

# PRACTICE EXAM 12: ASE A7 SIMULATION

## (50 QUESTIONS)

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1. A vehicle's A/C system has the following readings at 86°F ambient: low side 35 psi, high side 215 psi, vent temperature 45°F. The technician measures the liquid line temperature at the condenser outlet and finds it is 98°F. The P-T chart shows the high-side pressure of 215 psi corresponds to approximately 124°F. What is the subcooling value, and what does it indicate?

- A. 26°F subcooling, which is slightly above normal range and may indicate a mild overcharge condition
- B. 98°F subcooling, which represents the absolute liquid line temperature and confirms adequate condensation
- C. 124°F subcooling, which represents the saturation temperature and indicates the condenser is undersized
- D. 89°F subcooling, which indicates the condenser is rejecting far more heat than necessary for the conditions

2. Technician A says that a serpentine tube condenser can be effectively flushed after a catastrophic compressor failure because its internal passages are open and allow solvent to flow freely. Technician B says that a sub-cool condenser with an integrated receiver tank must be replaced rather than flushed because its micro-channels and internal receiver section trap debris. Who is correct?

- A. Technician A only, because all condenser designs can be flushed with approved solvent regardless of type
- B. Technician B only, because serpentine condensers also have micro-channels that prevent effective flushing
- C. Both Technician A and Technician B are correct about the flushability of their respective condenser types
- D. Neither Technician A nor Technician B, because all condensers must be replaced after any compressor failure

3. A vehicle owner reports that the heater works well on cold mornings during the commute to work. However, after parking the vehicle at work for 8 hours in 15°F weather, the heater takes noticeably longer to produce hot air during the evening commute compared to the morning startup. Engine warm-up time appears the same. What is the MOST likely explanation?

A. The heater core has developed a progressive restriction that worsens after extended cold soaking periods

B. The coolant concentration has changed due to evaporation during the workday, reducing heat transfer ability

C. The engine oil becomes thicker in cold weather, which slows the water pump and reduces heater core flow

D. The HVAC housing, ductwork, and heater core have cold-soaked during the 8-hour park and must absorb heat before delivering warm air to the cabin

4. A vehicle with electronic HVAC controls has a blower motor that operates normally on all speed settings. However, the technician notices that the actual airflow from the vents is noticeably weaker than expected despite the motor running at full speed. The cabin air filter was replaced one month ago. What should the technician check?

A. The blower motor voltage at the connector to verify full battery voltage is reaching the motor at high speed

B. The evaporator face for ice buildup or debris accumulation that is restricting airflow through the housing

C. The blower motor current draw to determine if the motor is developing adequate torque at full speed

D. The HVAC control module software for an update that corrects a known blower speed calibration error

5. A vehicle's A/C system produces adequate cooling from the dashboard vents. However, the customer reports hearing water sloshing inside the dashboard area when turning corners or braking. The sound has been present for several weeks. What is the MOST likely cause?

- A. A refrigerant leak inside the HVAC housing that is pooling liquid refrigerant in the evaporator drain pan
- B. A loose heater core that has shifted inside the HVAC housing and allows coolant to slosh during movement
- C. A clogged evaporator condensation drain tube causing water to accumulate inside the HVAC housing
- D. An air pocket in the heater core that produces sloshing sounds as coolant moves during vehicle maneuvers

6. On a vehicle with an ATC system, the scan tool shows the blend door actuator commanded to 50% and the actual position feedback reads 50%. The vent temperature from the center vent is 75°F. The set temperature is 72°F, the in-car sensor reads 75°F, and the evaporator temperature reads 37°F. All sensor readings verified accurate. What should the technician conclude?

- A. The module is correctly calculating a blend position that will gradually bring the 75°F cabin down to the 72°F set point
- B. The blend door actuator has stripped gears and the 50% reading is false despite matching the command
- C. The evaporator temperature of 37°F is too cold and is causing the module to limit cooling by opening the blend
- D. The system is malfunctioning because 50% blend should produce air much cooler than 75°F with a 37°F evaporator

7. A technician is replacing a TXV on a vehicle. The old TXV is removed and the new TXV is ready for installation. Before installing the new valve, what critical pre-installation step should the technician perform regarding the sensing bulb?

- A. Pre-heat the sensing bulb with a heat gun to activate the internal charge before connecting it to the system
- B. Test the bulb by immersing it in ice water and verifying the valve closes completely in response to cold

C. Verify that the new TXV has the exact same superheat rating as the original by comparing the part numbers

D. Verify the sensing bulb charge is intact by checking that the capillary tube is undamaged and the bulb is not corroded

8. A vehicle's A/C system was recently recharged after a leak repair. The system cools well, but the technician notices the compressor cycles off for exactly 3 seconds every 45 seconds, producing a brief warm pulse from the vents. This is an orifice tube system. Gauge pressures during the on-cycle are: low side 32 psi, high side 200 psi at 84°F ambient. What does this cycling pattern indicate?

A. An overcharged system where excess refrigerant raises the low-side pressure above the switch cutout point

B. An incorrect cycling clutch switch that has been installed with a cutout pressure too close to normal operating range

C. A marginally low charge that allows the low-side to drop to the cutout point slightly faster than optimal

D. Normal cycling clutch operation for this system type, with pressures and vent temperatures within specification

9. A vehicle's engine coolant temperature reaches 200°F within 8 minutes of cold start on a 50°F day. The thermostat is rated at 195°F. The upper radiator hose becomes hot approximately 9 minutes after start. Both heater hoses are hot. The heater produces excellent heat. Which of these observations provides the STRONGEST confirmation that the thermostat is functioning correctly?

A. The engine reaching 200°F within 8 minutes, which shows the cooling system is holding heat during warm-up

B. Both heater hoses being hot, which confirms coolant is circulating through the heater core circuit properly

C. The heater producing excellent heat, which proves the entire cooling system including the thermostat is working

D. The upper radiator hose becoming hot after 9 minutes, which confirms the thermostat opened near its 195°F rating

10. A vehicle's scan tool shows the A/C high-side pressure reading 225 psi and the low-side reading 33 psi at 88°F ambient with the system operating. The technician's manifold gauge reads 228 psi high and 34 psi low. What do these closely matching readings confirm?

A. The system is slightly overcharged because both the scan tool and gauges show pressures above normal range

B. The electronic pressure sensors are reading accurately and can be trusted for diagnostic decision-making

C. The manifold gauge set is precisely calibrated and should be used as the primary reference over the sensor

D. The system has non-condensable gases because matching readings between two instruments is unusual

11. On a vehicle with electronic HVAC controls, the technician retrieves multiple U-codes from the HVAC module indicating lost communication with three different actuators (blend door, mode door, and air inlet door). All three actuators are connected via the LIN bus. No other module communication issues exist. What single fault could cause all three communication failures?

A. Three separate actuator motor failures occurring simultaneously due to a manufacturing batch defect

B. A failed HVAC control module CAN bus interface that prevents it from receiving commands for all actuators

C. An intermittent power supply to each actuator caused by three separate corroded connector pins

D. A break in the shared LIN bus wire between the HVAC module and the first actuator in the daisy-chain

12. A technician replaces a compressor on a vehicle. The new compressor arrives with 7 ounces of PAG 46 oil. The old compressor was drained and contained 3 ounces. The total system oil specification is 7 ounces. How much oil should the technician drain from the new compressor before installation?

- A. Drain 7 ounces (all oil) and add back exactly 3 ounces to match what was in the old compressor
- B. Drain 4 ounces from the new compressor, leaving 3 ounces, to account for the 4 ounces in other components
- C. Leave all 7 ounces since the new compressor's factory charge equals the total system specification exactly
- D. Drain 3 ounces from the new compressor, leaving 4 ounces, to split the charge between the compressor and system

13. A vehicle's cooling system has been flushed and refilled with the correct coolant type. The engine reaches operating temperature normally. However, the technician notices that the coolant level in the reservoir drops approximately one inch over the first three drive cycles, then stabilizes and holds steady for the next two weeks. What is the MOST likely explanation?

- A. Air pockets trapped during the refill are gradually purging through the reservoir as the system reaches temperature
- B. A very slow external leak exists that stopped on its own after the trapped air sealed the leak point
- C. The new coolant is chemically different from the original and occupies less volume at operating temperature
- D. The reservoir tank has a hairline crack that sealed itself after the coolant's anti-leak additives took effect

14. A vehicle's HVAC system has a blower motor that makes a rhythmic ticking noise that changes frequency with blower speed — faster ticking at higher speeds. The noise stops completely when the blower is turned off. What is the MOST likely cause?

- A. A failing blower motor bearing that produces a speed-dependent clicking as the shaft wobbles in its bore
- B. The blower motor resistor block vibrating at the frequency of the current passing through the selected resistor
- C. A foreign object such as a leaf or small piece of debris caught in the blower fan wheel striking the housing
- D. The blower motor brushes bouncing on a worn commutator segment as the armature rotates at varying speeds

15. A vehicle has a confirmed R-134a A/C system. The technician uses a refrigerant identifier and finds 97% R-134a with 3% air content. What is the correct procedure?

- A. Proceed with normal service since 3% air is within the universally accepted 5% tolerance for R-134a systems
- B. Add 3 ounces of pure R-134a to the system to dilute the air percentage below the acceptable threshold
- C. Replace the accumulator or receiver-drier since air contamination indicates the desiccant has failed completely
- D. Recover the refrigerant, evacuate the system to remove the air and associated moisture, then recharge properly

16. A vehicle with vacuum-operated HVAC controls has the following symptom: the air delivery mode works correctly when the engine is at idle but reverts to defrost-only when the vehicle accelerates uphill at full throttle. After cresting the hill and returning to level driving, the mode selection returns to normal. What is the MOST likely cause?

- A. A worn engine with low compression that cannot produce adequate intake manifold vacuum under full load
- B. A failed vacuum check valve that allows stored vacuum to bleed back to the manifold during low-vacuum conditions

C. A cracked vacuum reservoir that loses stored vacuum whenever engine compartment pressure increases

D. An oversized vacuum actuator that requires more vacuum than the engine can produce during acceleration

17. Technician A says that the evaporator temperature sensor's primary function is to prevent evaporator freeze-up by providing feedback to the control module. Technician B says that on some vehicles, the evaporator temperature sensor data is also used by the ATC module to calculate the required blend door position for precise temperature control. Who is correct?

A. Both Technician A and Technician B are correct about the evaporator temperature sensor's functions

B. Technician A only, because the evaporator sensor is exclusively a freeze protection device with no ATC role

C. Technician B only, because freeze protection is handled by a separate dedicated cycling switch not the sensor

D. Neither Technician A nor Technician B, because the evaporator sensor only controls compressor clutch cycling

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18. A vehicle's A/C compressor was replaced due to a bearing failure (noise only — no internal debris was released). After the replacement, the system is evacuated to 485 microns and charged with the specified 22 ounces of R-134a. The vent temperature reaches 42°F at 80°F ambient. One week later, the customer returns with a vent temperature of 48°F. The technician recovers 20 ounces. What is the MOST likely cause of the 2-ounce loss?

A. The compressor shaft seal on the new compressor has not fully seated and is allowing a small initial seep

B. Normal refrigerant permeation through the hoses that occurs at a higher rate in the first weeks of operation

C. A leak at one of the fittings disturbed during the compressor replacement, such as an improperly seated O-ring

D. The recovery machine's measurement tolerance accounts for the 2-ounce difference and no leak actually exists

19. On a vehicle with an ATC system, the customer reports that the system blows maximum cold air regardless of the set temperature. The set temperature is 78°F. The scan tool shows the in-car sensor reading 85°F and the ambient sensor reading 90°F. The blend door is commanded to 0% (full cold). What is the MOST likely cause?

A. A stuck blend door actuator that has failed in the full cold position and is overriding the module command

B. The in-car sensor reading 85°F with a 78°F set point causes the module to correctly command maximum cooling

C. A failed sun load sensor sending a maximum signal that is overriding the temperature control algorithm

D. A shorted ambient temperature sensor causing the module to believe the outside temperature is extreme

20. A vehicle's A/C evaporator drain tube is dripping a light green fluid instead of clear water. The A/C system cools normally. What does the green discharge indicate?

A. Coolant from a leaking heater core is mixing with evaporator condensation inside the HVAC housing

B. The green color is normal UV dye residue from a previous A/C service and does not indicate any current leak

C. Mold and algae growth inside the drain tube has colored the condensation green as it passes through

D. Refrigerant oil leaking from the evaporator has mixed with condensation and produced the green coloring

21. A technician is diagnosing a vehicle where the A/C compressor clutch engages when the ignition key is turned to the RUN position — before the engine is started. The compressor should only engage when the engine is running. What is the MOST likely cause?

A. A faulty ignition switch that sends the engine-running signal to the HVAC module at the key-on position

B. A missing or bypassed engine RPM signal that the module uses to verify the engine is running before engagement

C. Normal operation on vehicles with electric compressors that do not require the engine to be running

D. A shorted compressor clutch relay that has welded contacts and engages the clutch whenever ignition is on

22. A vehicle has an A/C system that worked normally until a rodent chewed through a wiring harness in the engine compartment. After the harness repair, the A/C blows warm. The compressor clutch engages and runs. The gauge readings show low side 62 psi and high side 75 psi — nearly equalized. What is the MOST likely cause?

A. The rodent damage introduced debris into the A/C system through a chewed refrigerant hose connection

B. A damaged wire in the repaired harness is now sending an incorrect signal to the compressor control valve

C. The compressor was contaminated by rodent nesting material that entered through the clutch hub opening

D. The harness repair reconnected a wire to the compressor displacement control solenoid incorrectly, holding displacement at minimum

23. Technician A says that the cabin air filter should be replaced at manufacturer-recommended intervals to maintain optimal HVAC airflow and indoor air quality. Technician B says that a severely clogged cabin air filter can reduce both heating and cooling performance because it restricts total airflow through the evaporator and heater core. Who is correct?

- A. Technician A only, because a clogged filter only affects air quality and does not measurably impact temperature
- B. Technician B only, because cabin air filters have no recommended replacement interval and are replaced only when restricted
- C. Both Technician A and Technician B are correct about filter replacement intervals and performance impact
- D. Neither Technician A nor Technician B, because cabin air filters are optional accessories with no performance role

24. A vehicle has an electronic A/C pressure transducer that reads system pressure and sends a variable voltage signal to the HVAC module. The transducer operates on a 0.5V–4.5V signal range corresponding to 0–500 psi. The scan tool shows the pressure reading at 0.3V with the system at rest. Normal static pressure at the current ambient temperature should produce approximately 2.0V. What does the 0.3V reading indicate?

- A. The signal voltage is below the sensor's normal operating range, indicating a sensor circuit fault or failed sensor
- B. The system has zero refrigerant charge and the low voltage accurately represents the empty system pressure
- C. The module is in a diagnostic self-test mode that temporarily outputs a low reference voltage for calibration
- D. The transducer's 5V reference supply has dropped to approximately 3.5V due to a high-resistance connection

25. A vehicle's engine overheats only when the A/C is running in heavy traffic. Without the A/C on, the engine temperature remains stable in heavy traffic. All cooling fans are operational. What is the MOST likely cause?

- A. The A/C compressor clutch is slipping, generating excessive heat that transfers to the engine through the belt

- B. The condenser fan is running backward due to reversed wiring, pushing hot air from the condenser into the radiator
- C. The A/C system is overcharged, causing the condenser to radiate excessive heat into the engine compartment
- D. The condenser is partially blocking airflow to the radiator, and the additional heat from the A/C system overwhelms the cooling system's capacity in stop-and-go conditions

26. A technician is performing a bidirectional scan tool test on a mode door actuator. When commanded to the FLOOR position, the actuator moves and the feedback shows FLOOR position achieved. However, airflow from the floor vents is weak while strong airflow exits the defrost vents. What is the MOST likely cause?

- A. The actuator shaft has sheared and the feedback gear rotates without moving the actual mode door at all
- B. A broken or disconnected linkage between the actuator output shaft and the physical mode door mechanism
- C. The HVAC control module is simultaneously commanding the defrost door open through a separate circuit
- D. The floor ductwork has collapsed internally, redirecting air pressure through the defrost path instead

27. A vehicle's cooling system uses HOAT (Hybrid Organic Acid Technology) coolant. The customer adds conventional green IAT coolant to top off the reservoir. Within three months, the heater output has decreased noticeably. What is the connection between the coolant mixing and the heater performance decline?

- A. The IAT coolant's lower boiling point reduced the available coolant temperature for the heater core
- B. The two coolant types have different specific heat values that prevent effective heat transfer in the heater
- C. Mixing IAT with HOAT caused a chemical reaction producing gel or sludge that is restricting heater core flow

D. The IAT coolant corroded the reservoir tank, releasing plastic particles that clogged the heater core passages

28. A vehicle's A/C system is being diagnosed. The technician finds the following: compressor clutch engages, low-side pressure drops to 5 psi within 30 seconds, high-side pressure only reaches 120 psi at 82°F ambient. The suction line feels warm rather than cold. The liquid line upstream of the orifice tube is warm. Frost appears on the liquid line immediately downstream of the orifice tube. What is the MOST likely cause?

A. A severely restricted orifice tube that is creating an extreme pressure drop while starving the evaporator

B. A failed compressor with bypassing internal reed valves that cannot develop adequate pressure differential

C. An overcharged system where excess liquid refrigerant is flooding the evaporator and backing up into the lines

D. A condenser with heavily damaged fins that cannot reject heat, causing the high-side to remain at low pressure

29. A vehicle's automatic temperature control system has been maintaining the correct cabin temperature. The customer parks the vehicle in a hot parking lot for 4 hours on a 100°F day. Upon returning, the customer starts the vehicle and sets the A/C to 68°F. The cabin temperature is approximately 140°F. What is the expected ATC system response?

A. Maximum blower speed, full cold blend position, recirculation mode, compressor on, panel vent delivery

B. Low blower speed with gradual increase, full cold blend, fresh air mode to introduce cooler outside air

C. Maximum cooling from the compressor with the blend door at 50% to prevent thermal shock to occupants

D. Delayed compressor engagement for 60 seconds while the system evacuates hot air through the floor vents

30. A vehicle's A/C system has been charged to the manufacturer's specification of 20 ounces by weight. The technician performs a final performance test and finds: low side 33 psi, high side 205 psi, vent temperature 43°F, subcooling 15°F, superheat 10°F at 84°F ambient. The customer reports satisfactory cooling. Is the system ready for delivery?

A. No — the technician must also verify condenser fan operation at both low and high speed before delivery

B. No — the system needs a full 24-hour soak test to verify that the charge holds before releasing the vehicle

C. No — the superheat of 10°F is at the upper end of specification and the TXV should be adjusted or replaced

D. Yes — all measured parameters are within normal specifications and the customer confirms satisfactory performance

31. A vehicle has an intermittent HVAC complaint: occasionally the blend door clicks loudly three times and the vent temperature shifts from the set temperature before returning to normal. The problem happens randomly — sometimes once a day, sometimes not for a week. No DTCs are stored. What is the MOST likely cause?

A. A CAN bus communication glitch that momentarily corrupts the blend door position command from the module

B. A failing HVAC control module with an intermittent output driver that drops the blend door signal briefly

C. A blend door actuator with gears that are beginning to strip, occasionally skipping teeth before re-engaging

D. An intermittent power supply interruption to the actuator that causes it to lose position and then recalibrate

32. A technician measures the voltage at a blower motor resistor block. With the switch on LOW speed, the voltage at the motor connector reads 4.2V. On MEDIUM-LOW, it reads 7.1V. On MEDIUM-HIGH, it reads 10.3V. On HIGH, it reads 14.1V. What do these progressive voltage readings demonstrate?

- A. The resistor block drops voltage progressively — lower speeds have more resistance in the circuit, delivering less voltage to the motor
- B. The blower motor is drawing excessive current at lower speeds, creating abnormally high voltage drops
- C. The resistor block is partially failed because the voltage difference between speeds should be equal
- D. The readings indicate a faulty blower switch that is not selecting the correct resistor combinations properly

33. A vehicle has an A/C system that produces a noticeable vibration in the dashboard area when the compressor clutch engages. The vibration is felt through the steering wheel and the dashboard surface. It stops immediately when the A/C is turned off. Cooling performance is normal. What is the MOST likely cause?

- A. A failing compressor with an unbalanced internal mechanism that transmits vibration through the mounting
- B. A worn serpentine belt that vibrates when the compressor load is applied to the drive system at engagement
- C. Normal compressor engagement vibration that is transmitted through the engine mounts to the chassis
- D. A broken or deteriorated compressor mounting bracket or loose mounting bolt that allows excessive movement

34. Technician A says that R-12 was banned because of its high global warming potential. Technician B says that R-12 was banned because its chlorine atoms destroy stratospheric ozone. Who is correct?

- A. Technician A only, because R-12's global warming potential was the primary environmental concern
- B. Technician B only, because R-12's ozone depletion potential was the reason for the CFC ban under the Montreal Protocol
- C. Both Technician A and Technician B, because R-12 was banned for both ozone depletion and global warming

D. Neither Technician A nor Technician B, because R-12 was banned solely due to its flammability hazard

35. A vehicle's A/C system has been properly charged and performs well at the shop. The customer returns the next day complaining that the A/C blows warm during morning startup but improves after 10 minutes of driving. The technician cannot duplicate the complaint — by the time the customer arrives at the shop, the system is working normally. What diagnostic approach should the technician use?

A. Replace the compressor clutch relay as a precaution since morning cold conditions can cause relay contact sticking

B. Perform a complete leak test and recharge since the morning warmth suggests a slow overnight charge loss

C. Connect a data logger to the scan tool and have the customer drive from a cold start to capture live data during the event

D. Instruct the customer to call the shop immediately when the problem occurs so a technician can meet them quickly

36. On a vehicle with an electronically controlled variable displacement compressor, the scan tool shows the displacement command at 100% but the A/C system produces only marginally cool air. Gauge readings show low side 40 psi and high side 160 psi at 90°F ambient — both lower than expected for full displacement. What is the MOST likely cause?

A. The electronic displacement control valve is stuck at a reduced displacement position despite receiving the maximum command

B. The scan tool is misreporting the displacement command and the module is actually commanding minimum output

C. The compressor drive belt is slipping at higher loads, preventing the compressor from achieving full speed

D. The HVAC module is correctly commanding 100% but the CAN bus is not transmitting the command to the valve

37. A vehicle's heater core was replaced. During the test drive, the technician notices the heater produces excellent heat but hears a continuous clicking sound from behind the dashboard — one click per second. The sound is present regardless of blower speed, temperature setting, or mode selection. What is the MOST likely cause?

- A. A blend door actuator that was displaced during the heater core replacement and is now continuously hunting
- B. A heater hose clamp that was not fully tightened and is vibrating against the firewall at engine idle frequency
- C. The new heater core's internal turbulence baffles producing flow noise that is transmitted through the housing
- D. A door actuator that lost its calibration when the battery was disconnected during the repair and is trying to recalibrate

38. A vehicle's A/C system uses R-1234yf. The technician identifies the refrigerant and confirms 98% R-1234yf with 2% air. The technician has R-1234yf recovery equipment certified to SAE J2843. Before beginning recovery, what built-in safety feature must the R-1234yf machine verify?

- A. The machine must verify the ambient temperature is below 110°F to prevent refrigerant decomposition risk
- B. The machine must verify the vehicle's VIN matches an approved list of R-1234yf-equipped models in its database
- C. The machine's built-in refrigerant identifier must verify the refrigerant type before allowing recovery to proceed
- D. The machine must verify the system pressure is below 300 psi before connecting to prevent a high-pressure release

39. A technician removes a receiver-drier from a TXV system during a condenser replacement. The technician notices the old receiver-drier is heavier than the new replacement. What does this weight difference MOST likely indicate?

- A. The old receiver-drier used a denser metal construction that is no longer used in modern replacement designs
- B. The old desiccant has absorbed a significant amount of moisture over its service life, adding weight to the unit
- C. The new receiver-drier is defective and does not contain the required amount of desiccant material inside
- D. The weight difference is coincidental and has no diagnostic significance for the condition of either component

40. A vehicle has an A/C complaint: cold air from the center and driver-side vents, but ambient-temperature air from the passenger-side vent. This is a single-zone system with one blend door. The A/C system gauges and vent temperatures at the center vent are normal. What should the technician investigate?

- A. The passenger-side vent ductwork for a disconnection, collapse, or gap that allows unconditioned air to enter
- B. The evaporator for partial frost blockage on the passenger side that is preventing air from passing through
- C. The blend door for a crack or warp that creates an uneven air split between the left and right airflow paths
- D. The refrigerant charge for a marginal undercharge that cannot sustain cooling across all outlet locations

41. On a vehicle with electronic HVAC controls, the A/C compressor engages when the engine is started in the morning, runs for exactly 5 minutes, then disengages and will not re-engage for the rest of the day. No DTCs are stored. Turning the A/C off and back on does not cause re-engagement. Cycling the ignition off and back on the next morning restarts the 5-minute pattern. What is the MOST likely cause?

- A. A thermally sensitive compressor clutch coil that opens circuit after reaching operating temperature and resets overnight

- B. An intermittent cycling clutch switch that functions correctly when cold but fails open after reaching temperature
- C. A software fault in the HVAC control module that disables the compressor after a fixed time period per ignition cycle
- D. A failing A/C relay that has contacts that weld briefly at cold startup but burn open after sustained current flow

42. A technician connects a manifold gauge set to a vehicle and reads static pressures of 85 psi on both the high and low side at 78°F ambient. The P-T chart shows approximately 82–85 psi for R-134a at 78°F. After starting the engine and engaging the A/C, the low side drops to 30 psi and the high side rises to 185 psi within 30 seconds. What can the technician determine from these observations?

- A. The system has a restriction that is preventing the pressures from separating at the expected rate during startup
- B. The static pressure confirms adequate charge, and the normal pressure separation confirms the compressor is functioning
- C. The high-side is lower than expected at 185 psi and indicates a partially blocked condenser limiting heat rejection
- D. The low-side of 30 psi is too low for 78°F ambient and indicates the system is undercharged by approximately 3 ounces

43. A vehicle's cooling system has a slow external leak from the water pump weep hole. A small drip is visible only when the engine is at full operating temperature and disappears after the engine cools. What does this drip pattern indicate about the water pump?

- A. The drip is normal condensation from temperature differential and does not indicate any pump seal issue
- B. The pump bearing is worn and allowing the shaft to wobble, but the seal is still intact and functional
- C. The pump's internal shaft seal has failed and is allowing coolant to leak past during pressurized operation

D. The weep hole is clogged with debris and needs to be cleaned to prevent pressure buildup behind the seal

44. Technician A says that the blend door controls outlet air temperature by splitting airflow between the heater core and a bypass path. Technician B says that on vehicles with a heater control valve, the valve can be used to shut off coolant flow to the heater core during maximum A/C operation. Who is correct?

A. Both Technician A and Technician B are correct about the blend door function and heater control valve purpose

B. Technician A only, because heater control valves are not used in any modern vehicle HVAC design

C. Technician B only, because the blend door controls mode selection rather than temperature in modern systems

D. Neither Technician A nor Technician B, because temperature is controlled solely by compressor cycling

45. A vehicle's A/C compressor was replaced. The old compressor had a catastrophic internal failure. The system was flushed, and a new orifice tube and accumulator were installed. The serpentine tube condenser was flushed with approved solvent. After assembly, evacuation, and charging, the system cools normally for two days. On the third day, the vent temperature rises to 55°F. Gauge readings show low side 18 psi and high side 250 psi at 86°F ambient. What is the MOST likely cause?

A. The new accumulator's desiccant bag has ruptured and released bead material that is clogging the orifice tube

B. The new compressor has failed prematurely due to a manufacturing defect in its internal valve assembly

C. The flushed condenser still contained residual debris that has migrated to the orifice tube and created a restriction

D. Debris from the original compressor failure that was not fully removed during flushing has migrated to the new orifice tube and is restricting flow

46. A technician is diagnosing an ATC system where the scan tool shows the ambient temperature sensor reading 55°F when the actual outside temperature is 55°F. The in-car sensor reads 72°F when the technician's thermometer reads 72°F at the sensor location. The sun load sensor reads 3.2V on a sunny day. All readings verify accurate. The customer complains that the A/C overcools the cabin on sunny days. What should the technician investigate?

- A. Whether the heater control valve is stuck closed, preventing the blend door from adding heat on sunny days
- B. Whether the sun load sensor's 3.2V reading is causing the module to command excessive cooling for the actual conditions
- C. Whether the blend door actuator is calibrated correctly, since inaccurate calibration could cause overcooling
- D. Whether the evaporator temperature sensor is reading colder than actual, allowing the compressor to overcool

47. A vehicle has a confirmed slow A/C leak losing approximately 2 ounces per month. The technician has checked all accessible fittings, hoses, and components with electronic detection and UV dye without finding the source after three weeks. What is the MOST probable location of the undetectable leak?

- A. The evaporator, which is sealed inside the HVAC housing and cannot be reached by standard external detection methods
- B. The compressor shaft seal, which only leaks under dynamic operating conditions and seals when the system is static
- C. A micro-crack in the condenser that is too small for electronic detection but allows molecular-level permeation
- D. The Schrader valve cores in the service ports, which can leak at rates too low for standard detection sensitivity

48. A vehicle's A/C system has been operating with the wrong oil type — mineral oil instead of the specified PAG 46. The system uses R-134a. What problems could this incorrect oil cause?

- A. No problems, because mineral oil and PAG oil provide identical lubrication regardless of refrigerant type
- B. Increased high-side pressure only, because mineral oil has higher viscosity than PAG oil at all temperatures
- C. Poor lubrication, potential compressor damage, and reduced cooling efficiency because mineral oil does not mix well with R-134a
- D. Immediate catastrophic compressor failure within the first hour of operation due to chemical incompatibility

49. A vehicle with dual-zone climate control has the driver side set to 68°F and the passenger side set to 78°F. The driver side maintains 68°F correctly. The passenger side maintains 78°F correctly. However, the rear seat passenger complains of being cold. What is the MOST likely explanation?

- A. The rear auxiliary A/C system is overcooling the rear cabin area independently of the front zone settings
- B. The rear cabin receives cold air intended for the driver-side zone that migrates rearward through the cabin
- C. A mode door is misdirecting cold floor air to the rear foot area instead of containing it in the driver zone
- D. Cold air from the driver-side setting at 68°F dominates the rear cabin because it has greater thermal mass

50. A vehicle's A/C system has the following readings at 80°F ambient after a proper charge: low side 30 psi, high side 195 psi, vent temperature 44°F, subcooling 14°F, superheat 10°F. The technician then performs an electronic leak test at every fitting, connection, and component. No leaks are detected. What is the final step before releasing the vehicle?

- A. Run the system for an additional 30 minutes to verify the pressures remain stable under extended operation
- B. Verify the condenser fan activates at the correct temperature and the compressor clutch engages and disengages normally

C. Record the vent temperature hourly for a minimum of 4 hours to establish a performance degradation baseline

D. Perform a 50-mile test drive to verify the system performs under varying driving conditions and heat loads

## Practice Exam 12: Answer Key and Explanations

1. A — Subcooling equals the P-T chart saturation temperature minus the actual measured liquid line temperature:  $124^{\circ}\text{F} - 98^{\circ}\text{F} = 26^{\circ}\text{F}$ . Normal subcooling is  $10^{\circ}\text{F}$ – $20^{\circ}\text{F}$ , so  $26^{\circ}\text{F}$  is above the typical range. Elevated subcooling with a correct charge suggests a mild overcharge — excess liquid refrigerant is backing up in the condenser, subcooling further below the condensation temperature. If the system was recently charged, the charge amount should be verified against the exact manufacturer specification.

2. C — Both technicians are correct about their respective condenser types. Technician A is right that serpentine tube condensers have open, large-diameter internal passages that allow flushing solvent to flow freely and carry out debris effectively. Technician B is right that sub-cool condensers with integrated receiver tanks have micro-channel tubes and an internal receiver section that trap debris in passages too narrow for solvent to reliably clean — these must be replaced rather than flushed.

3. D — The engine warm-up time is the same in both situations, confirming the thermostat and cooling system function identically. The difference is the HVAC housing and ductwork — after 8 hours at  $15^{\circ}\text{F}$ , these components are thoroughly cold-soaked. The heater core, housing walls, blend doors, and ductwork must all absorb heat before they stop cooling the air that passes through them. In the morning, the HVAC components retain residual warmth from the previous evening's drive, requiring less warm-up before delivering hot air.

4. B — The blower motor operates at all speeds correctly (eliminating electrical and motor faults) and the cabin air filter is new (eliminating filter restriction). Reduced total airflow despite normal motor operation indicates a restriction inside the HVAC housing itself. Ice buildup on the evaporator face — from a failed freeze protection device — or debris accumulation on the evaporator surface would physically block the air path, reducing the volume of air that can pass through regardless of blower speed.

5. C — Water sloshing inside the dashboard during turns and braking is the hallmark symptom of a clogged evaporator condensation drain tube. Moisture that normally condenses on the cold evaporator surface and drains out through the drain tube is instead accumulating in the bottom of the HVAC housing. When the vehicle turns or brakes, the trapped water shifts position and produces an audible

sloshing sound. Clearing the blocked drain tube allows the accumulated water to exit and eliminates the noise.

6. A — The in-car sensor reads 75°F — 3°F above the 72°F set point. The module correctly calculates that mild cooling is needed and commands the blend door to 50% — mixing cold evaporator air with some warm heater core air to produce a moderate outlet temperature that will gradually bring the cabin down to 72°F without overshooting. This proportional response to a small temperature error is exactly how ATC closed-loop control is designed to work. The system is functioning correctly.

7. D — Before installing any TXV, the technician should verify the sensing bulb charge is intact by inspecting the capillary tube for kinks, dents, or corrosion that could indicate a leak. A bulb with a lost or diminished charge cannot generate adequate opening pressure, causing the valve to remain closed or nearly closed and starving the evaporator. Visual inspection of the capillary tube and bulb condition is a critical pre-installation verification step.

8. D — The gauge readings (32 psi low / 200 psi high at 84°F ambient) are within normal range, and the vent temperature is adequate. In a cycling clutch orifice tube system, the compressor cycling off for 3 seconds every 45 seconds is normal operation — the cycling switch disengages the compressor when the low-side pressure drops to its cutout point and re-engages it when pressure rises to the cut-in point. The brief warm pulse during the off-cycle is the expected result of momentary compressor disengagement.

9. D — The upper radiator hose becoming hot approximately 9 minutes after cold start — just after the engine reaches 200°F — provides the strongest confirmation of proper thermostat operation. The thermostat is rated at 195°F and should open near that temperature, allowing hot coolant to flow into the upper radiator hose. The hose transitioning from cool to hot at 9 minutes (when coolant passes 195°F) directly proves the thermostat opened at its rated temperature. The other observations confirm cooling system function but do not specifically verify thermostat operation.

10. B — The electronic pressure sensors (225 psi high / 33 psi low) closely match the manifold gauge readings (228 psi high / 34 psi low) — a difference of only 1–3 psi between the two measurement methods. This close agreement confirms the electronic pressure transducers are accurately calibrated and their readings can be trusted for diagnostic decision-making without requiring separate manifold gauge verification. Both instruments validate each other.

11. D — Three actuators simultaneously losing LIN bus communication while all other vehicle modules communicate normally on the CAN bus points to a shared LIN bus wiring fault. On many vehicles, the LIN bus to HVAC actuators is daisy-chained — a single wire runs from the module to the first actuator,

then continues to the second, then the third. A break in the LIN bus wire between the module and the first actuator in the chain would cut communication to all three actuators downstream while leaving the CAN bus and other systems unaffected.

12. B — The old compressor contained 3 ounces, meaning the remaining 4 ounces of the 7-ounce total specification are distributed in other system components (condenser, evaporator, hoses, accumulator). The new compressor arrives with 7 ounces — the full system charge. Installing it with all 7 ounces would create a total of 11 ounces in the system. Draining 4 ounces from the new compressor leaves 3 ounces in the compressor, which combined with the 4 ounces in other components equals the correct 7-ounce total.

13. A — A cooling system that loses a small amount of coolant level over the first few drive cycles after a refill — then stabilizes permanently — is characteristic of trapped air pockets working their way out of the system. As the engine heats and cools over several cycles, air bubbles migrate through the passages to the highest point (the reservoir), where they escape. The coolant level drops as the air space previously occupied by the bubbles is replaced by coolant drawn from the reservoir. Once all air is purged, the level stabilizes.

14. C — A rhythmic ticking noise that changes frequency directly with blower speed — and stops completely when the blower is off — is characteristic of a foreign object striking the housing at a fixed point on each fan revolution. A leaf, piece of paper, twig, or small debris item caught in the squirrel-cage fan wheel contacts the housing once per revolution, producing a click. Faster fan speed means more revolutions per second and therefore faster clicking. Removing the debris resolves the noise immediately.

15. D — Air content of 3% exceeds the generally accepted 2% threshold for non-condensable gases. The air must be removed because it raises high-side pressure above normal levels, reduces cooling efficiency, and introduces moisture that causes corrosion and metering device freeze-up. The correct procedure is to recover all refrigerant, evacuate the system thoroughly to remove all air and associated moisture, and then recharge with the correct amount of pure R-134a by weight.

16. B — During full-throttle acceleration uphill, engine intake manifold vacuum drops near zero because the throttle is wide open. The vacuum check valve should maintain stored vacuum in the reservoir for the HVAC actuators during these low-vacuum events. A failed check valve allows the stored vacuum to bleed backward through the valve to the manifold, depleting the reservoir. The mode doors lose vacuum and default to defrost. When the driver lifts off the throttle and vacuum recovers, the mode doors return to their selected positions.

17. A — Both technicians describe valid functions of the evaporator temperature sensor. Technician A is correct that the sensor's primary function is freeze protection — providing feedback to prevent the evaporator from dropping below 32°F and forming ice. Technician B is correct that on many ATC-equipped vehicles, the evaporator temperature data is also used by the control algorithm to calculate the cold air temperature available for blending, enabling more precise blend door positioning for accurate cabin temperature control.

18. C — A 2-ounce charge loss within one week of a compressor replacement is not normal permeation — it is a leak. The most common leak source after compressor service is a fitting that was disturbed during the repair. An O-ring that was pinched during installation, not lubricated with refrigerant oil, cross-threaded, or slightly undersized will produce a slow leak that manifests within days to weeks. The technician should perform a thorough leak test focusing on every connection that was opened during the compressor replacement.

19. B — The scan tool data tells the story clearly: the in-car sensor reads 85°F and the set temperature is 78°F — a 7°F error with the cabin warmer than desired. The module correctly responds to this 7°F deficit by commanding maximum cooling (0% blend = full cold) to bring the cabin temperature down as quickly as possible. The module is functioning exactly as designed — the sensor data is accurate, the command is logical, and the system will gradually reduce cooling output as the cabin approaches 78°F.

20. A — Light green fluid dripping from the evaporator drain tube — instead of clear water — indicates coolant is mixing with the evaporator condensation inside the HVAC housing. The heater core and evaporator are both located inside the housing, and a leaking heater core drips coolant that mixes with the condensation from the evaporator. The green color matches the coolant type. This confirms a heater core leak that should be repaired promptly.

21. B — The HVAC module should verify that the engine is running before allowing compressor engagement — typically by monitoring engine RPM data received from the ECM via the CAN bus. If this RPM signal is missing, bypassed, or shorted to a voltage that the module interprets as "engine running," the module may authorize clutch engagement at key-on before the engine actually starts. Checking the RPM signal path and any related wiring that may have been modified or damaged will identify the fault.

22. D — Nearly equalized pressures (62 psi low / 75 psi high) with the compressor running indicate the compressor is spinning but not creating an effective pressure differential. After the rodent damage and harness repair, the most likely cause is that a wire to the compressor's electronic displacement control solenoid was reconnected incorrectly — either to the wrong terminal or to a circuit that holds the

solenoid in the minimum displacement position. The compressor turns but pumps virtually no refrigerant because the swashplate is at minimum angle.

23. C — Both technicians are correct. Technician A is right that cabin air filters have manufacturer-recommended replacement intervals (typically 12,000–15,000 miles or annually) to maintain airflow and air quality. Technician B is right that a severely clogged filter restricts total air volume through the HVAC housing, reducing the amount of air passing over both the evaporator (less cooling capacity) and the heater core (less heating capacity) — degrading performance in both modes.

24. A — The transducer's normal operating range is 0.5V–4.5V. A reading of 0.3V falls below this range, which the module recognizes as an out-of-range signal indicating a circuit fault rather than a valid pressure reading. Common causes include a failed sensor element, an open ground wire (pulling the signal below normal range), or a short to ground on the signal wire. The module will likely set a DTC and may disable the compressor as a protective measure.

25. D — With all fans operating, the cooling system handles engine heat adequately without the A/C. When the A/C is engaged, the condenser — mounted directly in front of the radiator — adds its rejected heat to the air passing through to the radiator. In stop-and-go traffic with minimal ram air, the additional heat load from the condenser can raise the temperature of the air reaching the radiator enough to overwhelm the radiator's capacity, causing the engine to overheat. At highway speed, ram air provides sufficient cooling for both.

26. B — The actuator moves, the feedback shows the correct position achieved, and the motor runs — all confirming the actuator's internal mechanism is functioning. However, the air exits through the wrong vents, meaning the physical mode door did not move despite the actuator shaft turning to the correct position. A broken or disconnected linkage between the actuator's output shaft and the actual mode door allows the actuator to operate normally (motor, gears, feedback all work) while the door remains stationary.

27. C — Mixing IAT (green, silicate/phosphate-based) coolant with HOAT (organic acid plus silicate) coolant causes the different inhibitor chemistries to react, producing a gel-like sludge that progressively clogs narrow passages. The heater core — with its small-diameter tubes — is particularly vulnerable to this restriction. Within three months of the mixing event, enough sludge has accumulated in the heater core to noticeably reduce coolant flow and diminish heat output.

28. A — The diagnostic pattern tells a clear story: low-side dropping to near-vacuum (5 psi), high-side lower than expected (120 psi), warm suction line (no cold refrigerant reaching the evaporator), warm

liquid line upstream of the orifice tube (liquid backing up), and frost immediately downstream of the orifice tube (the tiny amount of refrigerant that squeezes through expands dramatically). This localized extreme pressure and temperature drop at the orifice tube confirms a severe restriction at that metering point.

29. A — With a 140°F cabin and a 68°F set point — a 72°F error — the ATC module responds with its most aggressive cooling strategy: maximum blower speed to move the largest volume of air, blend door to full cold (0%) to deliver the coldest possible air, recirculation mode to recycle the gradually cooling cabin air rather than continuously introducing 100°F outside air, compressor fully engaged, and panel vent delivery for maximum upper-body cooling. This aggressive pull-down response is the expected ATC behavior for an extreme heat load condition.

30. D — All measured parameters fall within normal specifications: pressures are textbook for 84°F ambient, vent temperature of 43°F represents excellent cooling, subcooling of 15°F confirms adequate liquid production, superheat of 10°F confirms proper TXV operation, and the electronic leak test found no leaks. The customer confirms satisfactory cooling. The system meets every objective performance criterion. No additional testing beyond a final visual inspection and documentation is required before delivery.

31. C — An intermittent clicking from the blend door area followed by a temporary temperature shift that self-corrects is characteristic of an actuator with gears that are beginning to strip. The weakened teeth occasionally skip under load — producing the audible clicks — causing the door to shift position briefly. The motor then drives the door back to the commanded position when the teeth re-engage. This intermittent skip-and-recover pattern produces no DTC because the position feedback eventually matches the command.

32. A — The progressive voltage readings demonstrate exactly how a resistor block controls blower speed. At LOW speed, all resistors are in the circuit, creating maximum resistance and dropping the voltage to 4.2V at the motor. At each higher speed, one or more resistors are bypassed, reducing total resistance and increasing the voltage reaching the motor. At HIGH, all resistors are bypassed and the motor receives full battery voltage (14.1V). This is the fundamental operating principle of resistor-based blower speed control.

33. D — A dashboard vibration present only when the A/C compressor is engaged — with normal cooling performance and no abnormal compressor noise — points to the compressor's mechanical mounting. A broken, cracked, or deteriorated mounting bracket, a loose mounting bolt, or a failed vibration-dampening bushing allows the compressor body to transmit its normal operating vibration

directly through the engine and chassis to the dashboard. Tightening or replacing the mounting hardware eliminates the vibration.

34. B — Technician B is correct that R-12 was banned specifically because of its ozone depletion potential — the chlorine atoms in its CFC molecular structure destroy stratospheric ozone molecules. The Montreal Protocol (1987) and subsequent U.S. Clean Air Act amendments targeted ozone-depleting substances, not greenhouse gases. While R-12 does have a high GWP (10,900), this was not the primary driver of the ban. Technician A is incorrect because ozone depletion, not global warming, was the regulatory reason.

35. C — An intermittent complaint that cannot be reproduced in the shop requires data capture during the actual failure event. A scan tool data logger records all HVAC parameters continuously — pressures, temperatures, clutch status, sensor readings, and actuator positions — while the customer drives from a cold start. When the warm-air condition occurs, the logged data reveals exactly what changed: a pressure drop, a sensor anomaly, a clutch dropout, or a blend door shift. This objective data directs the repair without guessing.

36. A — The module commands 100% displacement and the scan tool confirms the command is being sent, but the gauge readings (40 psi low / 160 psi high) are lower than expected for a fully displaced compressor at 90°F ambient. The electronic displacement control valve converts the electrical command into mechanical swashplate angle — if the valve is stuck at a reduced displacement position (mechanically stuck despite receiving the maximum electrical signal), the compressor pumps less refrigerant than commanded, producing the below-normal pressures.

37. D — A continuous clicking sound appearing immediately after a repair that required battery disconnection (common during dashboard work for heater core access) is most likely a door actuator that lost its calibration reference when power was interrupted. The actuator is attempting to recalibrate — driving the door to find its end stops — but cannot complete the process successfully. Performing the manufacturer's actuator calibration or relearn procedure through the scan tool should resolve the clicking.

38. C — SAE J2843-certified R-1234yf recovery equipment includes a mandatory built-in refrigerant identifier as a safety requirement unique to R-1234yf. Because R-1234yf is mildly flammable (A2L classification), the machine must verify the refrigerant type before beginning recovery to prevent recovering a flammable contaminant (such as propane or butane from an illegal hydrocarbon charge) into the machine's storage tank, which could create a fire or explosion hazard.

39. B — The old receiver-drier's desiccant has been absorbing moisture from the refrigerant throughout its service life — potentially for years. Molecular sieve and silica gel desiccants retain the moisture they absorb, adding measurable weight. A noticeably heavier old receiver-drier compared to its new replacement indicates the old desiccant has absorbed a significant amount of water over time. This weight difference confirms the old desiccant was working as designed but also confirms it was nearing or at saturation.

40. A — In a single-zone system where the center and driver-side vents blow cold but the passenger-side vent blows ambient temperature, the HVAC housing is delivering cold air — the problem is in the passenger-side ductwork between the housing and the vent outlet. A disconnected duct, a collapsed internal section, or a gap in the duct connection allows unconditioned warm air from behind the dashboard to enter the passenger-side vent path while the other vents receive properly conditioned air through their intact ducts.

41. D — A pattern of engagement at cold startup that fails after exactly 5 minutes and does not reset until the next morning's cold start points to a relay with contacts that behave differently at different temperatures. Cold contacts make a temporary connection when the relay first energizes, but as the contacts heat from sustained current flow, thermal expansion or oxidation breaks the connection. Overnight cooling allows the contacts to contract and re-establish the connection. The relay should be replaced.

42. B — The static pressure of 85 psi at 78°F ambient matches the P-T chart (82–85 psi expected), confirming the system contains adequate refrigerant charge. After starting the engine and engaging the A/C, the pressures separate normally — low side drops to 30 psi (compressor pulling refrigerant from the evaporator) and high side rises to 185 psi (compressor pushing compressed refrigerant to the condenser). This normal pressure separation confirms the compressor is pumping effectively.

43. C — The water pump weep hole is designed as an indicator — it provides an exit path for coolant that leaks past the internal shaft seal. A drip visible only at operating temperature (when the cooling system is pressurized at 15–16 psi) that disappears after cooldown (when pressure drops) confirms the shaft seal has failed. System pressure forces coolant past the compromised seal during operation. The pump must be replaced before the seal failure progresses to a complete breach.

44. A — Both technicians describe correct HVAC component functions. Technician A is right that the blend door controls outlet air temperature by splitting airflow — some passes through the heater core (heated) and some bypasses it (remains at evaporator temperature), with the mix ratio determining the final outlet temperature. Technician B is right that heater control valves (on equipped vehicles) shut off

coolant flow to the heater core during maximum A/C, preventing unwanted radiant heat from the constantly hot core.

45. D — The system cooled normally for two days, then developed low-side-low / high-side-high readings (18 psi low / 250 psi high) — the classic restriction pattern. Despite flushing the serpentine tube condenser, residual debris from the original catastrophic compressor failure remained trapped in system passages. Over two days of operation, this debris migrated to the new orifice tube's inlet screen and progressively blocked it. The orifice tube must be replaced, and the system should be re-flushed to remove any remaining contamination.

46. B — All sensors verify accurate with independent instruments, eliminating sensor error as the cause. The customer's complaint is specifically about overcooling on sunny days. The sun load sensor at 3.2V on a sunny day is within its expected range, but the module may be overweighting this input and commanding more cooling than the conditions warrant. The technician should investigate whether the sun load sensor's voltage output is proportionally correct for the actual solar intensity, or whether the sensor is reading higher than the actual conditions justify.

47. A — After exhausting all external detection methods (electronic scanning and UV dye inspection of all accessible fittings, hoses, and components), the most probable remaining leak source is the evaporator. Located inside the sealed HVAC housing behind the dashboard, the evaporator cannot be reached by external electronic detector probes during standard scanning. The leak's slow rate (2 ounces per month) is consistent with a small evaporator pinhole that would not produce visible UV dye traces at the drain tube for weeks.

48. C — Mineral oil does not mix well with R-134a refrigerant — the two substances have poor miscibility, meaning the oil tends to separate from the refrigerant and pool in low-flow areas rather than circulating uniformly. This separation starves the compressor of lubrication (risking bearing and seal damage), coats evaporator and condenser surfaces with an insulating oil film (reducing heat transfer efficiency), and reduces overall system cooling capacity. The oil must be changed to the specified PAG type.

49. D — Without rear auxiliary A/C, the single front HVAC system has limited influence over rear cabin temperature. In a dual-zone system with the driver side at 68°F, the cold air from the driver-side floor and panel vents migrates rearward through the cabin. The passenger side at 78°F sends warmer air, but the overall rear cabin environment is dominated by the colder driver-side output because the cold air has greater thermal influence. The rear passenger seated behind the driver receives the coldest conditions.

50. B — The performance test measurements confirm the refrigeration system is functioning correctly. The electronic leak test confirms no refrigerant leaks. Before releasing the vehicle, the technician should verify the supporting systems: the condenser fan must activate at the correct temperature threshold and at both speed settings (if equipped), and the compressor clutch must engage and disengage normally during cycling. These final operational checks confirm the complete system — not just the refrigerant circuit — is functioning properly.