow to the radiator

B. The original thermostat's wax element had expanded due to contamination and was opening at a higher temperature

C. The original thermostat was installed backward, which reversed the sensing direction and caused early opening

D. The radiator was partially restricted, which raised system pressure and caused the thermostat to open prematurely

17. A vehicle has an A/C system with the following condition: the compressor clutch engages and runs continuously. Low-side pressure is 45 psi and high-side is 48 psi at 82°F ambient. The vent temperature is ambient — no cooling at all. What does this nearly equalized pressure pattern with a running compressor indicate?

A. A massively overcharged system where liquid refrigerant has filled both sides and equalized all pressures

B. A completely blocked condenser that is preventing any refrigerant from flowing through the high-side circuit

C. A compressor with total internal failure — no compression is occurring despite the shaft turning with the clutch

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

18. A vehicle with electronic HVAC controls has a DTC B0228 — Blend Door Actuator Circuit Malfunction. The scan tool bidirectional test commands the blend door from 0% to 100%. The motor is heard running faintly but the position feedback stays fixed at 12% throughout the sweep. What is the MOST likely cause?

A. A failed HVAC control module that cannot send sufficient current to drive the actuator at full power output

B. A seized blend door inside the HVAC housing that the actuator motor cannot overcome despite running

C. A wiring fault between the module and actuator that reduces the motor's voltage below operational level

D. Stripped gears inside the actuator that allow the motor to spin without driving the output shaft or feedback

19. A vehicle has been in storage for two years. The owner starts the vehicle and turns on the A/C. The compressor clutch does not engage. The static pressure reads 30 psi at 75°F ambient. Normal static pressure at this temperature should be approximately 80–85 psi. What should the technician do FIRST?

A. Perform a thorough leak detection procedure since the low static pressure confirms significant refrigerant loss

B. Add refrigerant to bring the static pressure up to normal so the low-pressure switch will allow engagement

C. Replace the compressor since two years of inactivity has likely caused the internal seals to dry out and fail

D. Replace the low-pressure switch since it may have failed in the open position during the storage period

20. On a vehicle with dual-zone ATC, the driver side blows cold air at 40°F from the panel vents. The passenger side blows warm air at 82°F from the panel vents. Both zones are set to 72°F. The scan tool shows the driver blend door at 5% and the passenger blend door at 5%. Both actual positions match their commands. What is the MOST likely cause?

A. The driver-side blend door actuator is reporting an accurate position but the passenger-side feedback is false

B. The passenger-side blend door actuator has a disconnected output shaft — it reports 5% but the door is at full hot

C. A failed passenger-side in-car temperature sensor reading colder than actual, causing the module to undercommand cooling

D. An evaporator that is cooling unevenly, producing colder air on the driver side and warmer air on the passenger side

21. A vehicle's A/C system has the following readings at 95°F ambient: low side 50 psi, high side 330 psi. The condenser fan is operating at high speed. The condenser face is clean. The system was recently recharged. Vent temperature is 58°F. What is the MOST likely cause of these elevated pressures?

A. A restricted evaporator that is preventing adequate airflow and causing heat to build up in the refrigerant circuit

B. A failed compressor with bypassing internal valves that allow high-side pressure to feed back to the low side

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

D. An overcharge of refrigerant or non-condensable gases introduced during the recent charging procedure

22. A technician is performing an A/C performance test. The ambient temperature is 80°F, the engine is at 1,500 RPM, and the blower is on high with all doors open. The manifold gauges read low side 30 psi and high side 190 psi. The center vent temperature is 43°F. The technician then closes all doors and windows and switches the system to recirculation mode. After 5 minutes, the vent temperature drops to 38°F. What does this change demonstrate?

A. Recirculation mode recycles cooler cabin air rather than continuously conditioning hot outside air, improving efficiency

B. Closing the doors reduced engine load which allowed the compressor to operate more effectively at the same RPM

C. The evaporator performs better with the increased humidity that builds up inside the cabin with doors closed

D. The change is coincidental and within the normal measurement variation that occurs during any extended test

23. A vehicle's A/C system has been properly evacuated. The vacuum pump achieved 450 microns. After closing the manifold valves and turning off the pump, the micron gauge reading rises to 600 microns within 2 minutes and then holds steady at 600 microns for the next 10 minutes. What should the technician conclude?

A. A small leak exists that is allowing air to enter the system at a rate that produces the 150-micron rise observed

B. The vacuum pump is failing and could not maintain its rated vacuum depth during the hold portion of the test

C. A small amount of residual moisture boiled off and stabilized — the system passed the vacuum decay test

D. The system must be re-evacuated for a minimum of 2 additional hours to remove the remaining contamination

24. A vehicle's A/C compressor produces a chirping noise that occurs only for 1–2 seconds each time the compressor clutch engages, then stops. The noise repeats with every clutch cycle. The belt is six months old and the tensioner was recently replaced. What is the MOST likely cause?

A. A worn clutch friction surface that briefly slips during the initial engagement torque before the magnetic field seats fully

B. A contaminated belt surface from an oil leak that reduces friction specifically at the compressor pulley location

C. Normal engagement noise that all electromagnetic clutches produce when the hub contacts the spinning pulley

D. A weak automatic belt tensioner that allows momentary slip under the sudden load increase of clutch engagement

25. On a vehicle with electronic HVAC controls, the technician performs a blend door actuator calibration through the scan tool after replacing the actuator. The calibration process starts but the scan tool displays "calibration failed — unable to find cold stop." What does this message MOST likely indicate?

A. The new actuator motor is defective and cannot generate sufficient torque to drive the door to its endpoints

B. The blend door is physically obstructed or jammed, preventing the actuator from driving it to the full cold position

C. The scan tool software is incompatible with the new actuator's communication protocol and cannot read endpoints

D. The HVAC control module needs to be reprogrammed before it can recognize the replacement actuator's range

26. A vehicle's A/C system was charged to the manufacturer's 20-ounce specification. The vent temperature is 44°F at 82°F ambient. The technician measures subcooling at 12°F and superheat at 10°F. Both values fall within normal range. What can the technician confirm from these measurements?

A. The compressor is operating at peak efficiency and does not need replacement within the next 12 months

B. The condenser fan speed is optimal and is providing exactly the correct airflow for the ambient conditions

C. The system charge is correct, the condenser is producing adequate liquid, and the evaporator is receiving proper flow

D. The cabin air filter is clean and unrestricted because a dirty filter would cause both readings to be abnormal

27. A vehicle with ATC has the following complaint: the system maintains temperature correctly in all conditions, but the customer hears a faint continuous whirring sound from behind the dashboard that was not present when the vehicle was new. The sound does not change with blower speed, temperature setting, mode, or A/C on/off status. What is the MOST likely source?

A. The in-car temperature sensor aspirator fan motor wearing over time and producing audible noise during operation

B. A blend door actuator motor that is continuously hunting to maintain its commanded position against door pressure

C. The evaporator making refrigerant flow noise that has increased as internal passages have partially restricted

D. A cabin air filter that has become slightly misaligned and is vibrating in the airflow at a specific resonance

28. Technician A says that when checking the compressor clutch air gap, measurements should be taken at 3–4 equally spaced points around the hub circumference to verify uniformity. Technician B says that if the air gap exceeds specification, removing shims from behind the hub will move the hub closer to the pulley and reduce the gap. Who is correct?

A. Technician A only, because adding shims — not removing them — is the correct method to reduce the air gap

B. Both Technician A and Technician B are correct about the measurement technique and the gap adjustment method

C. Technician B only, because a single-point measurement at the most accessible location provides adequate data

D. Neither Technician A nor Technician B, because the air gap is factory-set and is not adjustable in the field

29. A vehicle's cooling system uses OAT (orange) coolant. The customer has been adding IAT (green) coolant to top off the level over the past year. The heater performance has gradually decreased. The technician opens the coolant reservoir and finds the fluid has a muddy brown appearance with visible gel-like clumps. What is the correct repair procedure?

A. Add a cooling system chemical flush additive and run the engine for 30 minutes to dissolve the gel deposits

B. Simply drain the contaminated coolant, refill with the correct OAT type, and monitor heater performance

C. Thoroughly flush the entire cooling system including the heater core, refill with the correct OAT coolant type

D. Replace the heater core since the gel contamination has permanently restricted the internal flow passages

30. A vehicle's A/C compressor runs continuously in a cycling clutch orifice tube system. The low-side pressure is steady at 40 psi and the high-side reads 225 psi at 88°F ambient. The vent temperature is 42°F. The customer reports the compressor never shuts off. What is the MOST likely cause?

A. The cycling clutch pressure switch has failed with its contacts welded closed, preventing the compressor from cycling off

B. The system is significantly overcharged, keeping the low-side pressure perpetually above the switch cutout point

C. The orifice tube has a partial restriction that maintains constant low-side pressure above the switch threshold

D. Normal system operation because some ambient conditions and system designs produce continuous operation

31. A vehicle's A/C system was working normally until the vehicle was involved in a minor rear-end collision. After the collision, the rear auxiliary A/C system produces no cooling. The front system continues to work normally with correct gauge pressures. What should the technician inspect FIRST?

A. The rear A/C electrical connections for damage from the collision impact in the rear of the vehicle

B. The rear refrigerant lines running under the vehicle for kinks, dents, or disconnections caused by the impact

C. The compressor for reduced output capacity that may not be sufficient to serve both systems after damage

D. The total refrigerant charge level since the impact may have caused a leak that depleted the shared charge

32. On a vehicle with electronic HVAC controls, the A/C compressor cycles off every time the throttle is pressed to the floor for wide-open-throttle acceleration. The compressor re-engages when the driver lifts off the throttle. No DTCs are stored. What is the MOST likely explanation?

A. An intermittent low-pressure cutout switch that trips during the vibration of wide-open-throttle engine operation

B. A failing A/C clutch relay that cannot maintain contact under the engine vibration of full-throttle acceleration

C. A high-pressure cutout that trips due to elevated condenser pressure from reduced airflow during acceleration

D. Normal module programming that disengages the compressor during WOT to provide maximum engine power to the drivetrain

33. A vehicle's A/C system produces a rhythmic pulsating sound from the dashboard area. The pulse rate is approximately once per second and does not change with blower speed. The compressor is engaged and gauge readings are normal. The sound stops when the A/C compressor is turned off. What is the MOST likely source of this pulsation?

A. Compressor discharge pressure pulsations being transmitted through the refrigerant lines to the evaporator inlet

B. The evaporator condensation drain tube vibrating in resonance with the compressor's discharge frequency

C. A refrigerant overcharge causing liquid slugs to circulate periodically through the evaporator passages

D. The blend door actuator vibrating in response to electrical noise from the compressor clutch coil circuit

34. Technician A says that the purpose of the refrigeration cycle's condenser is to reject heat from the refrigerant into the outside air. Technician B says that the condenser converts high-pressure refrigerant vapor into high-pressure liquid through the process of condensation. Who is correct?

A. Technician A only, because the condenser does not actually cause a phase change in the refrigerant

B. Technician B only, because heat rejection at the condenser is a secondary effect rather than its primary purpose

C. Both Technician A and Technician B are correct — the condenser rejects heat, causing the refrigerant to condense

D. Neither Technician A nor Technician B, because the condenser's purpose is to lower refrigerant pressure

35. A vehicle's scan tool HVAC data shows the blend door actuator commanded to 30% and the actual feedback at 30%. The evaporator temperature is 37°F. The heater core inlet hose temperature is 200°F. The vent temperature from the center vent is 58°F. The customer has the temperature set to 72°F with the in-car sensor reading 80°F. Is the system operating correctly?

A. Yes — the module is blending cold evaporator air with warm heater core air to produce a 58°F outlet that will gradually cool the 80°F cabin toward the 72°F set point

B. No — the blend door should be at 0% full cold because the cabin is 8°F warmer than the set temperature

C. No — the vent temperature of 58°F is too warm and indicates a restricted evaporator or low refrigerant charge

D. Yes — but only if the vehicle has a variable displacement compressor operating at reduced output by design

36. A vehicle's heater produces excellent heat from the floor vents. However, when the driver selects defrost mode, the windshield clears fog on the driver side but not the passenger side. The blower motor operates at full speed in defrost. What is the MOST likely cause?

A. A disconnected or collapsed defrost duct on the passenger side that prevents heated air from reaching that area

B. A blocked or misdirected defrost outlet on the passenger side preventing air from contacting the glass surface

C. The heater core is cooling unevenly, with the driver side receiving hotter coolant than the passenger side

D. A cracked windshield on the passenger side that allows outside air to re-fog the glass as fast as defrost clears it

37. A vehicle's HVAC system has the following condition: the mode door actuator has been replaced twice in the past six months. Both replacements failed with stripped gears. The door moves to the commanded position but the gears strip within weeks. What underlying condition is MOST likely causing the repeat actuator failures?

A. Incorrect replacement actuators that have a lower gear strength rating than the OEM original design

B. A contaminated LIN bus signal that causes the actuator motor to run erratically and overload the gears

C. Excessive blower motor vibration being transmitted through the HVAC housing to the actuator mounting point

D. A binding or seized mode door pivot that requires excessive force for the actuator to move the door

38. A vehicle's A/C system uses R-1234yf. The technician has properly identified the refrigerant and is ready to recover it. All of the following statements about servicing this system are correct EXCEPT:

A. The recovery machine must be certified to SAE J2843 and include a built-in refrigerant identifier

B. The recovered R-1234yf can be recycled and reused in the same type of vehicle system it was recovered from

C. The service fittings on R-1234yf systems are unique and different from both R-12 and R-134a designs

D. R-1234yf can be safely recovered using R-134a equipment if the technician purges the machine's hoses first

39. Technician A says that a heater core flush should be attempted before committing to the expensive labor of heater core replacement. Technician B says that a heater core that has an internal leak cannot be repaired by flushing and must be replaced. Who is correct?

A. Technician A only, because modern flushing techniques can seal small internal leaks as well as clear restrictions

B. Both Technician A and Technician B are correct — flushing addresses clogs while replacement addresses leaks

C. Technician B only, because flushing a heater core has no effect on flow restriction and is a waste of time

D. Neither Technician A nor Technician B, because all heater core problems require immediate replacement

40. On a vehicle with ATC, the scan tool shows the following data: set temperature 72°F, in-car sensor 72°F, ambient sensor 85°F, evaporator temp 37°F, blend door at 18%. The customer reports the system cycles between cold air and warm air every 3–4 minutes, making the cabin uncomfortable. Which scan tool parameter should the technician monitor to identify the cause?

A. The high-side A/C pressure to determine if condenser performance is fluctuating under varying heat loads

B. The sun load sensor voltage to see if solar radiation changes are causing the module to adjust cooling demand

C. The blend door position over time to determine if the door is oscillating between positions in a hunting pattern

D. The compressor clutch command to see if the module is cycling the compressor on and off at unusual intervals

41. A vehicle's A/C system has a slow refrigerant leak that has been difficult to locate. The technician has performed multiple electronic leak detection scans and UV dye inspections over three service visits without finding the source. The system loses approximately 3 ounces per month. What is the MOST effective next diagnostic step?

A. Remove an access panel near the evaporator and insert an electronic detector probe directly into the HVAC housing

B. Pressurize the system to 250 psi with nitrogen to force the leak rate higher and make detection easier

C. Replace all O-rings at every fitting as a shotgun repair since the leak must be at one of the connection points

D. Install a new cabin air filter since a dirty filter can create airflow that disperses refrigerant vapor from the leak

42. A vehicle's scan tool shows the engine coolant temperature at 200°F while the HVAC module's coolant temperature input reads 165°F. Both readings are from the same vehicle at the same time. What could explain this discrepancy?

A. The two modules are reading the same sensor but applying different calibration offsets in their software

B. The scan tool is malfunctioning and displaying an incorrect value for one of the two temperature readings

C. The two modules may read different coolant temperature sensors located at different points in the cooling circuit

D. The HVAC module processes the signal more slowly and is displaying a delayed reading from minutes earlier

43. Technician A says that the serpentine belt should be checked for wear using a belt wear gauge that measures rib depth because EPDM belts wear by losing rib material rather than developing visible cracks. Technician B says that if a serpentine belt shows no visible cracks, it is in good condition and does not need replacement regardless of mileage. Who is correct?

A. Both Technician A and Technician B, because visual inspection and gauge measurement are equally reliable

B. Technician A only, because EPDM belts can be worn beyond specification without any visible cracking

C. Technician B only, because modern EPDM belts are designed to crack before they wear below rib specification

D. Neither Technician A nor Technician B, because belt replacement should be based solely on mileage intervals

44. A vehicle has an A/C system that cools well from the dashboard vents but the customer reports warm air from the rear auxiliary system vents. The front gauges show normal pressures. The rear blower operates at all speeds. The technician checks the rear expansion valve and finds heavy frost on the inlet fitting but no frost on the outlet. What does this frost pattern indicate?

A. The rear TXV is stuck open and flooding the rear evaporator with more refrigerant than it can evaporate

B. The front system is stealing all the refrigerant flow and the rear is receiving only a trickle at the inlet

C. Normal rear system operation during the initial pull-down phase when the rear cabin is extremely warm

D. A restriction at the rear TXV inlet that is creating a localized pressure drop and temperature drop at that point

45. A vehicle's ATC system maintains the set temperature correctly in AUTO mode. The customer reports that when switching from AUTO to manual blower speed control, the vent temperature changes noticeably. What is the correct explanation?

A. In manual blower mode, the module may not compensate blend door position as precisely because the driver overrode the fan speed

B. The blower motor controller operates differently in manual versus AUTO mode, producing different actual motor speeds

C. The HVAC control module disables temperature regulation entirely when the driver selects manual blower speed

D. Manual blower selection bypasses the electronic controller and routes power directly through the resistor block

46. A vehicle's A/C system has been diagnosed with a condenser leak from stone damage. The technician orders a replacement condenser. Before installing the new condenser, what should the technician verify about the replacement part?

A. That the replacement condenser uses the same refrigerant type rating as the original equipment component

B. That the replacement condenser includes a new receiver-drier if the original was an integrated sub-cool design

C. That the replacement condenser has the same tube and fin design type as the original for proper fitment

D. All of the above — refrigerant rating, receiver-drier inclusion if integrated, and physical design compatibility

47. A vehicle with an orifice tube system has the compressor clutch cycling every 8–10 seconds. The vent temperature fluctuates between 42°F and 50°F with each cycle. Low-side pressure cycles between 22 psi (clutch off) and 44 psi (clutch on). Ambient temperature is 82°F. What should the technician conclude?

A. The system has a low refrigerant charge that is causing the cycling rate to be faster than normal specifications

B. The pressures, temperatures, and cycling rate are within normal operating parameters for this system type

C. The cycling clutch switch needs replacement because the cutout pressure of 22 psi is too low for these conditions

D. The compressor has worn internal components that cannot maintain adequate low-side pressure between cycles

48. A technician is performing an A/C system evacuation. After 30 minutes of pump operation, the micron gauge reads 2,500 microns and is very slowly dropping. The technician has verified the pump oil level is adequate and the pump is operating. What is the MOST likely cause of the slow evacuation progress?

A. Heavy moisture contamination inside the system that is continuously boiling off and maintaining high vapor pressure

B. A significant leak in the system that is allowing atmospheric air to enter as fast as the pump removes it

C. A worn vacuum pump that has lost its ability to pull a deep vacuum and needs internal seal replacement

D. The micron gauge is reading incorrectly and the actual system vacuum is much deeper than displayed

49. A vehicle owner reports that their heater works well in cold weather but produces an annoying ticking or popping sound from behind the dashboard during the first 5 minutes of operation on cold mornings. The sound gradually stops as the system reaches full operating temperature. What is the MOST likely cause?

A. A failing blend door actuator that clicks as its gears engage and disengage during the initial warm-up cycle

B. The heater control valve cycling rapidly between open and closed as the module calibrates during cold start

C. Refrigerant migrating through the A/C system during the initial warm-up creating pressure equalization sounds

D. Thermal expansion of the heater core, HVAC housing, or ductwork components as they heat up from cold-soak

50. A vehicle's A/C system has been completely serviced — new compressor, flushed condenser, new orifice tube, new accumulator, new O-rings, proper evacuation, and charged to specification. The system cools perfectly for one month. The customer then returns with a vent temperature of 55°F instead of the previous 42°F. The technician recovers 18 ounces of the original 22-ounce charge. What should the technician do?

A. Simply recharge the system with 22 ounces since the 4-ounce loss is within normal annual permeation rates

B. Perform a comprehensive leak test to find and repair the leak source before evacuating and recharging the system

C. Replace the accumulator again since its desiccant may have become saturated and is causing refrigerant breakdown

D. Replace the orifice tube since it may have become restricted by debris that was missed during the original flush

Practice Exam 13: Answer Key and Explanations

1. C — Superheat of 25°F dramatically exceeds the normal 8°F–12°F TXV specification, confirming the evaporator is starved for refrigerant — all liquid boils off early and the remaining vapor superheats excessively. Since the charge was verified correct by weight, the restriction is not from low charge but from the TXV itself. A restricted TXV does not open wide enough to supply adequate refrigerant flow to the evaporator, producing the warm suction line and excessive superheat described.

2. B — Technician A is correct that after catastrophic compressor failure, the entire system must be cleaned — flushable components are flushed with approved solvent, and non-flushable components (parallel flow condensers, metering devices, accumulators/receiver-driers) must be replaced. Technician B is incorrect because simply replacing the compressor and drier without addressing debris in the condenser, evaporator, and lines leaves contamination that will destroy the replacement compressor within days or weeks.

3. D — A blower fuse that blows, works for two days after replacement, then blows again indicates an intermittent overcurrent condition in the blower circuit. The most common cause is a blower motor with worn brushes, partially shorted windings, or a dragging bearing that draws excessive current. The motor may function normally at first but as it heats during operation, the internal fault worsens until current exceeds the fuse rating. Measuring the motor's current draw under load will confirm this diagnosis.

4. A — Every measured parameter falls within the manufacturer's specifications: pressures are normal for 90°F ambient, subcooling of 15°F confirms adequate liquid production, superheat of 11°F confirms proper TXV operation, and a vent temperature of 48°F at 90°F ambient is within the expected performance range. The system is performing at its designed capability. The customer's expectation of 38°F vent temperatures may not match the system's actual design capacity under these ambient conditions.

5. D — The scan tool communicates normally with the ECM, BCM, and all other modules — confirming the CAN bus network itself is functional. Only the HVAC module fails to respond. This isolates the fault to the HVAC module itself (internal processor failure, power supply loss) or its individual physical connection to the CAN bus (disconnected bus connector at the module, broken wire between the module and the bus). A bus-wide failure would affect communication with all modules.

6. B — At highway speed, the water pump spins faster and pushes more coolant volume through the heater core, overcoming the partial restriction and delivering adequate heat. At idle, the reduced pump speed produces lower flow that the restriction chokes further — the supply hose stays hot (coolant

arrives) but the return hose cools because insufficient flow passes through the restricted core. The engine temperature difference of only 5°F between highway and idle eliminates the thermostat as the cause.

7. A — White crystalline deposits on the orifice tube screen — without metallic particles — indicate desiccant breakdown from the accumulator. The desiccant bag inside the accumulator has deteriorated, releasing molecular sieve bead material that circulates with the refrigerant and collects on the orifice tube's inlet screen. The accumulator must be replaced along with the orifice tube, and the system should be inspected for additional desiccant contamination in the condenser and evaporator.

8. C — The scan tool confirms the blend door is at 0% (full cold) and the evaporator is cooling to 36°F — the air management and refrigeration systems are both functioning correctly. Yet the vent temperature is 62°F, meaning heat is being added to the cold airstream after it leaves the evaporator. A heater control valve stuck in the open position allows hot engine coolant to continuously flow through the heater core, radiating heat into the airstream even though the blend door directs most air away from the core.

9. A — A pressure cap releasing at 10 psi instead of 16 psi reduces the system's effective pressurized boiling point by approximately 12°F. Under high-demand conditions (heavy traffic, A/C running, engine under load), coolant in the hottest areas of the engine — near exhaust ports and combustion chambers — may reach the now-lower boiling point and form localized steam pockets. These vapor areas reduce coolant contact with metal surfaces and can intermittently disrupt flow through the heater core, reducing heat output.

10. D — The manifold gauges show stable, normal pressures while the electronic sensor reading fluctuates wildly between 0 and 350 psi. Since the actual system pressures are stable (confirmed by the gauges), the electronic signal is the problem — not the actual refrigerant pressure. A faulty pressure transducer with a failing internal element, a loose connector with intermittent contact, or a chafed signal wire intermittently touching ground or voltage would produce exactly this erratic reading pattern.

11. A — A 4°F vent temperature rise and a 15 psi high-side pressure increase after one hour of continuous operation is normal heat-soak behavior. As the engine compartment, condenser, and surrounding components absorb and radiate heat during extended operation, the ambient conditions around the condenser gradually worsen. The condenser must work harder to reject heat, high-side pressure rises slightly, and the system operates at a marginally reduced efficiency compared to the initial cold-start conditions. This is expected and not a fault.

12. D — The clutch pulley spins on its bearing whenever the engine runs — the A/C is off, so the clutch hub is not engaged and the compressor shaft is stationary. Visible wobble of 1/8 inch at the pulley rim indicates the bearing has failed and can no longer hold the pulley concentric on its shaft. The excessive radial and axial play produces the wobble. If left unrepaired, the bearing will eventually seize, potentially shredding the belt and stranding the driver.

13. B — Terminal 86 has 12.4V (coil power present) and terminal 85 has 0.3V (module providing ground — the small voltage represents the normal drop across the module's ground-side driver). Power and ground are both present at the relay coil terminals, yet the relay does not click. The only explanation is that the coil winding itself is open internally — current cannot flow through the broken winding despite having both power and ground available at its terminals. The relay must be replaced.

14. B — Gurgling behind the dashboard combined with intermittent heater output loss — immediately following a cooling system flush and refill — is the classic symptom of air pockets trapped in the heater core. Air bubbles that were not fully purged during the refill intermittently block coolant passages in the heater core, producing the gurgling sound as coolant and air move through the narrow passages, and temporarily reducing heat output until the bubble shifts. Properly bleeding the cooling system resolves both symptoms.

15. C — Both actuators and their diaphragms hold vacuum perfectly when tested directly with a hand pump, confirming the actuators themselves are functional. The vacuum supply appears adequate since the hand pump achieved 18 inches. The problem is that vacuum is not being properly directed to the correct actuator during normal operation. The HVAC control panel contains vacuum switching valves that route vacuum to specific actuators based on the mode selected — a failed or stuck switching valve inside the control panel would prevent proper vacuum distribution.

16. A — The engine stabilized at 185°F — 10°F below the specified 195°F thermostat rating — and installing a correct new 195°F thermostat resolved the problem. The original thermostat was either the wrong rating (perhaps a 180°F unit installed during previous service), or its wax element had weakened with age and was opening prematurely below its rated temperature. Either condition allows coolant to reach the radiator too soon, preventing the engine from reaching the designed 195°F operating temperature.

17. C — Pressures of 45 psi low / 48 psi high are nearly equalized with only a 3 psi differential — the compressor clutch is engaged and the shaft is turning, but virtually no compression is occurring. The compressor has suffered a complete internal mechanical failure — shattered reed valves, broken scroll elements, or a sheared internal coupling — that allows the shaft to spin freely without compressing any refrigerant. The pressure remains near the static equilibrium point because nothing is actively pumping.

18. D — The motor runs (confirmed audibly) but the position feedback remains fixed at 12% throughout the entire 0%–100% commanded sweep. The motor is spinning inside the actuator housing, but the output shaft and the feedback mechanism (which is mechanically linked to the output shaft) do not move. Stripped gears between the motor pinion and the output shaft allow the motor to rotate freely without transmitting torque to move the door or the feedback potentiometer.

19. A — A static pressure of 30 psi at 75°F ambient — where the P-T chart indicates approximately 80–85 psi — confirms the system has lost more than half its refrigerant charge during the two years of storage. The low-pressure switch correctly prevents compressor engagement to protect the compressor from running without adequate refrigerant and oil. The first step is always to find the leak before adding refrigerant, because the leak that depleted the charge is still present and will drain any new charge.

20. B — Both blend door actuators show 5% commanded and 5% actual — the scan tool data suggests both doors are at nearly full cold. The driver side confirms this with 40°F vent air. But the passenger side produces 82°F air despite the feedback reading 5%. The position feedback matches the command but the door is not actually at 5% — the actuator's output shaft has disconnected from the blend door, so the shaft turns and the feedback gear rotates, but the physical door remains at full hot.

21. D — Both-sides-high pressures (50 psi low / 330 psi high) with a clean condenser and functional fan at 95°F ambient — on a recently recharged system — point to either a refrigerant overcharge or non-condensable gases (air) introduced during the charging procedure. Air cannot condense at system pressures and permanently elevates high-side pressure. An overcharge floods the condenser with excess liquid, reducing effective heat transfer area. Both conditions produce the elevated pressures and poor cooling described.

22. A — In recirculation mode with doors and windows closed, the system recirculates the gradually cooling cabin air rather than continuously drawing in 80°F outside air. Each pass through the evaporator cools the recirculated air further — the inlet air temperature to the evaporator drops progressively, allowing the evaporator to produce increasingly cold outlet air. This is why recirculation mode produces the coldest vent temperatures and the fastest cabin pull-down on hot days.

23. C — The micron reading rose 150 microns (from 450 to 600) within 2 minutes and then stabilized at 600 microns for the next 10 minutes without further rise. A stabilized reading confirms no leak — the 150-micron rise represents a small amount of residual moisture that boiled off at the low pressure, producing vapor that raised the reading. Since the reading stabilized and is reasonably close to the 500-micron target, the system has passed the vacuum decay test. A brief additional evacuation would remove this final moisture.

24. D — A brief chirping noise lasting only 1–2 seconds at each clutch engagement — with a belt that is only six months old and a recently replaced tensioner — suggests momentary belt slip at the instant of clutch engagement. Even with a new tensioner, the sudden torque spike when the compressor clutch engages creates a transient load that can briefly exceed the belt's grip. A tensioner that is slightly weak, not fully seated, or has a marginally under-specified spring rate would allow this momentary slip before regaining grip.

25. B — "Unable to find cold stop" means the actuator could not drive the blend door all the way to its full cold mechanical endpoint during the calibration sweep. The most common cause is a physical obstruction inside the HVAC housing — a dislodged piece of foam, a foreign object, a shifted component, or debris from the actuator replacement — that prevents the door from reaching its full-cold position. The door or housing must be inspected and the obstruction cleared before reattempting calibration.

26. C — Subcooling of 12°F (within the 10°F–20°F normal range) confirms the condenser is producing adequate fully condensed liquid with appropriate sub-cooling before it reaches the metering device. Superheat of 10°F (within the 8°F–12°F TXV specification) confirms the evaporator is receiving the correct refrigerant flow — all liquid evaporates properly and the vapor superheats to the design target. Together, these two measurements confirm the charge is correct and both major heat exchangers are performing properly.

27. A — A continuous faint whirring sound from behind the dashboard that does not change with any HVAC control — blower speed, temperature, mode, or A/C status — points to a component that runs independently of all these variables. The in-car temperature sensor aspirator fan runs continuously during HVAC operation to draw cabin air across the temperature sensor. Over time, the tiny fan motor's bushings wear, producing an audible whir. The noise has no performance impact and is a low-priority cosmetic concern.

28. B — Both technicians describe correct procedures. Technician A is right that the air gap must be measured at 3–4 equally spaced points to verify uniformity — a single-point measurement could miss a warped hub or worn pulley that creates an uneven gap. Technician B is right that removing shims from behind the clutch hub moves the hub closer to the pulley face, reducing the air gap. This is the standard adjustment method when the gap exceeds specification due to friction surface wear.

29. C — Mixing IAT and OAT coolants has already produced visible gel-like clumps — the chemical reaction between the incompatible inhibitor chemistries has created sludge that is restricting the heater core and other narrow passages. Simply draining and refilling will not remove the gel already deposited inside the system. A thorough flush — including reverse-flushing the heater core — is required to physically remove the accumulated sludge before refilling with the correct single coolant type.

30. A — The system cools well (42°F vent temperature) with normal pressures (40 psi low / 225 psi high at 88°F ambient). The only abnormality is that the compressor never cycles off. In a normally cycling system, the compressor would disengage when the low-side drops to the cutout point (typically 23–28 psi). The steady 40 psi low-side never reaches this cutout threshold. The cycling switch contacts have welded closed, keeping the clutch circuit permanently complete regardless of pressure.

31. B — The front system works normally with correct pressures, proving the compressor, condenser, and total refrigerant charge are adequate. Only the rear system lost cooling after the rear-end collision. The rear refrigerant lines run under the vehicle from the engine compartment to the rear — they pass through the area most affected by a rear-end impact. Kinked, dented, or disconnected rear lines from the collision forces would block refrigerant flow to the rear evaporator while the front circuit operates unimpeded.

32. D — Many engine management and HVAC control systems are programmed to disengage the A/C compressor during wide-open-throttle (WOT) acceleration to provide maximum engine power to the drivetrain. The compressor load — which can consume 5–15 horsepower — is temporarily removed during the high-power demand event and restored when the driver returns to normal throttle. The absence of DTCs confirms this is programmed behavior, not a fault.

33. A — A rhythmic pulsation from the dashboard area that is synchronous with compressor operation (approximately 1 per second matching compressor RPM) and stops when the compressor is turned off originates from compressor discharge pressure pulsations. Reciprocating piston compressors produce slight pressure pulses with each compression stroke, and these pulses travel through the refrigerant lines to the evaporator where they are audible inside the cabin. This is more noticeable in some vehicle designs than others.

34. C — Both technicians correctly describe the condenser's function. Technician A is right that the condenser's job is to reject heat from the hot, high-pressure refrigerant into the cooler outside air passing over its fins. Technician B is right that this heat rejection causes the refrigerant to undergo condensation — changing state from high-pressure vapor to high-pressure liquid as it releases its latent heat. The heat rejection and the phase change are two aspects of the same process.

35. A — The in-car sensor reads 80°F with a set point of 72°F — an 8°F error requiring cooling. The module commands 30% blend (mostly cold but mixed with some warm air) to produce a 58°F outlet temperature that will gradually pull the 80°F cabin down to 72°F without overshooting. The module uses proportional control — it does not slam to full cold for a moderate 8°F error. The 58°F outlet temperature will cool the cabin progressively, and the module will adjust the blend door as the cabin temperature approaches the set point.

36. B — The heater produces excellent heat from the floor vents, confirming the heater core, coolant flow, and blend door are functioning. The driver-side defrost works, confirming heated dehumidified air is being produced. Only the passenger-side windshield fails to clear. A blocked, misdirected, or disconnected defrost outlet on the passenger side prevents the heated air from reaching that section of glass. The ductwork between the HVAC housing and the passenger-side defrost outlet must be inspected.

37. D — Two actuator replacements failing with stripped gears in six months — the same failure mode each time — indicates the actuator is being forced to work against excessive resistance. The mode door pivot has likely seized, corroded, or bound due to debris, causing the door to require far more force to move than the actuator gears are designed to handle. Each replacement actuator strips its gears trying to overcome the seized door. Freeing or replacing the door mechanism and its pivot will prevent future actuator failures.

38. D — This is an EXCEPT question — three statements are correct and one is incorrect. R-1234yf CANNOT be safely recovered using R-134a equipment under any circumstances. R-1234yf is mildly flammable (A2L classification) and requires dedicated SAE J2843-certified equipment with a mandatory built-in refrigerant identifier. Using R-134a equipment creates cross-contamination risks and violates EPA regulations. The other three statements are all correct facts about R-1234yf service requirements.

39. B — Both technicians are correct about their respective points. Technician A is right that flushing a partially clogged heater core is a reasonable first attempt before committing to the expensive labor of replacement — flushing can restore flow through cores with soft deposits and sludge. Technician B is right that a heater core with an internal leak (releasing coolant into the HVAC housing) cannot be sealed by flushing and must be replaced. The two problems — restriction and leaking — require different solutions.

40. C — The customer reports cycling between cold and warm air every 3–4 minutes while the scan tool snapshot shows normal readings. The blend door position is the parameter most likely to reveal the cycling pattern — if the door is oscillating between positions (hunting), it would produce alternating cold and warm vent temperatures. Monitoring the blend door position continuously over time will reveal whether the module is commanding the door to shift or whether the actuator is drifting from its commanded position.

41. A — After multiple unsuccessful external leak detection attempts, the most probable remaining source is the evaporator — sealed inside the HVAC housing where standard external scanning cannot reach. Removing an access panel or the blower motor resistor near the evaporator and inserting an electronic detector probe directly into the housing space allows the probe to sample the air immediately

surrounding the evaporator surface, where even a tiny leak produces a detectable concentration of refrigerant.

42. C — Many vehicles use two separate coolant temperature sensors — one for the engine management system (typically in the cylinder head or thermostat housing) and another for the HVAC or gauge system (possibly in the engine block, heater hose, or a different location in the cooling circuit). Coolant temperatures can vary 15°F–35°F between different points in the circuit depending on sensor location, coolant flow patterns, and proximity to heat sources. Both readings can be simultaneously accurate.

43. B — Technician A is correct that modern EPDM serpentine belts wear by losing rib material — the ribs become progressively shallower — rather than developing the visible surface cracking that characterized older neoprene belts. A belt wear gauge is the only reliable way to assess EPDM belt condition. Technician B is incorrect because the absence of visible cracks does NOT confirm the belt is in good condition — the ribs may be worn well below specification without any cracking, reducing grip and causing slippage.

44. D — Heavy frost on the rear TXV inlet fitting but no frost on the outlet — with normal front system operation and a functioning rear blower — indicates refrigerant is reaching the valve inlet but not passing through to the outlet. The frost at the inlet forms because the small amount of refrigerant that does squeeze past the restriction expands and cools the fitting dramatically. A restriction at the TXV inlet (debris, stuck valve) creates this localized pressure drop and temperature drop at the inlet while starving the rear evaporator.

45. A — In full AUTO mode, the ATC module simultaneously controls both blower speed and blend door position, optimizing both variables together. When the driver manually selects a specific fan speed, the module loses control of one variable and must compensate with the other. The module's algorithm was calibrated assuming it controls both — overriding fan speed changes the airflow volume, which alters the effective heat transfer rate across the evaporator and heater core, potentially producing a vent temperature different from the set point.

46. B — When replacing a condenser that was an integrated sub-cool design with a built-in receiver tank, the replacement unit must include a new receiver-drier section with fresh desiccant. The integrated receiver cannot be separated and transferred from the old condenser. If the replacement condenser does not include the integrated receiver (or arrives with expired desiccant from extended shelf storage), the system will not have adequate desiccant protection. Verifying receiver inclusion is the critical pre-installation check.

47. B — The cycling clutch compressor disengages at 22 psi (within the typical 23–28 psi cutout range) and re-engages at 44 psi (within the typical 40–48 psi cut-in range). The cycling interval of 8–10 seconds at 82°F ambient is within normal operating parameters. The vent temperature fluctuation of 42°F–50°F between cycles represents the normal temperature swing that occurs as the evaporator cools during the on-cycle and warms slightly during the off-cycle. All values confirm a properly functioning system.

48. A — Heavy moisture contamination inside the system produces a large volume of water vapor as the vacuum pump lowers the pressure to the point where water boils at the current temperature. This continuous evaporation maintains a high vapor pressure inside the system that the pump must overcome, dramatically slowing the evacuation progress. The very slow micron gauge descent from 2,500 microns is characteristic of the pump working against a steady supply of vapor from boiling moisture. Extended evacuation time is required.

49. D — Ticking or popping sounds from behind the dashboard during the first few minutes of cold-morning operation that gradually stop as the system warms are caused by thermal expansion. The heater core, HVAC housing, metal ductwork, and plastic components are cold-soaked overnight. When hot coolant suddenly flows through the heater core and warm air begins flowing through the housing, the rapid temperature change causes these components to expand at different rates. The expansion produces audible clicks and pops that stop once all components reach thermal equilibrium.

50. B — A loss of 4 ounces (from 22 to 18) in one month far exceeds any normal permeation rate — a properly sealed system should lose less than 1 ounce per year through permeation. This charge loss definitively confirms a leak exists somewhere in the system. The technician must perform a comprehensive leak test — electronic detection, UV dye, or both — to locate and repair the leak source before evacuating and recharging. Simply adding refrigerant without finding the leak will result in another return visit.