PRACTICE EXAM 14: ASE A7 SIMULATION (50 QUESTIONS)

1. A vehicle's A/C system was working normally until the customer had the radiator replaced at a general repair shop. After the radiator replacement, the A/C blows warm. The compressor clutch engages and the compressor turns. Manifold gauges show low side 60 psi, high side 68 psi at 80°F ambient. What is the MOST likely cause?

A. The new radiator is blocking airflow to the condenser, preventing adequate heat rejection from the system

B. The general repair shop accidentally discharged the refrigerant while removing the radiator and hose connections

C. The compressor was damaged by debris from the old radiator that entered through a shared coolant passage

D. A refrigerant line was kinked or a fitting was left loose during the radiator replacement, preventing refrigerant flow

2. Technician A says that POE (polyolester) oil is sometimes preferred for R-12 to R-134a retrofit systems because it is compatible with both refrigerant types and tolerant of residual mineral oil. Technician B says that PAG oil should never be used in any retrofit system because it reacts violently with any trace of mineral oil. Who is correct?

A. Technician A only, because PAG oil can be used in retrofits but POE is often preferred for its mineral oil tolerance

B. Both Technician A and Technician B, because PAG oil is completely incompatible with any mineral oil residue

C. Technician B only, because POE oil is actually incompatible with R-134a and should only be used with R-12

D. Neither Technician A nor Technician B, because only mineral oil should be used in all retrofit applications

3. A vehicle's engine reaches 205°F operating temperature within 10 minutes on a 30°F winter day. The heater produces hot air from the floor vents. However, the customer reports that the windshield takes over 10 minutes to defog when the defrost mode is selected on cold mornings. The A/C compressor light illuminates in defrost mode. What should the technician check?

A. The engine thermostat for premature opening that reduces coolant temperature available for the defrost system

B. The heater core for partial restriction that limits heat delivery specifically to the defrost ductwork outlet

C. Whether the A/C compressor is actually engaging in defrost mode to dehumidify the air before it reaches the glass

D. The blower motor speed in defrost mode to verify it reaches maximum output for effective windshield clearing

4. On a vehicle with electronic HVAC controls, the blend door actuator has been replaced. The technician attempts to calibrate the new actuator using the scan tool. The calibration completes successfully. However, when the temperature is set to full cold, the vent temperature is 65°F instead of the expected 40°F. When set to full hot, the vent temperature is 115°F instead of 135°F. What is the MOST likely cause?

A. The new actuator has a wider internal gear ratio that extends the shaft rotation beyond the door's travel range

B. The actuator was installed one spline position off on the blend door shaft, shifting the entire operating range

C. The HVAC control module needs a software update to match the replacement actuator's feedback signal range

D. The calibration process was corrupted and must be repeated with all vehicle accessories turned off first

5. A technician is testing the A/C compressor clutch relay. With the relay removed from its socket, the technician applies 12V directly to terminal 86 and grounds terminal 85. An audible click is heard from

the relay. The technician then measures continuity between terminals 30 and 87 while the coil is energized and finds 0.3 ohms. What can the technician conclude?

A. The relay coil energizes and the contacts close with low resistance — the relay is functioning correctly

B. The 0.3 ohm contact resistance is too high and the relay should be replaced with a unit showing zero ohms

C. The relay coil energizes but 0.3 ohms of contact resistance will prevent adequate voltage from reaching the clutch

D. The relay is partially failed because the contacts should show infinite resistance when the coil is energized

6. A vehicle has an A/C system with R-134a. The technician recovers the refrigerant and the oil in the recovery machine separator appears dark brown with a burnt odor. The recovered refrigerant measures 19 ounces from a system specified at 22 ounces. What do the oil condition and short charge indicate?

A. The system was overcharged at the factory and the excess refrigerant caused the oil to degrade prematurely

B. The dark oil is normal PAG oil coloration after two years of service and does not indicate any internal problem

C. The compressor likely experienced overheating from restricted airflow or prolonged low-charge operation with insufficient oil

D. The oil condition indicates moisture contamination that caused acid formation and corroded internal components

7. A vehicle's A/C compressor has been replaced twice within six months. Both replacement compressors developed the same internal noise within weeks of installation. The system was flushed each time and the accumulator and orifice tube were replaced. The condenser is a parallel flow design. What is the MOST likely reason for the repeat failures?

A. The replacement compressors are inferior aftermarket units that do not meet the OEM quality specifications

B. The parallel flow condenser was not replaced — its micro-channels still contain debris that cannot be flushed out

C. The serpentine belt tension is excessive and is placing abnormal radial load on the compressor shaft bearing

D. The system's refrigerant charge specification is incorrect and the overcharge is causing hydraulic damage

8. A vehicle's heater produces good heat during the first hour of driving but the heat output gradually decreases over the next 30 minutes despite the engine temperature remaining stable at 200°F. Both heater hoses remain hot throughout. After shutting the engine off for 15 minutes and restarting, full heat returns for another hour before diminishing again. What is the MOST likely cause?

A. A failing thermostat that gradually opens too wide after extended operation and recovers during the off period

B. An air pocket in the cooling system that expands as coolant temperature stabilizes and blocks heater core flow

C. A heater core with progressive internal restriction from debris that shifts during operation and resets when stopped

D. The blend door actuator gradually drifts from its full-hot position due to a failing motor or worn gear mechanism

9. On a vehicle with automatic temperature control, the system maintains the cabin at 72°F as set. The customer reports that on very humid summer days, the windows fog slightly on the inside when the A/C first engages after sitting in a hot parking lot. The fogging clears within 2 minutes. What is the MOST likely cause?

A. Normal behavior — the cold evaporator initially cools the humid cabin air below its dew point, causing brief condensation on the glass until the air dehumidifies

B. A refrigerant leak at the evaporator that releases vapor into the cabin airstream causing the moisture appearance

C. A clogged evaporator drain tube that causes excess moisture to be blown into the cabin through the vents

D. A failed air inlet door that is drawing extremely humid outside air directly over the cold evaporator surface

10. A vehicle's scan tool HVAC data shows the following: ambient sensor 88°F, in-car sensor 88°F, set temperature 72°F, evaporator temp 50°F, compressor commanded ON, blend door at 0% (full cold). The vent temperature from the center vent is 52°F. What can the technician determine from the evaporator temperature reading?

A. The evaporator temperature of 50°F is normal and the system is operating at maximum cooling capacity

B. The blend door is not at true full cold position because a 50°F evaporator should produce colder vent air

C. The evaporator temperature of 50°F is too warm — the refrigeration system is not cooling the evaporator adequately

D. The compressor displacement valve has reduced output because the module detects the evaporator is already cold

11. A vehicle's cooling system has been serviced. The technician fills the system with fresh coolant and starts the engine. During the fill, the technician notes that the coolant level drops repeatedly and requires topping off. After 15 minutes of running with the heater on maximum and the radiator cap off, the coolant level stabilizes. What was occurring during the initial top-off period?

A. The coolant was slowly mixing with residual air in the system and the air was working its way out through the open cap

B. Air pockets were trapped throughout the system during filling and gradually displaced as coolant circulated and filled voids

C. The water pump was initially drawing air that created vapor locks, preventing coolant from filling the system completely

D. The new coolant was thermally expanding as it heated and the rising level pushed air out through the open cap

12. Technician A says that the condenser's primary method of heat transfer from the refrigerant to the outside air involves conduction through the tube walls and convection from airflow over the fins. Technician B says that the condenser rejects heat primarily through radiation, similar to how the sun heats the vehicle's cabin. Who is correct?

A. Both Technician A and Technician B, because the condenser uses conduction, convection, and radiation equally

B. Technician B only, because the high temperature of the refrigerant makes radiation the dominant transfer mode

C. Technician A only, because conduction through the tube walls and forced convection from airflow are the primary mechanisms

D. Neither Technician A nor Technician B, because heat transfer at the condenser is purely through convection alone

13. A vehicle has an A/C system where the compressor clutch engages normally and the system cools, but the technician notices the suction line from the evaporator to the compressor is covered in heavy frost from the evaporator outlet all the way to the compressor inlet. The accumulator is also frosted over completely. Low-side pressure is 26 psi at 82°F ambient. What is the MOST likely cause?

A. A critically low refrigerant charge causing the small amount of remaining refrigerant to flash-freeze at the evaporator

B. Normal system operation during maximum cooling demand where the evaporator runs at its lowest safe temperature

C. An overcharge of refrigerant that is flooding the evaporator beyond its capacity and spilling into the suction line

D. A failed freeze protection device that is not disengaging the compressor, allowing the evaporator to overcool and flood liquid into the suction line

14. A vehicle's HVAC system has the following complaint: the air from the vents has a persistent chemical or plastic smell that has been present since the vehicle was new. The smell is strongest when the cabin temperature is high and diminishes as the A/C cools the cabin. The vehicle is 4 months old. What is the MOST likely source?

A. Off-gassing from new dashboard materials, carpet, and adhesives that release volatile compounds when heated

B. A manufacturing defect in the evaporator core that is leaking refrigerant oil into the airstream continuously

C. Residual flushing solvent from the factory A/C assembly process that was not fully purged before delivery

D. Antimicrobial treatment applied to the evaporator at the factory that releases odor when the system first operates

15. On a vehicle with electronic HVAC controls, the technician retrieves DTC B0131 — A/C Pressure Sensor Signal Range/Performance. The scan tool live data shows the A/C pressure sensor reading 150 psi with the engine off and system at rest at 85°F ambient. The manifold gauge reads 93 psi at the same port. What is the MOST likely cause of the DTC and the pressure discrepancy?

A. The manifold gauge is reading low due to a partially blocked Schrader valve core in the service port fitting

B. The system has a partial restriction that creates different pressures at the sensor versus the service port location

C. The A/C pressure sensor is sending an inaccurate high reading to the module, triggering the range/performance code

D. Both readings could be correct if the sensor measures absolute pressure while the gauge reads gauge pressure

16. A vehicle's engine overheated on the highway. After the engine cooled, the technician adds coolant and starts the engine. The temperature gauge reads normal and the heater blows hot air. However, the A/C compressor will not engage. The scan tool shows the module commanding the relay ON. The relay clicks. Voltage is present at the clutch coil connector. The clutch does not engage. What is the MOST likely cause?

A. Normal voltage at the connector with the clutch not engaging indicates an open in the ground circuit preventing current flow

B. The overheat event caused a thermal fuse in the compressor clutch coil circuit to blow, disabling engagement

C. The compressor seized internally during the overheat and the locked shaft prevents the clutch from turning

D. The high-pressure relief valve opened during the overheat and the system lost its entire refrigerant charge

17. Technician A says that an electronic expansion valve (EEV) uses a stepper motor controlled by the HVAC module to precisely regulate refrigerant flow into the evaporator. Technician B says that EEVs are becoming more common in hybrid and electric vehicles that use heat pump systems. Who is correct?

A. Technician A only, because EEVs are used exclusively in commercial refrigeration and not in automotive applications

B. Both Technician A and Technician B are correct about EEV operation and their increasing use in modern vehicles

C. Technician B only, because electronic expansion valves use a solenoid rather than a stepper motor for control

D. Neither Technician A nor Technician B, because all automotive systems use only TXVs or orifice tubes

18. A vehicle's A/C compressor makes a knocking noise that is present only when the A/C is turned on. The noise increases in frequency with engine RPM. The manifold gauges show normal pressures and the vent temperature is adequate at 44°F. The compressor is two years old. What is the MOST likely cause?

A. A developing internal mechanical failure in the compressor such as worn bearings or loose components that will worsen

B. Normal compressor noise produced by refrigerant pressure pulsations that are amplified at higher RPM speeds

C. A loose compressor mounting bolt that allows vibration only when the compressor is under operational load

D. The serpentine belt slipping on the compressor pulley due to oil contamination from a nearby engine leak

19. On a vehicle with an ATC system, the driver sets the temperature to 72°F. The scan tool shows the in-car sensor reading 72°F. The blend door is at 25% (near cold). The evaporator temp reads 37°F. The ambient sensor reads 92°F. The customer's complaint is that the A/C seems to work harder than necessary — the blower runs at a higher speed than expected for a cabin already at the set temperature. All sensor readings verify accurate. What should the technician investigate?

A. The aspirator fan for the in-car temperature sensor — a failed fan may delay feedback, causing the module to overshoot

B. The condenser for partial blockage that is forcing the system to compensate with higher blower speed output

C. The sun load sensor for an elevated reading that is commanding additional cooling beyond what temperature alone requires

D. The compressor displacement control valve for a fault that is reducing output and forcing blower compensation

20. A technician measures the voltage drop across the compressor clutch coil ground wire while the clutch is engaged. The reading is 0.2V. What does this measurement indicate?

A. The ground circuit voltage drop of 0.2V is within acceptable limits, confirming a good ground connection

B. The 0.2V drop is marginally high and the ground connection should be cleaned and retightened as a precaution

C. The test was performed incorrectly because voltage drop cannot be measured on ground circuits with a standard DMM

D. The ground wire has excessive resistance that is reducing the clutch coil's magnetic field strength significantly

21. A vehicle's A/C system has the following condition: the system was working normally but the customer drove through a construction zone where gravel impacted the front of the vehicle. After the drive, the A/C blows warm. The compressor engages. The low-side pressure reads 15 psi and the high-side reads 15 psi at 85°F ambient. What has MOST likely occurred?

A. The compressor was damaged by the vibration from driving over gravel and has lost internal compression ability

B. A gravel impact punctured the radiator, and the leaking coolant has contaminated the A/C system's refrigerant

C. A gravel stone punctured the condenser, causing a complete loss of refrigerant and equalization at low pressure

D. The gravel impact dislodged the serpentine belt from the compressor pulley, preventing compressor operation

22. Technician A says that when performing an A/C retrofit from R-12 to R-134a, the system's original R-12 Schrader valve fittings must be replaced with or adapted to R-134a quick-disconnect fittings. Technician B says that the retrofit label is optional but recommended for documentation purposes. Who is correct?

A. Technician A only, because the retrofit label is mandatory under EPA regulations and not merely optional

B. Technician A only, because both the fitting conversion and the label are required — the label is not optional

C. Both Technician A and Technician B, because the fittings must be changed but the label is a best practice only

D. Technician B only, because the original R-12 fittings can remain as long as the label identifies the new refrigerant

23. A vehicle's cooling system pressure cap is rated at 16 psi. The engine does not overheat and the heater works well. However, the customer reports the coolant reservoir overflows approximately once per month, requiring a top-off. The cap tests correctly at 16 psi. The cooling system holds pressure during a standard 15-minute test. A combustion gas test on the coolant is negative. What is the MOST likely cause?

A. The coolant reservoir is being overfilled above the MAX cold line, and normal thermal expansion pushes excess out

B. The cap's vacuum valve has failed, preventing coolant from being drawn back from the reservoir during cooldown

C. A very small external leak exists that only occurs at full operating temperature and pressure during driving

D. The radiator hose is slightly collapsing during cooldown, creating a siphon that drains coolant from the reservoir

24. On a vehicle with electronic HVAC controls, the technician attempts a bidirectional test of the mode door actuator. The scan tool commands the actuator to the FLOOR position. The technician hears the motor running and the position feedback changes to FLOOR. However, strong airflow exits from the defrost vents and only weak airflow from the floor vents. The same result occurs for every mode position — the feedback matches but the airflow does not. What is the MOST likely cause?

A. The HVAC control module is sending conflicting commands to a secondary mode door through a separate circuit

B. The scan tool is commanding the wrong actuator and the actual mode door actuator is a different component

C. Multiple mode doors exist and only one actuator is responding — another actuator controlling a different door has failed

D. The actuator shaft has disconnected from the mode door — the actuator operates normally but the door does not move

25. A vehicle's A/C compressor clutch does not engage. The technician finds the A/C fuse blown. After replacing the fuse, the A/C works for approximately 30 seconds before the fuse blows again. What should the technician suspect?

A. A defective HVAC control module that is sending excessive current through the clutch relay coil winding

B. A compressor clutch coil with a partial short that draws excessive current after it heats up from initial operation

C. A low refrigerant charge that causes the compressor to cycle rapidly and create current spikes that blow the fuse

D. A failed A/C relay with welded contacts that bypass the fuse protection and create an overcurrent condition

26. A vehicle's A/C system has been properly charged with 20 ounces of R-134a. The technician performs a performance test at 78°F ambient and records: low side 28 psi, high side 175 psi, vent temperature 42°F, subcooling 13°F, superheat 9°F. Are these readings acceptable?

A. All readings are within normal specifications for the stated ambient temperature, confirming the system performs correctly

B. The low-side pressure of 28 psi is below normal and indicates the metering device may be slightly restricting flow

C. The subcooling of 13°F is borderline low and suggests the system may benefit from an additional 1–2 ounces of refrigerant

D. The superheat of 9°F is at the lower limit and indicates the TXV is allowing slightly too much refrigerant into the evaporator

27. A vehicle has a TXV-equipped A/C system. The technician replaces the TXV and installs the sensing bulb on the suction line. After charging and testing, the system overcools the evaporator — frost forms on the suction line and the evaporator temperature drops to 26°F. The TXV appears to be stuck open. What installation error MOST likely caused this?

A. The sensing bulb was installed without insulation wrap, causing it to read ambient air temperature instead of line temperature

B. The capillary tube between the bulb and valve was accidentally kinked during installation, blocking bulb pressure

C. The new TXV is the wrong part number and has a superheat setting that is too low for this vehicle application

D. The sensing bulb was installed on the liquid line instead of the suction line, reading a much warmer temperature than intended

28. A vehicle's A/C system has normal gauge readings and the vent temperature is 43°F from the center vent. However, the customer reports that the A/C does not seem to cool the cabin effectively — the cabin temperature remains at 80°F despite the cold vent air. The blower is on HIGH and the mode is set to panel. What should the technician investigate?

A. The refrigerant charge level since a marginal undercharge could produce cold vent air but insufficient total cooling

B. The evaporator for a partial ice blockage that is reducing total airflow volume despite the cold temperature reading

C. Whether the air inlet door is stuck in the fresh air position, continuously introducing hot outside air into the cabin

D. The compressor for reduced displacement that produces cold air at low volume but cannot sustain cabin cooling

29. On a vehicle with vacuum-controlled HVAC, the mode doors work correctly in all positions. However, the customer reports that the air inlet door does not switch to recirculation when the recirculation button is pressed. The technician verifies vacuum supply to the HVAC control panel is adequate. What should the technician check next?

A. The engine intake manifold for a vacuum leak that reduces total available vacuum to the HVAC system

B. The vacuum switching valve for the recirculation circuit inside the HVAC control panel for proper operation

C. The recirculation door actuator diaphragm for a tear that prevents it from holding vacuum and moving the door

D. The vacuum reservoir for a slow leak that depletes stored vacuum specifically when recirculation is requested

30. A vehicle's scan tool shows the HVAC module commanding the compressor clutch relay OFF despite the A/C button being pressed. The ambient temperature is 85°F, the engine is at operating temperature, and the A/C pressure sensor reads 90 psi (normal static). The evaporator temperature sensor reads −15°F. What is preventing compressor engagement?

A. The A/C pressure sensor reading of 90 psi is below the module's minimum engagement pressure threshold

B. The ambient temperature of 85°F is above the module's maximum temperature limit for A/C compressor operation

C. The engine coolant temperature has exceeded the module's thermal protection threshold for the compressor

D. The evaporator sensor reading of −15°F causes the module to prevent engagement to avoid freeze-up damage

31. A vehicle's engine cooling system uses a 50/50 ethylene glycol and water mixture. The technician tests the coolant with a refractometer and reads a freeze point of −34°F. The coolant appears bright orange and clean. The pH test strip reads 8.5 (slightly alkaline). The inhibitor reserve test strip shows adequate protection remaining. What should the technician conclude about the coolant condition?

A. The coolant is in good condition — correct concentration, appropriate color, acceptable pH, and adequate inhibitor reserve

B. The pH of 8.5 is too alkaline and indicates the coolant needs immediate replacement to prevent seal damage

C. The freeze point of −34°F indicates the mixture has too much glycol concentrate and should be diluted with water

D. The bright orange color indicates the coolant has overheated at some point and the inhibitors are compromised

32. A vehicle has an electronic HVAC system where the scan tool can communicate with the HVAC module and read all sensor data, but bidirectional control tests for the blend door actuator fail with the message "function not supported." What is the MOST likely explanation?

A. The blend door actuator has an internal fault that prevents it from responding to bidirectional scan tool commands

B. The HVAC control module software does not support bidirectional testing and requires a factory-level diagnostic tool

C. The LIN bus connection to the blend door actuator is intermittent and drops out specifically during command mode

D. The scan tool may not have full bidirectional capability for this specific vehicle — a manufacturer-specific tool may be required

33. A vehicle's A/C system has been operating with a known slow leak for approximately eight months. The customer has had the system "topped off" three times without leak repair. During the most recent service, the technician recovers the refrigerant and finds the oil is milky white and cloudy. What does this oil condition indicate and what is the MOST likely cause?

A. The oil has been contaminated with engine coolant from a heater core leak that is draining into the HVAC housing

B. The milky appearance is normal for PAG oil that has been in service for more than six months and is not a concern

C. Moisture has contaminated the oil — atmospheric air and water vapor entered through the leak over the eight-month period

D. The oil has been mixed with an incompatible lubricant type during one of the three previous top-off services

34. Technician A says that the low-pressure cutout switch in an A/C system protects the compressor by preventing operation when the refrigerant charge is critically low. Technician B says that the low-pressure cutout switch also indirectly protects the compressor from running without adequate oil, since oil circulates with the refrigerant. Who is correct?

A. Technician A only, because the low-pressure switch has no relationship to oil circulation or compressor lubrication

B. Technician B only, because the switch specifically monitors oil pressure rather than refrigerant pressure

C. Both Technician A and Technician B are correct about the direct and indirect protective functions of the switch

D. Neither Technician A nor Technician B, because the low-pressure switch controls evaporator freeze protection only

35. A vehicle with electronic HVAC controls has the mode door stuck in the panel vent position. The scan tool shows DTC B0268 — Mode Door Actuator Position Disagreement. The bidirectional test commands the mode door to FLOOR. The motor runs audibly but the position feedback does not change from 18% (panel). What is the MOST likely cause?

A. Stripped gears inside the mode door actuator that allow the motor to run without driving the output shaft

B. A seized mode door pivot that prevents the door from moving despite the actuator generating adequate torque

C. An incorrect replacement actuator that has a different gear ratio and cannot achieve the commanded positions

D. A LIN bus communication error that prevents the module from receiving updated feedback from the actuator

36. A vehicle's heater core was replaced two weeks ago. The customer returns complaining that the driver-side floor area is damp. There is no sweet smell and the fluid on the carpet appears to be clear water. The A/C system is working and the evaporator drain tube is dripping clear water normally underneath the vehicle. What is the MOST likely cause?

A. The heater core is leaking clear coolant before the dye or color has time to develop in the new replacement core

B. The evaporator condensation drain tube was dislodged or kinked during the heater core replacement, causing water overflow

C. Rainwater is entering the cabin through a firewall seal that was not properly reseated during the heater core installation

D. The new heater core has a slight coolant seep that is so small the coolant evaporates, leaving only condensation behind

37. A vehicle's A/C system has been diagnosed with a leak at the compressor shaft seal. The compressor is 8 years old. The technician replaces the shaft seal, evacuates, and recharges. The system cools well for 3 weeks, then the customer returns with reduced cooling. The technician finds the system has lost 4 ounces. Leak detection reveals the shaft seal area is leaking again. What is the MOST likely explanation for the repeat failure?

A. The replacement seal was a defective part that did not meet the manufacturer's specifications for this compressor

B. The shaft seal seat on the compressor housing is worn or corroded and cannot provide a proper mating surface

C. The technician used the incorrect refrigerant oil type which degraded the new seal material within three weeks

D. The compressor shaft has developed a groove or wear pattern at the seal contact area that prevents a proper seal

38. A vehicle's engine reaches operating temperature of 200°F. The heater produces hot air. The customer then drives onto the highway at 70 mph on a 15°F day. After 20 minutes at highway speed, the engine temperature gauge drops to 175°F and the heater output decreases noticeably. What is the MOST likely cause?

A. The thermostat is opening too wide at highway speed, allowing the high-velocity ram air to overcool the engine

B. Normal engine behavior where the extreme cold ambient temperature and high ram airflow at 70 mph overcool the engine below the thermostat's regulating range

C. A partially stuck-open thermostat that cannot fully close against the higher coolant flow rate at highway RPM

D. The radiator fan is running at high speed unnecessarily, combining with ram air to overcool the engine excessively

39. A vehicle has an orifice tube A/C system. The technician replaces the orifice tube during routine service. After installation, the A/C system performance is noticeably worse than before the service. Gauge readings show higher-than-normal low-side pressure and lower-than-normal high-side pressure. What installation error MOST likely occurred?

A. The technician installed the new orifice tube with the screen facing the wrong direction, affecting filtration

B. The replacement orifice tube has a slightly larger opening than the original, allowing excessive flow into the evaporator

C. The orifice tube was installed backward, with the flow direction arrow pointing away from the evaporator

D. The technician failed to remove the protective shipping cap from one end of the orifice tube before installation

40. On a vehicle with an ATC system, the customer reports that the system maintains correct temperature but makes a brief clicking noise from behind the dashboard approximately every 60 seconds. The noise has been present for three months and is getting louder. The scan tool shows no DTCs and all actuator positions match their commands. What is the MOST likely source of this noise?

A. A blend door or mode door actuator with gears that are progressively stripping and clicking as teeth skip periodically

B. The compressor cycling clutch engaging and disengaging at 60-second intervals during normal cycling operation

C. Thermal expansion clicks from the evaporator or heater core as temperature fluctuates during normal cycling

D. A loose HVAC housing panel that vibrates at a specific frequency produced by the blower motor air turbulence

41. A vehicle's A/C system was recharged two weeks ago after a leak repair at the evaporator inlet fitting. The system cooled well after the service. The customer now reports the vent temperature has risen from 42°F to 50°F. The technician connects gauges and finds normal pressures. What measurement should the technician check to determine if the charge has decreased?

A. The high-side pressure only, since any charge loss would be reflected as a drop in the high-side reading

B. The low-side pressure only, since any charge loss would be reflected as a drop in the low-side reading

C. The compressor discharge line temperature, since a lower temperature indicates reduced refrigerant mass

D. Subcooling at the condenser outlet, since decreasing subcooling is the earliest indicator of charge loss

42. A vehicle has a DTC U0100 — Lost Communication with ECM stored in the HVAC module. The customer's complaint is that the A/C compressor cycles on and off every 10 seconds. The scan tool confirms intermittent U0100 codes that set and clear repeatedly. What is the connection between the communication fault and the compressor cycling?

A. The ECM communication loss has no effect on compressor operation because the HVAC module controls it independently

B. Each time communication drops, the module loses authorization to run the compressor and disengages it until communication restores

C. The intermittent communication is causing the pressure sensor to send erratic readings that trigger cycling

D. The ECM is intentionally cycling the compressor to reduce engine load during the communication fault condition

43. A vehicle's A/C performance test shows the following at 82°F ambient: low side 30 psi, high side 185 psi, vent temperature 44°F, subcooling 12°F, superheat 10°F. The technician notes that the condenser outlet temperature is 97°F and the ambient temperature is 82°F — a difference of 15°F. What does this 15°F condenser outlet-to-ambient temperature differential indicate?

A. The condenser is performing well — 15°F above ambient at the outlet indicates complete condensation with adequate subcooling

B. The condenser is underperforming because the outlet should be within 5°F of ambient for optimal efficiency

C. The 15°F differential is too low and indicates an overcharge that is backing liquid into the condenser tubes

D. The differential cannot be evaluated without also knowing the condenser inlet temperature for comparison

44. Technician A says that when evacuating a system, the vacuum pump should run for a minimum of 30 minutes after reaching the target vacuum depth to ensure moisture removal is complete. Technician B says that achieving 500 microns on the gauge is sufficient proof that all moisture has been removed, regardless of how long the pump has been running. Who is correct?

A. Technician A only, because reaching 500 microns only means the pressure is low enough for water to boil — the water still needs time to vaporize and be pulled out

B. Technician B only, because 500 microns is the industry-accepted proof that the system is completely dry

C. Both Technician A and Technician B, because reaching the target depth and running for minimum time are both satisfied by the 500-micron reading

D. Neither Technician A nor Technician B, because evacuation time should be determined solely by the system's internal volume

45. A vehicle has an A/C system complaint. The technician finds the low-side service port cap is missing and the Schrader valve core appears corroded. The system has a slow leak of approximately 1 ounce per month. What is the MOST likely leak source?

A. The evaporator has a pinhole leak that coincidentally appeared at the same time the service port cap was lost

B. A fitting near the compressor has a slow O-ring leak that is unrelated to the missing service port cap

C. The condenser has developed a stone-damage pinhole that is losing refrigerant at a rate consistent with 1 ounce per month

D. The corroded Schrader valve core in the uncapped service port is the leak source, allowing slow refrigerant escape

46. A vehicle's cooling system has a thermostat rated at 195°F. The technician tests the thermostat by suspending it in a pot of gradually heated water with a thermometer. The thermostat begins to open at 193°F and is fully open at 212°F. What should the technician conclude?

A. The thermostat is functioning within acceptable tolerances — beginning to open within 2°F of its rated temperature is normal

B. The thermostat is defective because it should open exactly at 195°F, and 193°F is below the rated specification

C. The thermostat's full-open temperature of 212°F is too high and indicates the spring has weakened significantly

D. The test is invalid because thermostat testing must be performed in a pressurized container to simulate system conditions

47. On a vehicle with electronic HVAC controls, the technician scans the HVAC module and finds five historical DTCs for blend door actuator position disagreement. The system is currently operating normally with no active codes. The customer reports occasional temperature fluctuations. What should the technician recommend?

A. Immediately replace the blend door actuator because five historical codes confirm the actuator is failing

B. Replace the HVAC control module because repeated position codes indicate a corrupted module algorithm

C. Clear the codes, monitor the system, and recommend the customer return if the temperature fluctuations recur

D. Replace both the actuator and the control module to eliminate all possible causes of the intermittent fault

48. A vehicle's A/C system has a measured subcooling of 2°F at the condenser outlet. Gauge pressures show low side 25 psi and high side 170 psi at 80°F ambient. The vent temperature is 50°F. What does this very low subcooling value indicate?

A. The condenser fan is running at excessive speed and overcooling the refrigerant below its optimal condensation range

B. The system is undercharged — the condenser cannot produce adequate liquid refrigerant, resulting in minimal subcooling

C. The TXV is stuck open and drawing refrigerant out of the condenser faster than condensation can replace it

D. The compressor is operating at reduced displacement, which reduces the volume of refrigerant reaching the condenser

49. A vehicle has an A/C system that was working normally. The customer drove through standing water that splashed heavily into the engine compartment. After the incident, the A/C compressor clutch will not engage. The system has adequate static pressure. The scan tool shows the HVAC module is NOT commanding the relay. What sensor or circuit should the technician check FIRST?

A. The compressor clutch coil for water intrusion damage that has caused an internal short and increased current draw

B. The serpentine belt for water saturation that is causing it to slip on the compressor pulley preventing engagement

C. The condenser for water-borne debris blockage that is triggering the high-pressure cutout switch to prevent operation

D. The A/C pressure sensor connector for water intrusion that may be sending an out-of-range signal to the module

50. A vehicle's heater produces adequate heat when the system is set to full hot. However, when the customer sets the temperature to a moderate setting (halfway between cold and hot), the vent temperature fluctuates between warm and cool in a hunting pattern rather than maintaining a steady moderate temperature. The system uses a cable-operated blend door. What is the MOST likely cause?

A. A failing heater control valve that oscillates between open and closed at moderate temperature settings

B. A stretched or misadjusted temperature control cable that cannot position the blend door precisely at mid-range

C. A blend door with worn pivot bushings that allow the door to vibrate between positions in the middle of its travel

D. A malfunctioning in-car temperature sensor that provides erratic feedback to the module at moderate temperatures

Practice Exam 14: Answer Key and Explanations

1. D — Pressures of 60 psi low / 68 psi high are nearly equalized — the compressor engages and turns but cannot create a meaningful pressure differential. Since the system worked normally before the radiator replacement, the fault was introduced during that service. A kinked refrigerant line or a loose/disconnected fitting near the radiator work area would block refrigerant flow, preventing the compressor from building discharge pressure. The nearly equalized readings confirm refrigerant cannot circulate through the full circuit.

2. A — Technician A is correct that POE oil is compatible with both R-12 and R-134a and is more tolerant of residual mineral oil than PAG oil, making it a practical choice for retrofit systems where complete mineral oil removal is nearly impossible. Technician B is incorrect — PAG oil does not "react violently" with mineral oil. PAG oil is used in many retrofit systems, though it is less tolerant of mineral oil contamination than POE. Both PAG and POE are acceptable retrofit oils depending on the manufacturer's recommendation.

3. C — The A/C compressor indicator light illuminates in defrost mode, but the light alone does not confirm the compressor is actually engaging and running. The compressor clutch may not be engaging due to a tripped low-pressure switch, a failed relay, or a wiring issue — and without actual compressor operation, the evaporator cannot dehumidify the air before it reaches the windshield. The technician should verify the compressor clutch is physically engaging (visible hub contact, audible click, pressure change on gauges) — not just that the light is on.

4. B — When a replacement actuator is installed one spline position off on the blend door shaft, the actuator's entire mechanical range is shifted. The calibration completes "successfully" because the actuator reaches its electrical endpoints — but those endpoints no longer correspond to the door's physical full-cold and full-hot mechanical stops. The result is a reduced effective range — the door never quite reaches full cold or full hot, producing the 65°F minimum and 115°F maximum instead of the designed 40°F and 135°F.

5. A — Applying 12V to the coil terminals (86 and 85) produces an audible click, confirming the coil winding is intact and generates a magnetic field. Measuring 0.3 ohms between the contact terminals (30 and 87) while the coil is energized confirms the contacts close with very low resistance — well within the acceptable range for relay contacts (under 1.0 ohm is normal). Both the coil and contact functions test correctly, confirming the relay is operational.

6. C — Dark brown oil with a burnt odor is the definitive indicator of sustained compressor overheating — the oil has thermally degraded from excessive temperatures. Combined with a 3-ounce undercharge (19 of 22 ounces), the most likely scenario is that a slow leak gradually depleted the refrigerant and the oil that circulates with it. As the charge dropped, less oil reached the compressor, causing the internal temperature to rise and the remaining oil to overheat and degrade.

7. B — Two compressors failing with identical internal damage within six months — despite proper flushing, new accumulator, and new orifice tube each time — points to a persistent debris source that was not addressed. Parallel flow condensers have micro-channel tubes that trap metallic debris from compressor failures, and this debris cannot be reliably removed by flushing. Each time a new compressor is installed, the trapped debris circulates out of the condenser and into the new compressor, causing the same failure pattern.

8. D — Both heater hoses remain hot throughout the symptom (confirming coolant supply is adequate), the engine temperature stays stable at 200°F (eliminating thermostat and cooling system faults), and the problem resolves after a brief engine-off period (suggesting an electrical/mechanical reset). A blend door actuator that gradually drifts from its full-hot position during extended operation — due to a failing motor, worn gears, or weakening position-hold mechanism — would produce the progressive heat loss. The engine-off period allows the actuator to reset to its default or stored position.

9. A — When the A/C first engages after a hot soak, the cabin air is extremely warm and humid. The cold evaporator surface rapidly cools this humid air below its dew point, causing moisture to condense — not just on the evaporator (which is normal) but also on the cold windshield glass, which has been cooled by the initial blast of cold air from the defroster. Within 2 minutes, the evaporator dehumidifies the cabin air enough that the dew point drops below the glass temperature and the fogging clears. This is normal physics, not a system fault.

10. C — A properly functioning R-134a evaporator should operate at approximately 33°F–40°F during normal A/C operation. An evaporator temperature of 50°F with the compressor running and the blend door at full cold indicates the refrigeration system is not cooling the evaporator to its design temperature. Possible causes include a low refrigerant charge, a restricted metering device, a partially blocked condenser, or a compressor with reduced output. The 50°F reading confirms inadequate refrigeration performance.

11. B — During the initial coolant fill, air is inevitably trapped throughout the engine block, cylinder heads, heater core, and hose passages. As the engine runs and the water pump circulates coolant, these air pockets are gradually displaced by coolant and migrate to the highest point in the system — the open radiator cap or reservoir. Each time an air pocket escapes, the coolant level drops slightly and requires topping off. Once all air is purged, the level stabilizes permanently.

12. C — Technician A correctly identifies that the condenser rejects heat through two primary mechanisms: conduction transfers heat from the hot refrigerant through the aluminum tube walls and into the attached fins, and forced convection transfers that heat from the fin surfaces into the moving outside air. Technician B is incorrect because radiation is a minor contributor at condenser operating temperatures — the vast majority of heat rejection at the condenser occurs through the conduction-convection pathway.

13. D — Heavy frost extending from the evaporator along the entire suction line and across the accumulator indicates liquid refrigerant is present well beyond the evaporator — the evaporator is being flooded with more refrigerant than it can evaporate. A failed freeze protection device (cycling switch stuck closed, evaporator temp sensor reading warm) allows the evaporator to overcool below 32°F, and the excess unevaporated liquid spills into the suction line and accumulator, frosting everything it contacts.

14. A — A chemical or plastic smell present since the vehicle was new that intensifies with cabin heat and diminishes when the A/C cools the cabin is characteristic of off-gassing from new interior materials. Dashboard plastics, carpet backing, adhesives, sound-deadening materials, and upholstery all release volatile organic compounds (VOCs), especially when heated by sunlight or warm air. This "new car smell" is normal and gradually diminishes over the first 6–12 months as the materials cure and outgas their volatile components.

15. C — The manifold gauge reads 93 psi at 85°F ambient, which matches the expected P-T chart value for R-134a, confirming the gauge is accurate and the system has adequate charge. The electronic pressure sensor reads 150 psi — 57 psi higher than actual — confirming the sensor is sending an

inaccurate high signal to the module. This out-of-range signal triggers the DTC. The sensor or its circuit must be repaired to restore accurate pressure reporting to the module.

16. D — During a severe engine overheating event, A/C system pressures can spike above the high-pressure relief valve threshold (500–550 psi), causing the valve to open and vent the refrigerant charge. After the engine cools, the system has lost its charge. However, this question states voltage reaches the clutch coil connector — on some vehicle designs, the pressure switches are monitored electronically rather than wired in series, allowing voltage to reach the coil even with no charge. The compressor may have also seized from the extreme heat, preventing the clutch from turning the shaft despite engaging.

17. B — Both technicians are correct. Technician A accurately describes EEV operation — electronic expansion valves use a stepper motor precisely controlled by the HVAC module to regulate refrigerant flow based on multiple sensor inputs, providing more accurate control than mechanical TXVs. Technician B correctly identifies that EEVs are increasingly common in hybrid and electric vehicles, particularly those using heat pump systems where the same refrigerant circuit provides both heating and cooling and requires precise bidirectional flow control.

18. A — A knocking noise present only when the A/C is engaged that increases with RPM originates from the compressor's internal mechanism — the shaft and moving parts only turn when the clutch is engaged. A developing bearing failure, loose internal component, or worn reed valve produces mechanical noise under load that worsens with speed. The fact that pressures and cooling are still normal indicates the failure is in its early stage — but it will progress and eventually affect performance if not addressed.

19. A — All sensor readings verify accurate and the system maintains the set temperature, yet the blower runs faster than expected. The ATC module determines blower speed based on multiple inputs, including the in-car temperature sensor's response rate. If the aspirator fan that draws cabin air across the sensor has failed, the sensor reads stagnant air that responds slowly to temperature changes. The module perceives a delayed response and compensates by running the blower at higher speed to force the cabin toward the target faster.

20. A — A ground circuit voltage drop of 0.2V is well within the acceptable maximum of 0.3V for a ground circuit. This confirms the ground wire, its chassis attachment point, and all intermediate connections have low resistance and are providing an adequate return path for current through the clutch coil. The ground circuit is functioning properly and can be ruled out as a cause of any clutch engagement issues.

21. C — Static pressures equalized at only 15 psi at 85°F ambient — where normal static pressure should be approximately 93–95 psi — confirms the system has lost nearly its entire refrigerant charge. The event correlates with driving through a construction zone where gravel impacted the front of the vehicle. The condenser, mounted at the very front behind the bumper cover, is the most exposed component to stone impact. A gravel puncture through a condenser tube would cause rapid, complete charge loss.

22. B — Technician A is correct on both points: the R-12 fittings must be converted to R-134a quick-disconnect fittings (to prevent future technicians from connecting R-12 equipment), AND the retrofit label is mandatory — not optional — under EPA SNAP regulations. The label must include the new refrigerant type, oil type and amount, charge amount, shop name and address, and date. Technician B is incorrect because the retrofit label is a legal requirement, not merely a recommendation.

23. A — The pressure cap tests correctly at 16 psi (eliminating a weak cap), the system holds pressure during testing (no leak), and the combustion gas test is negative (no head gasket breach). The most common cause of periodic overflow from an otherwise healthy cooling system is overfilling. When coolant is added above the cold MAX line, normal thermal expansion during engine warm-up increases the volume beyond what the reservoir can hold, and the excess exits through the overflow tube. Filling to exactly the cold MAX line prevents this.

24. D — The scan tool confirms the actuator motor runs and the position feedback changes to match the command — all of these confirm the actuator's motor, gears, and feedback mechanism are functioning internally. However, the airflow from the vents does not match the commanded mode. The actuator's output shaft has become disconnected from the physical mode door — the shaft rotates and the feedback gear tracks correctly, but the door remains in its previous position because there is no mechanical link.

25. B — A fuse that holds for 30 seconds before blowing indicates the circuit initially draws acceptable current but escalates to overcurrent as the component heats during operation. A compressor clutch coil with a partial short between windings initially draws near-normal current when cold. As the coil heats from the current flowing through it, the shorted windings' resistance decreases further, allowing progressively more current until the fuse rating is exceeded approximately 30 seconds into operation.

26. A — At 78°F ambient, all readings fall within normal specifications: low side 28 psi and high side 175 psi are within standard ranges, vent temperature of 42°F represents excellent cooling output, subcooling of 13°F falls within the 10°F–20°F normal range confirming adequate liquid production, and superheat of 9°F falls within the 8°F–12°F TXV specification confirming proper evaporator refrigerant flow. The system is performing correctly across all measured parameters.

27. D — Installing the sensing bulb on the liquid line instead of the suction line exposes the bulb to much warmer temperatures (the liquid line runs 90°F–110°F versus the suction line at 40°F–55°F). The warmer temperature generates excessive opening pressure in the bulb, pushing the TXV diaphragm open far wider than intended. The valve floods the evaporator with refrigerant beyond its evaporation capacity, causing liquid to spill into the suction line, frost formation, and potential compressor slugging.

28. C — The center vent produces cold air at 43°F with normal gauge pressures — the refrigeration system is functioning correctly. However, the cabin remains at 80°F despite the cold air output. This disconnect between cold vent air and a warm cabin indicates the system is fighting a constant influx of warm air. An air inlet door stuck in the fresh air position continuously introduces hot outside air into the cabin, which the A/C system must constantly condition rather than recirculating and progressively cooling the cabin air.

29. B — The mode doors work correctly in all positions, confirming the vacuum supply to the control panel and the mode door actuators are functional. Only the recirculation function does not respond. The vacuum switching valve inside the HVAC control panel routes vacuum to different actuators based on button selections — each function has its own internal valve circuit. If the specific valve for the recirculation circuit has failed (stuck closed, blocked port), vacuum cannot reach the recirculation actuator despite being available for all other functions.

30. D — The evaporator temperature sensor reads −15°F — an impossibly cold reading that indicates a sensor circuit fault (likely an open circuit in an NTC sensor, producing maximum resistance interpreted as minimum temperature). The module sees −15°F and concludes the evaporator is deeply frozen, so it refuses to engage the compressor to prevent further freeze-up and potential compressor damage from liquid slugging. All other parameters (ambient temp, pressure, engine temp) are within normal engagement limits.

31. A — The coolant freeze point of −34°F confirms a proper 50/50 mixture. The bright orange color matches OAT coolant in good condition. The pH of 8.5 is within the normal range for automotive coolant (typically 7.5–10.0, slightly alkaline to protect against corrosion). The inhibitor reserve test shows adequate protection remaining. All four indicators — concentration, color, pH, and inhibitor reserve — confirm the coolant is in good condition and does not require replacement at this time.

32. D — The scan tool communicates with the module and reads sensor data successfully, confirming the physical connection and basic communication are functional. The "function not supported" message for bidirectional testing typically means the scan tool's software does not have the manufacturer-specific bidirectional commands for this vehicle's HVAC module. Many aftermarket scan tools can read data and

codes but lack the proprietary bidirectional control protocols that require a factory-level or manufacturer-specific diagnostic tool.

33. C — Milky white, cloudy oil is the definitive indicator of moisture contamination — water has emulsified with the PAG oil, creating the characteristic milky appearance. Over eight months of operating with a slow leak, atmospheric air and moisture continuously entered the system through the leak point. The moisture accumulated beyond the desiccant's absorption capacity (which was likely saturated early in the leak period) and eventually contaminated the oil. The system needs a complete flush, new drier, extended evacuation, and fresh oil.

34. C — Both technicians describe valid protective functions. Technician A is correct that the low-pressure switch directly protects the compressor by preventing operation when refrigerant pressure drops below the safe threshold, indicating a critically low charge. Technician B is correct that this protection is also indirect oil protection — since compressor oil circulates dissolved in the refrigerant, a critically low refrigerant charge also means critically low oil delivery to the compressor, risking seizure from inadequate lubrication.

35. A — The DTC indicates position disagreement, the motor runs audibly (confirmed during the bidirectional test), but the position feedback remains fixed at 18% regardless of the command. The motor spins but the output shaft and feedback mechanism do not move. This is the classic signature of stripped gears inside the actuator — the motor's pinion gear turns freely without meshing with or driving the reduction gears that move the output shaft. The actuator must be replaced and calibrated.

36. B — Clear water on the driver-side floor — without a sweet smell and with the evaporator drain dripping normally outside — rules out coolant and confirms the fluid is condensation water. During the heater core replacement, the technician likely disturbed or kinked the evaporator condensation drain tube. If the drain tube is partially blocked or misdirected, some of the evaporator condensation backs up inside the HVAC housing and overflows onto the passenger compartment floor instead of draining externally.

37. D — A shaft seal replacement that fails again within three weeks — leaking at the same location — indicates the sealing surface is the problem, not the seal itself. Over eight years and hundreds of millions of shaft rotations, the compressor shaft develops a microscopic wear groove at the exact point where the seal lip contacts the shaft. A new seal placed against the worn groove cannot achieve the same tight contact as the original seal on the unworn shaft. The compressor must be replaced because the shaft surface cannot be repaired.

38. B — At 70 mph on a 15°F day, the combination of extreme cold ambient air and high-velocity ram air through the radiator creates a massive heat rejection rate that can exceed the engine's heat production. Even with the thermostat attempting to restrict flow, the extreme conditions overwhelm the thermostat's ability to regulate — the 175°F stabilization point represents the equilibrium between engine heat production and the extreme cold-weather heat rejection. This is a physical limitation, not a thermostat fault.

39. C — An orifice tube installed backward reverses the position of the inlet and outlet screens and may alter the flow characteristics through the precision orifice opening. Most orifice tubes have a directional arrow indicating the correct flow direction toward the evaporator. Installing it backward can increase the effective orifice size or alter the flow pattern, allowing excessive refrigerant into the evaporator (higher-than-normal low-side pressure) while reducing the effective compression ratio (lower-than-normal high-side pressure).

40. A — A clicking noise every 60 seconds that has been progressively getting louder over three months — with no DTCs and correct actuator position readings — is characteristic of a blend or mode door actuator with gears that are progressively stripping. As the teeth wear, occasional skipping produces the click. The actuator motor compensates and re-engages, but the gear damage worsens over time, making the clicks louder. Eventually the gears will strip completely, producing a continuous clicking and a position disagreement DTC.

41. D — Subcooling at the condenser outlet is the most sensitive indicator of charge level. As refrigerant charge decreases, the condenser produces less fully condensed liquid, and the subcooling value drops. A system that started at 15°F subcooling and has lost a few ounces might now read 8°F or lower — a measurable decrease even when gauge pressures appear within the normal range. Gauge pressures can remain in the "normal" range even with a moderate charge loss, but subcooling reveals the deficit earlier.

42. B — The HVAC module requires data from the ECM — engine RPM, coolant temperature, engine load — to authorize compressor engagement. Each time the CAN bus communication drops (U0100 sets), the module loses this data and disengages the compressor as a protective measure because it cannot verify engine conditions are safe for compressor operation. When communication restores (U0100 clears), the module re-authorizes engagement. The intermittent communication produces the observed 10-second cycling pattern.

43. A — A condenser outlet temperature of 97°F — only 15°F above the 82°F ambient — indicates effective heat rejection. The subcooling of 12°F (within the 10°F–20°F normal range) confirms the refrigerant is fully condensed into liquid and subcooled below its condensation temperature. A

condenser outlet running 10°F–30°F above ambient temperature is typical and indicates complete condensation with adequate subcooling. All parameters confirm the condenser is performing correctly.

44. A — Technician A is correct that achieving 500 microns means the system pressure is low enough for water to boil at the current temperature — but the water still must physically evaporate and the resulting vapor must be pulled from the system by the pump. Reaching the target vacuum is the beginning of effective moisture removal, not the end. Continued pumping after achieving 500 microns ensures the moisture that is actively boiling has time to vaporize completely and be extracted. Technician B is incorrect because the 500-micron reading alone does not confirm all moisture is gone.

45. D — A missing service port cap exposes the Schrader valve core to moisture, road spray, and atmospheric contaminants that cause corrosion. A corroded Schrader valve core cannot seal properly against the valve seat, allowing refrigerant to slowly escape past the deteriorated seal. At 1 ounce per month, this leak rate is consistent with a weeping Schrader valve. The valve core should be replaced and a new cap installed. Service port caps with O-ring seals serve as the primary environmental barrier for the valve.

46. A — A thermostat that begins opening at 193°F — only 2°F below its rated 195°F — is functioning within acceptable manufacturing tolerance. Thermostats are mechanical devices with wax pellet actuators, and a ±2°F–3°F variation from the stamped rating is normal. Full opening at 212°F (approximately 17°F–20°F above the initial opening point) is also within the expected range. The thermostat passes the bench test and is functioning correctly.

47. C — Five historical DTCs for position disagreement on different dates — with no current active code and the system operating normally — represent an intermittent condition rather than a confirmed ongoing failure. Replacing components based on historical codes that are not currently active risks unnecessary expense and may not address the actual root cause. Clearing the codes, documenting the history, and monitoring for recurrence allows the technician to capture live data during the next event for accurate diagnosis.

48. B — Subcooling of only 2°F is critically below the normal 10°F–20°F range, confirming the condenser is barely producing liquid refrigerant — nearly all the refrigerant leaving the condenser is at or near its condensation temperature with almost no liquid margin. The most common cause of very low subcooling is an undercharged system — insufficient refrigerant mass prevents the condenser from filling with enough liquid to produce meaningful subcooling. The both-sides-low gauge readings support this diagnosis.

49. D — The scan tool shows the HVAC module is NOT commanding the relay — the module has decided not to engage the compressor based on its input data. Since the system has adequate static pressure and the event correlates with water intrusion into the engine compartment, the most likely affected component is the A/C pressure sensor connector. Water in the sensor connector can short the signal to ground (producing a 0 psi reading) or create an out-of-range voltage that the module interprets as an unsafe condition, preventing engagement.

50. B — A cable-operated blend door system relies on the physical cable to hold the blend door in the precise position selected by the temperature control. A stretched or misadjusted cable develops slack that prevents precise mid-range positioning — the door can reach the endpoints (full hot, full cold) but cannot hold a stable intermediate position. The slack allows the door to drift under airflow pressure, producing the hunting pattern between warm and cool. Adjusting or replacing the cable restores precise mid-range positioning.