

# PRACTICE EXAM 4: ASE A7 SIMULATION (50 QUESTIONS)

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1. A technician connects a manifold gauge set to an A/C system at rest with the engine off. The ambient temperature is 78°F. Both gauges read approximately 85 psi. After starting the engine and engaging the A/C, the low side drops to 28 psi and the high side rises to 195 psi. Vent temperature reaches 42°F. What should the technician conclude?

- A. The system is slightly undercharged because the static pressure does not precisely match the P-T chart
- B. The system is operating within normal parameters for the stated ambient temperature conditions
- C. The high-side pressure is too low, indicating condenser airflow restriction reducing heat rejection
- D. The low-side pressure is too low, indicating a partially blocked metering device starving the evaporator

2. Technician A says that a new replacement compressor arrives from the manufacturer pre-charged with oil that may need adjustment before installation. Technician B says that the oil in a new compressor should always be completely drained and replaced with fresh oil before installation. Who is correct?

- A. Technician A only, because the factory oil charge must be adjusted based on oil remaining in the system
- B. Technician B only, because factory-filled oil may have degraded during storage and shipping
- C. Both Technician A and Technician B, because draining and refilling ensures the freshest possible oil
- D. Neither Technician A nor Technician B, because compressors arrive dry and must be filled completely

3. A vehicle's A/C system produces adequate cooling with vent temperatures of 40°F when driving at 45 mph or faster. At speeds below 20 mph and at idle, the vent temperature gradually rises to 60°F. The compressor runs continuously at all speeds and does not cycle. Both gauge readings are normal at highway speed but the high side rises significantly when the vehicle slows. What is the MOST likely cause?

- A. A low refrigerant charge that provides adequate mass at highway speed but insufficient cooling at idle
- B. A worn compressor that cannot maintain adequate displacement at lower engine RPM speeds
- C. An evaporator that is partially iced over and progressively blocks airflow as the vehicle speed decreases
- D. Insufficient condenser airflow at low speeds due to a failed or underperforming condenser cooling fan

4. A technician measures voltage at the blower motor connector while the blower switch is set to MEDIUM speed. The reading is 6.8V. With the switch set to HIGH, the reading is 14.1V. What component is controlling the voltage difference between these two speed settings?

- A. The HVAC control module using a pulse-width modulated signal to vary the motor speed electronically
- B. The blower motor resistor block, which drops voltage through fixed resistors at lower speed settings
- C. A variable-speed relay that adjusts its internal resistance based on the switch position selected
- D. The blower motor's internal brush resistance, which naturally limits current at lower speed settings

5. An R-134a system is being charged after evacuation. The underhood label specifies 24 ounces. The technician charges exactly 24 ounces by weight. After running the system for 10 minutes at 1,500 RPM, the low-side pressure is 40 psi and the high-side is 260 psi at 95°F ambient. Vent temperature is 48°F. What should the technician do?

- A. Recover 2–3 ounces of refrigerant because the high-side pressure indicates a slight overcharge condition
- B. Add 2–3 ounces of additional refrigerant because the vent temperature is warmer than the optimal range
- C. Accept these readings as normal for the high ambient temperature and release the vehicle to the customer
- D. Inspect the condenser fans because elevated high-side pressure always indicates an airflow restrictio

6. A vehicle's scan tool HVAC data shows the ambient temperature sensor reading 145°F. The actual outside temperature is 88°F. The vehicle was driven to the shop on a hot day and has been idling for 5 minutes. What is the MOST likely explanation?

- A. The ambient sensor is heat-soaked from engine and road radiation and has not yet cooled to true ambient
- B. The sensor has a short to voltage in its signal wire that is pulling the reading to the maximum range
- C. The HVAC control module is adding a software offset to compensate for the high ambient conditions
- D. The sensor has failed completely and is producing a random high reading unrelated to any physical cause

7. Technician A says that the heater core is plumbed in parallel with the radiator so coolant flows through the heater core even when the thermostat is closed. Technician B says that the heater core cannot provide any heat until the thermostat opens and allows coolant to circulate through the entire system. Who is correct?

- A. Technician A only, because the parallel circuit allows coolant to flow through the heater during warm-up
- B. Technician B only, because all coolant must pass through the radiator before reaching the heater core
- C. Both Technician A and Technician B, because different vehicle designs use both plumbing configurations
- D. Neither Technician A nor Technician B, because the heater core is plumbed in series with the radiator

8. A technician removes a TXV from a vehicle and notices the capillary tube connecting the sensing bulb to the valve body is kinked and partially crushed. What effect would this damaged capillary tube have on TXV operation?

- A. The TXV would operate normally because the capillary tube only serves as a mounting bracket for the bulb
- B. The TXV would oscillate rapidly between open and closed positions as the damaged tube creates pressure pulses
- C. The TXV would be stuck in the fully open position because the damaged tube cannot restrict opening pressure

D. The TXV would likely remain closed or nearly closed because bulb pressure cannot reach the diaphragm properly

9. On a vehicle with electronic HVAC controls, the technician notices that all HVAC functions work correctly except that the recirculation door does not respond when the recirculation button is pressed. The scan tool shows no DTCs related to the air inlet circuit. What should the technician check FIRST?

A. The HVAC control module output circuits using a lab scope to verify the signal waveform to the actuator

B. The recirculation door actuator by performing a bidirectional test through the scan tool to verify response

C. The recirculation button on the control panel to verify it is sending an input signal to the HVAC module

D. The LIN bus communication wire between the module and actuator for an open or shorted condition

10. A vehicle that has been sitting unused in a parking lot for four months is brought to the shop with an A/C complaint. The system blows warm air. The compressor clutch will not engage. The low-side static pressure reads 35 psi at 80°F ambient. What is the MOST likely cause?

A. The compressor has seized internally from sitting unused and the clutch cannot overcome the resistance

B. The TXV sensing bulb has lost its charge during the extended storage period and needs replacement

C. The serpentine belt has deteriorated from sitting and is slipping on the compressor clutch pulley

D. The refrigerant charge has leaked down to a level where the low-pressure switch prevents engagement

11. A technician is testing a compressor clutch relay by measuring voltage at the relay socket with the relay removed. Terminal 30 shows 12.3V (battery voltage) and terminal 86 shows 12.1V when the A/C is requested. Terminal 85 shows 0.2V. What do these readings indicate?

A. The relay socket is receiving incorrect voltage and the fuse supplying the relay circuit has high resistance

- B. The relay control circuit is functioning correctly, providing power and ground to energize the relay coil
- C. The HVAC module is not providing a ground signal because terminal 85 should read battery voltage
- D. The relay power supply circuit has a significant voltage drop that will prevent proper relay operation

12. A technician measures the temperature at the condenser inlet and condenser outlet on an R-134a system. The inlet temperature is 165°F and the outlet temperature is 160°F. Ambient temperature is 90°F. What does this small temperature differential indicate?

- A. Normal condenser operation showing adequate heat rejection across the full condenser surface area
- B. A severely overcharged system with excess refrigerant flooding the entire condenser with liquid
- C. The condenser is not rejecting adequate heat, likely due to airflow restriction or fan failure
- D. The metering device is stuck open, causing high-side pressure to drop and reduce condenser loading

13. A vehicle's A/C system uses R-1234yf. The technician has R-134a recovery equipment and R-1234yf recovery equipment available. The refrigerant identifier confirms R-1234yf is in the system. Which statement about servicing this system is correct?

- A. R-134a equipment may be used if the technician purges the machine's hoses thoroughly before connecting
- B. Either machine may be used since R-1234yf and R-134a have nearly identical operating characteristics
- C. Only the dedicated R-1234yf equipment certified to SAE J2843 may be used to service this system
- D. The R-134a machine may be used for recovery only, but the R-1234yf machine must be used for charging

14. A technician is diagnosing a vehicle where the blend door actuator was replaced one week ago by another technician. The customer returned complaining that the temperature control does not reach full cold or full hot — it only adjusts through a narrow mid-range. No DTCs are stored. What is the MOST likely cause?

- A. The replacement actuator was not calibrated after installation, so the module's range does not match the door's full travel
- B. The replacement actuator is the wrong part number and has a shorter mechanical travel range than specified
- C. The HVAC control module software is incompatible with the replacement actuator's feedback signal range
- D. The blend door pivot has seized partially due to debris dislodged during the previous actuator replacement

15. A vehicle's A/C system has been retrofitted from R-12 to R-134a. The customer complains of poor cooling performance on extremely hot days (over 100°F) but adequate cooling on moderate days. There are no leaks and the charge is correct. What is the MOST likely explanation?

- A. The retrofit was performed with incorrect PAG oil viscosity that is degrading in extreme heat conditions
- B. The R-134a refrigerant is chemically breaking down at temperatures above 100°F and losing effectiveness
- C. The original R-12 components are adequately sized for R-12 but marginally undersized for R-134a efficiency
- D. R-134a is slightly less efficient than R-12, and the original system components reach their capacity limit under extreme heat loads

16. A technician uses a scan tool to command the mode door actuator to the FLOOR position. The actuator motor runs and the feedback shows the actuator reached the FLOOR position. However, the technician feels strong airflow from the defrost vents and only weak airflow from the floor vents. What is the MOST likely cause?

- A. The scan tool is misidentifying the actuator positions due to a software calibration error in the module
- B. A broken or disconnected linkage between the mode door actuator output shaft and the physical mode door
- C. An air leak in the HVAC housing that is allowing air to bypass the mode door and exit through the defrost
- D. The defrost ductwork is positioned upstream of the mode door and receives uncontrolled airflow at all times

17. What is the primary purpose of measuring subcooling at the condenser outlet during A/C diagnosis?
- A. To verify that the compressor clutch is engaging with sufficient magnetic force for full engagement
  - B. To determine the exact amount of superheat present at the evaporator outlet for TXV adjustment
  - C. To confirm that the refrigerant is fully condensed into liquid form before reaching the metering device
  - D. To measure the total heat load on the system and determine if the condenser is the correct size

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18. A technician is testing the resistance of a compressor clutch coil. With the coil disconnected from the vehicle wiring harness, the ohmmeter reads 4.2 ohms across the coil terminals. The manufacturer's specification is 3.0–5.0 ohms. What does this reading indicate?
- A. The clutch coil is within specification and is not the cause of a clutch engagement problem
  - B. The coil resistance is at the high end of the range and indicates early-stage winding degradation
  - C. The reading is only valid if the coil temperature is above 150°F during the measurement process
  - D. The coil should be replaced because any reading above 4.0 ohms indicates excessive internal resistance
19. A customer reports that their vehicle's A/C system blows cold air on the passenger side but room-temperature air on the driver side. This is a single-zone system with one blend door and one evaporator. What is the MOST likely cause?
- A. A refrigerant flow restriction in the evaporator that cools the passenger half but not the driver half
  - B. A cabin air filter that has shifted and is blocking airflow only to the driver-side evaporator section
  - C. An air leak in the driver-side ductwork downstream of the HVAC housing that is drawing in warm air
  - D. A crack or gap in the HVAC housing that allows warm air from the engine bay to mix into the driver-side ducts

20. A technician is checking the A/C pressure transducer signal on the scan tool. The reading shows 0 psi with the engine off and the system at rest. The ambient temperature is 85°F. A manifold gauge connected to the same port reads 95 psi. What is the correct diagnostic step?

- A. Replace the HVAC control module since it is clearly misinterpreting the pressure transducer signal
- B. Inspect the pressure transducer electrical connector, wiring, and sensor for an open or faulty signal circuit
- C. Recalibrate the manifold gauge set since the electronic sensor is more accurate than a mechanical gauge
- D. Replace the Schrader valve core in the service port since a sticking core can produce incorrect readings

21. On a vehicle with an automatic temperature control system, the driver reports that the system blows cold air from the vents for approximately 30 seconds after starting the engine on a cold winter morning, then switches to warm air as the engine begins to heat up. What does this behavior indicate?

- A. Normal ATC operation where the module initially circulates available air then transitions to heat as coolant warms
- B. A faulty blend door actuator that defaults to the cold position at startup before recalibrating its range
- C. A failing HVAC control module that loses its stored temperature settings each time the engine is shut off
- D. An incorrect thermostat rating that is allowing the engine to warm up more slowly than the system expects

22. A technician recovers refrigerant from a system and the recovered oil appears milky white with a cloudy consistency. What does this oil condition indicate?

- A. The oil has been contaminated with engine coolant from a leaking heater core inside the HVAC housing
- B. The oil is normal PAG oil that always appears milky white when exposed to cold recovery temperatures
- C. The oil has been mixed with an incompatible refrigerant type that caused a chemical reaction
- D. The oil has absorbed significant moisture, indicating the system's desiccant has been fully saturated

23. A vehicle's A/C evaporator has a confirmed slow leak that was detected with UV dye at the condensation drain outlet. The customer asks if an A/C sealant product can be used instead of replacing the evaporator. What is the correct advice?

- A. Sealant products are the manufacturer-recommended first repair option for all evaporator leaks
- B. Sealant products work permanently on small leaks and should be tried before committing to replacement
- C. Sealant products are not considered a permanent repair and evaporator replacement is the proper fix
- D. Sealant products are effective but require the compressor to be replaced simultaneously to prevent damage

24. A technician is diagnosing a vehicle where the heater produces hot air when the temperature control is set to maximum heat, but the air temperature does not decrease at all when the control is moved to mid-range or full cold positions. The A/C compressor engages normally. What is the MOST likely cause?

- A. A stuck-open heater control valve that is allowing constant coolant flow through the heater core
- B. A blend door that is stuck in the full hot position and does not move in response to temperature changes
- C. A failed evaporator that cannot absorb heat from the air even though the compressor is operating
- D. An overheating engine that is producing so much heat that the blend door cannot compensate

25. A vehicle's cooling system uses a 50/50 mix of ethylene glycol coolant and water. The technician tests the coolant with a refractometer and reads a freeze point of  $-10^{\circ}\text{F}$ . A properly mixed 50/50 solution should read approximately  $-34^{\circ}\text{F}$ . What does this reading indicate?

- A. The coolant mixture has too much water and not enough glycol concentrate to provide adequate protection
- B. The refractometer is malfunctioning and should be recalibrated using a known reference sample
- C. The coolant is at the end of its service life and the chemical inhibitors have depleted below the minimum
- D. The coolant has been contaminated with a different glycol type that is lowering the effective freeze point

26. On a vehicle with electronic HVAC controls, the scan tool shows the following information: A/C compressor commanded ON by the module, A/C relay commanded ON by the module, A/C pressure sensor reading 88 psi (system at rest, ambient 82°F). However, the compressor clutch does not engage. What should the technician check FIRST?

- A. The refrigerant charge level by connecting a manifold gauge set to verify the pressure sensor reading
- B. The HVAC control module power and ground circuits for adequate voltage supply to the module
- C. The evaporator temperature sensor signal to verify it is not preventing the module from engaging
- D. The A/C relay and clutch coil circuit for an electrical fault preventing voltage from reaching the clutch

27. Technician A says that the serpentine belt automatic tensioner maintains constant belt tension and eliminates the need for manual belt tension adjustment. Technician B says that a worn tensioner can cause belt flutter, chirping noise, and accessory drive slippage. Who is correct?

- A. Technician A only, because tensioners are maintenance-free and do not wear or degrade over time
- B. Both Technician A and Technician B are correct about tensioner function and potential failure effects
- C. Technician B only, because automatic tensioners still require periodic manual tension adjustment
- D. Neither Technician A nor Technician B, because most modern vehicles no longer use belt tensioners

28. A vehicle has an A/C system with the following gauge readings: low side 8 psi, high side 120 psi. The suction line from the evaporator to the compressor is warm to the touch rather than cold. The ambient temperature is 85°F. What is the MOST likely cause?

- A. A failed compressor with internal bypass that cannot create an adequate pressure differential
- B. An overcharged system causing the excess refrigerant to pool in the evaporator and reduce efficiency
- C. A severely restricted metering device or liquid line that is starving the evaporator of refrigerant flow
- D. A condenser fan that is running in reverse due to incorrect wiring, reducing heat rejection capability

29. A technician is performing a cooling system bleed procedure after replacing a thermostat. The service manual specifies opening a bleed valve on the thermostat housing during filling. If the technician does not open this bleed valve, what is the MOST likely consequence?

- A. An air pocket will be trapped in the cooling system that may cause overheating and poor heater output
- B. The new thermostat will not open properly because the air pressure holds the valve in the closed position
- C. The water pump will cavitate continuously because air reduces the liquid volume available for pumping
- D. The coolant level sensor will read incorrectly and illuminate the low coolant warning light on the dash

30. A technician is diagnosing a vehicle with an A/C system that has been functioning poorly since a body shop replaced the front bumper cover after a minor collision. The gauge readings show both sides slightly higher than normal. The vent temperature is 52°F at 88°F ambient. What should the technician inspect?

- A. The compressor mountings for misalignment caused by the body shop bumping the compressor bracket
- B. The refrigerant charge level because the body shop may have accidentally discharged some refrigerant
- C. Whether the body shop reinstalled the condenser air deflectors and seals that direct airflow through the condenser
- D. The evaporator for damage transmitted through the HVAC housing from the impact force of the collision

31. A vehicle owner complains that the heated seats and climate control display work normally, but no HVAC functions respond — no blower, no compressor engagement, no door actuator movement. The fuses all test good. The scan tool can communicate with the HVAC module and shows no DTCs. What should the technician investigate?

- A. The body control module since it may control the power supply relay that feeds the HVAC module outputs
- B. The engine control module because it must authorize all HVAC functions before allowing engagement
- C. The instrument cluster because it serves as the gateway for all body electrical system communications

D. The HVAC module's main power or output supply circuit, since the module communicates but cannot drive any loads

32. A technician is evaluating an A/C system on a hybrid vehicle equipped with an electric compressor rather than a belt-driven compressor. What is a key diagnostic difference between an electric compressor system and a conventional belt-driven system?

A. The electric compressor operates independently of engine RPM, so its output does not change with engine speed

B. The electric compressor uses R-12 exclusively because it is the only refrigerant compatible with electric motors

C. The electric compressor does not require any lubricating oil because the electric motor has sealed bearings

D. The electric compressor produces lower discharge pressures because electric motors generate less torque

33. On a vehicle with vacuum-operated HVAC controls, the mode selection works correctly when the engine is cold but becomes erratic after the engine reaches operating temperature. What is the MOST likely cause?

A. The thermostat is affecting vacuum supply by changing the engine's operating characteristics at temperature

B. A vacuum hose routed near the exhaust manifold that softens and collapses when heated, restricting flow

C. The vacuum reservoir is expanding due to heat and increasing its internal volume beyond design limits

D. The HVAC control panel vacuum switches are calibrated for cold engine vacuum levels and drift when hot

34. A vehicle's A/C compressor runs continuously without cycling in an orifice tube system. The low-side pressure reads 15 psi and the high-side reads 320 psi at 90°F ambient. The suction line is cold with heavy frost on the accumulator. What is the MOST likely cause?

- A. A massively overcharged system that is creating abnormally high head pressure on the high side
- B. A stuck-open TXV that is flooding the evaporator with excessive liquid refrigerant from the high side
- C. Normal system operation under extreme ambient temperature conditions with high heat load demand
- D. A restricted or partially blocked orifice tube creating excessive pressure differential across the metering point

35. A customer reports that the windshield defroster clears the glass effectively on the driver side but leaves persistent fog on the passenger side. The blower motor operates at full speed in defrost mode. What is the MOST likely cause?

- A. A cracked or leaking heater core on the passenger side releasing coolant vapor onto the passenger glass
- B. A failed mode door that is not directing adequate airflow to the passenger-side defrost outlet vent
- C. A blocked or misdirected defrost duct on the passenger side that is not delivering air to that section of glass
- D. The windshield has a defect in the glass coating on the passenger side that attracts more condensation

36. A technician is diagnosing an ATC system where the blend door actuator completes a full sweep during calibration on the scan tool but the vent temperature only changes from 55°F to 65°F instead of the expected 40°F to 130°F range. There are no DTCs. What is the MOST likely cause?

- A. A disconnected heater hose or closed heater control valve limiting the hot end of the temperature range
- B. A contaminated evaporator that cannot produce temperatures below 55°F due to reduced heat transfer
- C. An actuator that has the correct travel range but is installed in the wrong position on the door shaft
- D. A failed engine thermostat stuck open that prevents coolant from reaching adequate heating temperature

37. Technician A says that when the low-pressure cutout switch prevents compressor engagement, the correct repair is to bypass the switch and charge the system. Technician B says that when the low-pressure switch prevents engagement, the correct approach is to find and repair the leak, then evacuate and recharge the system. Who is correct?

- A. Technician A only, because the system needs refrigerant before the switch will allow normal operation
- B. Technician B only, because bypassing the switch risks compressor damage from running without oil
- C. Both Technician A and Technician B, because bypassing is necessary to add charge before leak testing
- D. Neither Technician A nor Technician B, because the switch should be replaced regardless of charge level

38. A vehicle's scan tool HVAC data shows the blend door position commanded to 50% and the actual feedback reads 50%. The set temperature is 72°F. The in-car sensor reads 72°F. The ambient sensor reads 85°F. The evaporator temperature reads 37°F. The customer reports comfortable temperature from the face vents but cold air from the floor vents. What is the MOST likely cause?

- A. A blend door with a warped or broken section that directs different air temperatures to different outlets
- B. An incorrect mode door position that is directing unevenly mixed air to the panel and floor outlets
- C. A leaking evaporator that is producing cold condensation that drips onto the floor ductwork area
- D. A mode door that is partially stuck, splitting airflow unevenly between the floor and panel distribution paths

39. A technician replaces the accumulator on an orifice tube system during a compressor replacement. What MUST the technician do to the new accumulator before installation?

- A. Pre-charge the accumulator with a small amount of refrigerant to prevent the desiccant from drying out
- B. Remove the shipping caps and immediately blow nitrogen through the accumulator to purge any moisture
- C. Add the specified amount of clean refrigerant oil to replace the oil retained in the old accumulator
- D. Verify the desiccant bag is properly seated by shaking the accumulator and listening for bead movement

40. A vehicle's A/C system was recharged two months ago. The customer returns with a complaint that cooling has gradually diminished. The technician recovers the refrigerant and obtains 16 ounces — the

original charge was 22 ounces. No visible oil staining is found at any fittings or components during a visual inspection. What should the technician do next?

- A. Inject UV dye into the system, recharge, and instruct the customer to return in 1–2 weeks for a dye inspection
- B. Replace all O-rings at every fitting since one of them must be the source of the undetectable refrigerant loss
- C. Perform an electronic leak test at all fittings and connections to attempt to locate the leak source
- D. Pressure test the system with nitrogen and apply soap solution to every connection point for bubble detection

41. On a vehicle with automatic temperature control, the passenger adjusts the temperature setting from 72°F down to 65°F. The system responds by immediately blowing maximum cold air from all vents at high blower speed before gradually settling to normal output. What does this behavior indicate?

- A. A failing HVAC control module that overreacts to temperature setting changes with excessive output
- B. An incorrectly calibrated blend door actuator that overshoots the target position before correcting
- C. Normal ATC response to a large set-point change, where the module initially maximizes output to reach the new target quickly
- D. A faulty in-car temperature sensor that momentarily spikes its reading when the control panel is adjusted

42. A technician notices that the oil recovered from an A/C system has a greenish tint with gritty particles visible. What does this oil condition MOST likely indicate?

- A. Normal discoloration that occurs when PAG oil mixes with UV dye that was previously injected
- B. Desiccant breakdown from the accumulator or receiver-drier, with loose beads contaminating the system
- C. Copper corrosion from deteriorating evaporator or condenser tubes dissolving into the refrigerant oil
- D. An incorrect oil type that has chemically reacted with the refrigerant and produced corrosion byproducts

43. A vehicle with electronic HVAC controls has intermittent communication faults. The scan tool occasionally displays U-codes for lost communication with multiple modules. The technician notices that the HVAC, instrument cluster, and power window functions all drop out simultaneously and then restore after a few seconds. What is the MOST likely cause?

- A. Multiple individual module failures occurring coincidentally at the same time across different systems
- B. A failing HVAC control module that is flooding the network with corrupted data and disrupting traffic
- C. A faulty body control module power supply that is intermittently losing voltage and rebooting the module
- D. An intermittent CAN bus wiring fault such as a loose connection or damaged wire affecting the shared network

44. Technician A says that POE (polyolester) oil is sometimes used in R-12 to R-134a retrofit systems because it is compatible with both refrigerants. Technician B says that POE oil is more tolerant of residual mineral oil that may remain in the system after flushing during a retrofit. Who is correct?

- A. Both Technician A and Technician B are correct about POE oil's compatibility advantages in retrofit applications
- B. Technician A only, because POE oil is actually less tolerant of mineral oil contamination than PAG oil
- C. Technician B only, because POE oil is only compatible with R-12 and cannot be used with R-134a systems
- D. Neither Technician A nor Technician B, because POE oil is exclusively used in commercial refrigeration

45. A vehicle has a heater performance complaint. The technician verifies that the engine reaches 205°F operating temperature, both heater hoses are hot, and the blend door moves to full hot when commanded. However, the maximum vent temperature from the floor vents is only 95°F instead of the expected 130°F or higher. What is the MOST likely cause?

- A. A thermostat rated at too low a temperature that is limiting the maximum coolant temperature available

- B. A heater control valve that is only partially opening and restricting full coolant flow to the heater core
- C. A heater core that has internal buildup restricting flow enough to reduce heat output despite both hoses being hot
- D. An air leak in the floor ductwork that is mixing ambient temperature air into the heated air stream

46. A technician is diagnosing a vehicle where the A/C compressor engages when the defrost mode is selected but does NOT engage when the panel (face vent) mode is selected with the A/C button pressed. What is the MOST likely cause?

- A. A failed compressor clutch coil that only engages when the module sends a higher voltage in defrost mode
- B. A failed A/C relay that operates only when triggered by the defrost circuit but not the normal A/C circuit
- C. A failed evaporator temperature sensor that sends a signal preventing A/C engagement except in defrost
- D. A faulty A/C switch or its circuit that fails to send the A/C request signal to the module in normal modes

47. A vehicle has a DTC U0100 — Lost Communication with ECM stored in the HVAC module. The A/C compressor will not engage. After the communication issue is repaired, should the A/C system require additional diagnosis?

- A. Yes, because the communication fault likely caused physical damage to the compressor clutch coil
- B. No, because restoring communication should allow the HVAC module to resume normal compressor control
- C. Yes, because the refrigerant charge is likely depleted from sitting with the compressor non-operational
- D. No, but the system must be evacuated and recharged as a precaution after any module communication fault

48. A technician is performing an A/C system flush after a compressor failure. The vehicle has a sub-cool condenser with integrated receiver. Which approach is correct for this condenser type?

- A. Replace the entire condenser assembly because the integrated receiver and micro-channels cannot be flushed
- B. Flush only the sub-cooling section at the bottom while sealing off the receiver section from solvent
- C. Remove the receiver tank insert from the condenser header and flush the tubes with the receiver removed
- D. Flush the condenser normally using reverse-flow technique since the integrated design does not affect procedure

49. Technician A says that a cycling clutch orifice tube system controls evaporator temperature by cycling the compressor on and off using a pressure or temperature switch. Technician B says that a TXV system controls evaporator temperature by varying refrigerant flow through the expansion valve based on sensing bulb feedback. Who is correct?

- A. Technician A only, because TXV systems also rely on compressor clutch cycling to control temperature
- B. Both Technician A and Technician B are correct about how each system type controls evaporator temperature
- C. Technician B only, because orifice tube systems use a variable-speed compressor rather than clutch cycling
- D. Neither Technician A nor Technician B, because both system types use identical temperature control methods

50. A vehicle has been sitting in the sun for several hours on a 100°F day. The owner starts the engine and turns the A/C to maximum. The initial vent temperature is 90°F. After 3 minutes, the vent temperature drops to 55°F. After 8 minutes, it reaches 42°F. The owner felt the initial 90°F output was a system failure. What should the technician explain?

- A. The system has a slow refrigerant leak that reduces initial cooling capacity until full pressure develops
- B. The compressor clutch has a delayed engagement due to a weak coil that requires warm-up time to function
- C. This is normal pull-down behavior — the system must overcome extreme cabin heat load before reaching target temperature

D. The evaporator is partially restricted and needs flushing to restore instantaneous cooling upon system startup

## Practice Exam 4: Answer Key and Explanations

1. B — At 78°F ambient, a static pressure of 85 psi is consistent with the P-T chart for R-134a. With the system running, a low-side of 28 psi, high-side of 195 psi, and vent temperature of 42°F all fall squarely within the normal operating ranges for this ambient temperature. These readings indicate a properly charged, fully functional system with no abnormalities requiring further investigation.

2. A — Technician A is correct that a new compressor arrives pre-charged with oil that typically represents the total system oil capacity, and this amount must be adjusted to account for oil remaining in other system components. Technician B is incorrect because the factory oil is clean and appropriate — completely draining and replacing it is unnecessary and risks introducing contamination or incorrect oil measurement.

3. D — Adequate cooling at highway speed with degraded cooling at low speed, combined with a rising high-side pressure as the vehicle slows, is the textbook pattern for insufficient condenser airflow at low vehicle speeds. At highway speed, ram air provides sufficient condenser cooling. At idle and low speeds, the condenser fan must supply this airflow — a failed or underperforming fan allows high-side pressure to climb and cooling performance to deteriorate.

4. B — In a resistor-based blower speed control system, the blower switch selects different combinations of fixed resistors that drop voltage before it reaches the motor. At MEDIUM speed, resistors in the circuit drop the voltage from battery level down to 6.8V. At HIGH speed, all resistors are bypassed and the motor receives full battery voltage at 14.1V. This stepped voltage reduction through fixed resistors is the defining characteristic of resistor block speed control.

5. C — At 95°F ambient with a correct 24-ounce charge verified by weight, pressures of 40 psi low / 260 psi high and a vent temperature of 48°F are all within normal ranges for hot-day conditions. Higher ambient temperatures push both pressures upward and reduce the achievable vent temperature. The system is performing as designed under demanding conditions and no corrective action is needed.

6. A — A reading of 145°F from the ambient sensor after driving on a hot day and idling for 5 minutes is consistent with heat soak — radiant heat from the engine, exhaust, and hot pavement has heated the sensor above the true air temperature. Many ATC modules include software filtering to manage heat

soak, but the raw sensor reading can temporarily show elevated values. As the vehicle moves and airflow cools the sensor, the reading will drop to the actual ambient temperature.

7. A — Technician A is correct that the heater core is plumbed in parallel with the radiator, creating an independent flow path that allows coolant to circulate through the heater core even when the thermostat is closed and blocking flow to the radiator. This is why vehicles begin producing some cabin heat within minutes of cold start — the water pump pushes coolant through the heater circuit from the moment the engine starts, regardless of thermostat position.

8. D — The capillary tube transmits the sensing bulb's pressure to the TXV diaphragm. If this tube is kinked or crushed, the bulb pressure cannot reach the diaphragm effectively — the opening force is lost or severely reduced. Without adequate opening force, the spring and evaporator pressure (both closing forces) hold the valve closed or nearly closed, starving the evaporator of refrigerant and producing poor or no cooling.

9. C — Since no DTCs are stored and all other HVAC functions work correctly, the HVAC module, actuators, and communication network are functional. The most logical first check is the recirculation button itself — if the button's switch is not sending an input signal to the module, the module has no way of knowing the button was pressed. Verifying the input signal before testing the output circuit follows proper diagnostic sequence from input to output.

10. D — A static pressure of 35 psi at 80°F ambient is dramatically below the expected 90–100 psi, confirming the system has lost a significant portion of its refrigerant charge during the four months of storage. At this low pressure, the low-pressure cutout switch correctly prevents compressor engagement to protect the compressor from running without adequate refrigerant and lubricating oil. The leak must be found, repaired, and the system properly recharged.

11. B — Terminal 30 at battery voltage confirms power is available to the relay's switch contact. Terminal 86 at 12.1V confirms the relay coil has power. Terminal 85 at 0.2V confirms the HVAC module is providing a ground path for the relay coil (the small voltage represents the minor voltage drop across the module's ground-side driver). With power on pin 86 and ground on pin 85, the relay coil circuit is complete and the relay would energize when installed.

12. C — A temperature differential of only 5°F across the condenser (165°F in, 160°F out) is far too small — a properly functioning condenser should show a 20°F–50°F temperature drop as hot vapor enters at the top and exits as warm liquid at the bottom. This minimal heat rejection indicates the

condenser is not performing its job, most likely due to restricted airflow from debris, a failed fan, or a physical blockage between the condenser and radiator.

13. C — R-1234yf is classified as mildly flammable (A2L) and requires its own dedicated recovery, recycling, and charging equipment certified to SAE J2843. This standard includes a mandatory built-in refrigerant identifier to prevent recovering flammable contaminants. Using R-134a equipment on an R-1234yf system violates EPA regulations and creates safety risks from cross-contamination and flammability. No exceptions apply regardless of how similar the refrigerants' operating characteristics are.

14. A — A blend door that moves through a narrow mid-range without reaching full cold or full hot — immediately after actuator replacement with no DTCs — is the classic symptom of a missing calibration procedure. The new actuator's mechanical range does not correspond to the module's stored position reference points from the old actuator. The module must relearn the new actuator's full travel range through a calibration or relearn procedure specified in the service manual.

15. D — R-134a is slightly less thermally efficient than R-12, meaning the same-sized condenser, evaporator, and compressor produce marginally less cooling with R-134a than they did with R-12. On moderate days, this small efficiency reduction is unnoticeable. On extreme days over 100°F, the system reaches its maximum capacity limit more quickly than it would have with R-12. This is an inherent limitation of the retrofit, not a system fault.

16. B — The scan tool confirms the actuator motor ran and the feedback shows it reached the floor position — meaning the actuator's motor and gears are functional. But the airflow exits from the wrong vents, meaning the physical mode door did not move. A broken or disconnected linkage between the actuator output shaft and the mode door allows the actuator to operate normally (motor runs, shaft turns, feedback tracks) while the door remains stationary in its previous position.

17. C — Subcooling measures how far the refrigerant's temperature at the condenser outlet falls below its condensation temperature at the measured high-side pressure. Adequate subcooling (typically 10°F–20°F) confirms that the refrigerant leaving the condenser is fully condensed into a liquid state with no remaining vapor. Insufficient subcooling suggests undercharge or incomplete condensation; excessive subcooling suggests overcharge.

18. A — A clutch coil resistance of 4.2 ohms falls within the manufacturer's 3.0–5.0 ohm specification, confirming the coil winding is intact and within its designed resistance range. This reading eliminates the clutch coil as a suspect in any engagement problem. The technician should investigate other circuit

components — relay, fuse, pressure switches, wiring, and ground connections — as the cause of the engagement fault.

19. D — In a single-zone system with one blend door and one evaporator, both sides should receive identically conditioned air. If one side blows cold and the other blows ambient temperature, the air on the warm side is not being conditioned — it is bypassing the evaporator entirely. A crack or gap in the HVAC housing near the driver-side outlet would allow unconditioned warm air from the engine bay to enter the driver-side ductwork without passing through the evaporator.

20. B — The manifold gauge reads 95 psi (which matches the expected static pressure for 85°F ambient), confirming the system is properly charged. The scan tool reads 0 psi from the pressure transducer — a significant discrepancy that means the transducer is sending an incorrect signal to the module. The module sees 0 psi and will not engage the compressor because it believes the system is empty. Inspect the transducer connector, wiring, and sensor for faults.

21. A — This is normal ATC cold-start strategy. On a cold morning, the engine coolant is too cold to provide useful heat immediately. The ATC module initially allows the blower to circulate whatever air is available (which feels cold because the heater core has not warmed up yet). As the coolant temperature rises within the first few minutes, the module transitions to heated air delivery. The brief cold-air period before the engine warms is expected and not a fault.

22. D — Milky white, cloudy oil is the classic indicator of significant moisture contamination — water has emulsified with the PAG or POE oil, creating the milky appearance. This means the system's desiccant (in the accumulator or receiver-drier) has been completely saturated and can no longer absorb moisture. The system requires a thorough flush, replacement of the drier/accumulator with fresh desiccant, extended evacuation to remove all moisture, and a complete recharge with fresh oil.

23. C — While aftermarket A/C sealant products exist, they are not considered a permanent or manufacturer-recommended repair for evaporator leaks. Sealant particles circulate through the entire system and can clog the metering device screens, contaminate recovery equipment, and mask the leak temporarily without truly sealing it. The proper repair for a confirmed evaporator leak is evaporator replacement along with a new accumulator/receiver-drier and O-rings.

24. B — The A/C compressor engages normally (confirming the refrigeration circuit and controls work), but the temperature cannot be reduced from maximum hot regardless of the control setting. This means the blend door is stuck in the full hot position, directing all air through the heater core regardless of the

module's commands. A stuck blend door — from a failed actuator, stripped gears, or a physically jammed door — is the most direct explanation for this symptom.

25. A — A freeze point of  $-10^{\circ}\text{F}$  is significantly warmer than the  $-34^{\circ}\text{F}$  expected from a proper 50/50 mix, indicating the mixture contains too much water relative to glycol concentrate. This diluted mixture provides less freeze protection and less boiling point elevation than specified. The coolant should be adjusted by adding concentrate to restore the proper 50/50 ratio, or the system should be drained and refilled with correctly mixed coolant.

26. D — The scan tool confirms the HVAC module is commanding both the compressor and the relay ON, and the pressure sensor shows adequate system charge (88 psi static at  $82^{\circ}\text{F}$  is normal). Since the module is doing its job and the charge is present, the fault must be downstream in the relay-to-clutch circuit. Check the relay itself (contacts may be burned), the wiring from relay to clutch coil, and the clutch coil and ground for an open or high-resistance fault.

27. B — Both technicians are correct. Technician A correctly describes the function of an automatic tensioner — it uses a spring-loaded arm with an idler pulley to maintain constant belt tension, eliminating manual adjustment. Technician B correctly identifies that tensioners wear over time — the spring weakens, the pivot bearing degrades, and the dampening mechanism deteriorates, producing belt flutter, noise, and slippage on the accessory pulleys.

28. C — A low-side of 8 psi with a warm suction line indicates almost no refrigerant is reaching the evaporator — the evaporator is starved. The compressor is pulling the low side toward vacuum because the metering device or liquid line restriction is not allowing refrigerant through. The warm suction line confirms no cold refrigerant is present at the evaporator outlet. A severely restricted orifice tube, stuck-closed TXV, or kinked liquid line would produce this exact pattern.

29. A — When a bleed valve is not opened during cooling system filling, air becomes trapped above the closed thermostat in the highest point of the system. This air pocket prevents complete filling, creates a hot spot where coolant cannot circulate, and blocks full coolant flow through the heater core. The result is erratic temperature gauge readings, potential localized overheating, and reduced heater output — all caused by the trapped air preventing proper coolant circulation.

30. C — After bumper cover replacement, both-sides-slightly-high pressures with marginally warm vent temperatures suggest a mild condenser airflow restriction. Many vehicles have air deflectors, foam seals, and ducting pieces behind the bumper cover that direct incoming ram air through the condenser rather

than around it. If the body shop did not reinstall these pieces — or installed them incorrectly — some air bypasses the condenser, reducing heat rejection and raising system pressures.

31. D — The scan tool communicates with the HVAC module and reads no DTCs, confirming the module's microprocessor and communication circuits are functional. However, no outputs work — no blower, no compressor, no actuators. This indicates the module can think but cannot act, pointing to a loss of the module's main power supply or output power circuit. A failed power supply relay, a blown output fuse, or a wiring fault in the module's power distribution circuit would produce this exact symptom.

32. A — An electric compressor is driven by a high-voltage electric motor that operates independently of engine speed. In a conventional belt-driven system, compressor output varies with engine RPM — faster engine speed means more compressor output. An electric compressor maintains consistent output regardless of whether the engine is running at idle, cruising, or (in a hybrid) completely off. This is a fundamental diagnostic difference that affects performance testing and pressure interpretation.

33. B — Vacuum-operated HVAC systems route small rubber hoses throughout the engine compartment and dashboard. A hose routed near the exhaust manifold is exposed to extreme heat once the engine reaches operating temperature. The rubber softens and the hose collapses, restricting or blocking vacuum flow to the actuators it supplies. When cold, the hose is firm and passes vacuum normally. This temperature-dependent behavior directly matches the complaint pattern.

34. D — The combination of very low low-side pressure (15 psi), very high high-side pressure (320 psi), and a frost-covered accumulator with a cold suction line indicates a massive pressure differential across the metering device — consistent with a restricted or partially blocked orifice tube. The restriction traps refrigerant on the high side (raising pressure) while starving the low side (dropping pressure). The frost on the accumulator results from the small amount of refrigerant that passes through expanding dramatically.

35. C — Since the defroster clears the driver side effectively, the system is producing adequate warm, dehumidified air. The passenger side's persistent fog indicates that heated air is not reaching that portion of the windshield. A blocked, disconnected, or misdirected defrost duct on the passenger side would prevent air delivery to that area. The blower motor, heater core, and A/C system are all functioning — the problem is air distribution.

36. A — The actuator completes a full mechanical sweep (confirmed by the scan tool), but the temperature range is severely limited — only 55°F to 65°F instead of the expected 40°F to 130°F range.

The cold end works marginally (55°F from the evaporator), but the hot end barely rises (65°F), indicating the heater core is not contributing significant heat. A disconnected heater hose or a closed heater control valve would cut off hot coolant to the heater core, eliminating the hot end of the temperature range.

37. B — Technician B is correct that the proper response to a low-pressure switch preventing engagement is to find and repair the refrigerant leak, then evacuate and recharge. Technician A is incorrect because bypassing the low-pressure switch allows the compressor to run without adequate refrigerant and oil, which destroys the compressor through loss of lubrication and overheating. The switch is a protection device — it should never be permanently bypassed.

38. D — All sensor readings are accurate, the blend door is correctly positioned at 50% (mid-range for 72°F comfort), and the evaporator is cooling properly. The complaint is about temperature distribution — comfortable air from the face vents but cold air from the floor vents. This indicates the conditioned air is not being mixed uniformly before reaching the outlets. A partially stuck mode door that splits airflow unevenly between floor and panel ducts would deliver differently tempered air to each outlet.

39. C — The old accumulator retains compressor oil in its internal passages and around the desiccant bag. This retained oil is lost when the old accumulator is discarded. Adding the manufacturer-specified amount of fresh, correct-type refrigerant oil to the new accumulator before installation replaces this lost oil and maintains the total system oil charge. Without this step, the compressor will be under-lubricated.

40. A — With 6 ounces missing from a 22-ounce charge over two months and no visible oil staining found during visual inspection, the leak is too small or too inaccessible to detect with a brief visual check or possibly even a quick electronic scan. UV dye injected into the system will circulate with the refrigerant and accumulate at the leak point over days or weeks, making even the smallest leak visible under UV light upon the customer's return visit.

41. C — When the driver makes a large set-point change (72°F down to 65°F — a 7-degree drop), the ATC module detects a significant error between the current cabin temperature and the new target. The module's programmed response is to maximize output initially — full cold, high blower — to drive the cabin temperature toward the new set point as quickly as possible. As the cabin approaches 65°F, the module progressively reduces output to prevent overshoot. This aggressive-then-tapering response is normal ATC behavior.

42. B — Greenish-tinted oil with visible gritty particles is the characteristic signature of desiccant breakdown. The desiccant beads inside the accumulator or receiver-drier have deteriorated and released

bead material into the refrigerant stream. These particles contaminate the oil and can clog orifice tube screens and TXV inlet filters. The system requires a complete flush, replacement of the accumulator/receiver-drier, and inspection of all screens and metering devices for bead contamination.

43. D — Multiple modules losing communication simultaneously and then restoring indicates a shared communication pathway problem — the CAN bus wiring. A loose connector pin, a chafed wire intermittently shorting, or a corroded splice on the CAN bus line would cause all modules on that bus segment to lose communication at the same time. The intermittent nature matches a connection that breaks and re-establishes with vehicle vibration or temperature changes.

44. A — Both technicians are correct. Technician A is right that POE oil is compatible with both R-12 and R-134a, making it a practical choice for retrofit systems where both refrigerant types have been present. Technician B is right that POE oil mixes more readily with residual mineral oil than PAG oil does — since complete mineral oil removal during a retrofit is nearly impossible, POE's tolerance for mineral oil contamination provides an additional safety margin.

45. C — Both heater hoses are hot (confirming hot coolant is reaching and leaving the heater core), the blend door moves to full hot (confirming the air management system is directing all air through the heater core), and engine temperature is adequate at 205°F. Despite this, vent temperature maxes at 95°F instead of 130°F+. The heater core has internal buildup that is reducing its heat transfer efficiency — hot coolant passes through, but the deposits insulate the tube walls, preventing efficient heat transfer to the air.

46. D — In most vehicles, the defrost mode automatically engages the compressor through a separate signal path — the module activates the compressor whenever defrost is selected regardless of the A/C button status. A faulty A/C switch or its wiring circuit fails to send the normal A/C request signal to the module when panel mode is selected, but the defrost override path still works independently. The compressor itself and its relay are functional, proven by their operation in defrost.

47. B — The U0100 code indicates the HVAC module could not communicate with the ECM. Without ECM data (coolant temperature, engine RPM, engine running confirmation), the HVAC module cannot authorize compressor engagement. Once communication is restored, the module can again receive the necessary data and resume normal compressor control. No physical damage occurs to the A/C system from a communication fault — the system was simply waiting for authorization.

48. A — Sub-cool condensers with integrated receiver tanks are single-piece assemblies with internal micro-channels and built-in desiccant compartments that cannot be adequately flushed. Debris from

compressor failure becomes trapped in the narrow micro-channel passages and around the receiver section. The entire condenser assembly must be replaced to ensure no residual contamination reaches the new compressor. Attempting to flush this design risks leaving debris that will destroy the replacement compressor.

49. B — Both technicians are correct about the temperature control method used by each system type. Technician A correctly describes the orifice tube (CCOT) system — the fixed orifice cannot adjust flow, so a cycling clutch switch or sensor turns the compressor on and off to prevent evaporator freeze-up. Technician B correctly describes the TXV system — the expansion valve continuously varies refrigerant flow based on sensing bulb feedback to maintain target superheat, while the compressor typically runs continuously.

50. C — A vehicle that has been heat-soaked in 100°F sun for hours has a cabin temperature that can exceed 140°F. The A/C system must first overcome this massive stored heat load before vent temperatures begin approaching their normal cold range. This pull-down period — where temperatures start high and gradually decrease over several minutes — is completely normal and expected. The system's final 42°F vent temperature after 8 minutes confirms it is functioning properly.