PRACTICE EXAM 20: ASE A7 SIMULATION (50 QUESTIONS)

1. A vehicle's A/C system has been properly charged and produces a vent temperature of 43°F at 84°F ambient. The technician performs a comprehensive performance test and records: low side 31 psi, high side 198 psi, subcooling 14°F, superheat 10°F. The customer asks the technician to verify the system will perform reliably during the upcoming summer. What is the MOST important additional check the technician should perform?

A. Recover the entire charge and measure it against the specification to verify the exact weight matches the label

B. Verify the condenser fan activates at the correct temperature and the compressor clutch cycles normally during operation

C. Add UV dye to the system as a precautionary measure in case a leak develops during the summer heat season

D. Measure the compressor clutch air gap and coil resistance to verify the clutch will not fail during peak demand

2. Technician A says that during an R-12 to R-134a retrofit, the mineral oil must be removed and replaced with PAG or POE oil compatible with R-134a. Technician B says that the R-12 service fittings must be replaced with R-134a quick-disconnect fittings and a retrofit label applied to the vehicle. Who is correct?

A. Technician A only, because the original fittings can remain if a label identifies the new refrigerant type clearly

B. Technician B only, because mineral oil is compatible with R-134a and does not require replacement during retrofit

C. Both Technician A and Technician B are correct about the oil change requirement and the fitting/label requirements

D. Neither Technician A nor Technician B, because R-12 to R-134a retrofits are no longer permitted under EPA rules

3. A vehicle's engine temperature reaches 205°F on a 25°F winter morning. The heater blows hot air from the floor vents at 138°F. Both heater hoses at the firewall are hot. The customer complains the heat is "not warm enough" compared to their previous vehicle. The technician verifies all systems are functioning within specification. What should the technician explain?

A. A floor vent temperature of 138°F at 205°F coolant temperature is within normal operating range and varies between vehicle designs

B. The heater core should be flushed because any temperature below 140°F indicates early-stage internal restriction

C. A higher-rated thermostat should be installed to increase the maximum available coolant temperature for the heater

D. The cabin air filter should be replaced with a high-flow aftermarket unit to increase total heated airflow volume

4. On a vehicle with electronic HVAC controls, the scan tool shows all sensor readings accurate and all actuator positions matching commands. The A/C compressor runs and gauge pressures are normal. The customer's only complaint is that the system takes 8 minutes to cool the cabin from 110°F (after sun-soaking) to a comfortable 75°F on a 95°F day. Is this pull-down time acceptable?

A. No — a properly functioning system should cool the cabin from any temperature to the set point within 3 minutes

B. No — the extended pull-down time indicates a marginal refrigerant charge that cannot handle the extreme heat load

C. Yes — but only if the system uses a variable displacement compressor that intentionally ramps up cooling gradually

D. Yes — an 8-minute pull-down from 110°F on a 95°F day with all parameters within specification is normal performance

5. A vehicle's A/C system has the following condition: the system was working normally. The customer had a new windshield installed by a mobile glass service. After the windshield installation, the A/C vent temperature rose from 42°F to 50°F. Gauge readings show both the high-side and low-side pressures are slightly elevated above normal. What should the technician investigate?

A. The windshield replacement adhesive for chemical outgassing that could be interfering with the refrigerant properties

B. Whether the new windshield has a different solar transmission rating that increases the cabin heat load significantly

C. Whether a refrigerant line or fitting near the windshield cowl area was damaged or disturbed during the glass installation

D. The HVAC housing seal at the firewall for damage from the windshield removal that allows hot air to enter the system

6. On a vehicle with automatic temperature control, the technician retrieves DTC B0110 — In-Car Temperature Sensor Circuit Open. The scan tool live data shows the in-car sensor reading −40°F. The actual cabin temperature is 72°F. The A/C compressor does not engage. What is the connection between the open sensor circuit and the compressor non-engagement?

A. The module reads −40°F (far below any set point) and believes no cooling is needed, so it does not command the compressor

B. The open circuit causes the module to enter a full failsafe mode that disables all HVAC outputs including the compressor

C. The −40°F reading triggers a low-ambient lockout that prevents compressor engagement below a preset temperature

D. The open sensor circuit directly interrupts the compressor clutch relay coil ground path preventing relay activation

7. A vehicle has a TXV-equipped A/C system. The technician replaces the evaporator and TXV. After proper evacuation and charging, the system cools to 42°F vent temperature. However, the superheat measures only 2°F — well below the 8–12°F specification. The sensing bulb is properly clamped and insulated on the suction line. What is the MOST likely cause of the very low superheat?

A. The replacement TXV has a factory superheat setting that is too high, causing it to underfeed the evaporator

B. The system was overcharged during the service, and the excess mass is overwhelming the TXV's regulation capacity

C. The sensing bulb capillary tube was kinked during installation, preventing proper pressure feedback to the valve diaphragm

D. The replacement TXV has a factory superheat setting that is too low for this application and is overfeeding the evaporator

8. A vehicle's cooling system has been serviced with a water pump replacement and coolant refill. The engine reaches operating temperature and the heater works well. However, three days later, the customer reports intermittent heater output loss lasting 30–60 seconds during highway driving. The engine temperature remains stable during these events. What is the MOST likely cause?

A. The new water pump has a different impeller design that creates flow pulsations at specific highway RPM ranges

B. A residual air pocket trapped during the coolant refill that intermittently blocks heater core flow during driving

C. The heater core developed a restriction from debris dislodged during the water pump replacement procedure

D. A failing thermostat that sticks intermittently during highway cruise and diverts coolant away from the heater

9. On a vehicle with electronic HVAC controls, the technician finds the A/C compressor clutch relay does not click when the A/C is requested. The scan tool shows the HVAC module commanding the relay ON. The technician measures terminal 86 (coil power) at 12.4V and terminal 85 (coil ground) at 12.1V. What does the 12.1V reading at the ground terminal indicate?

A. Normal relay coil operation — the 0.3V difference between power and ground represents the coil's voltage drop

B. The relay coil has an internal short that is back-feeding voltage from the power terminal to the ground terminal

C. The HVAC module is not providing an adequate ground signal — the ground terminal should read near 0V when grounded

D. The relay is energized but its internal contacts have failed open, preventing the click despite proper coil activation

10. A vehicle's A/C system has been working normally for four years. The customer reports that over the past three months, the cooling has gradually diminished. The vent temperature has risen from 42°F to 52°F. The technician recovers 18 ounces from a 22-ounce system. After performing a thorough leak detection, UV dye is found at the evaporator condensation drain. What does this confirm?

A. The evaporator drain is clogged and the backed-up condensation has diluted the refrigerant inside the housing

B. UV dye at the drain was deposited during a previous service and does not necessarily confirm a current active leak

C. The evaporator has a leak — dye-laden refrigerant oil is seeping from the evaporator core and exiting through the drain

D. A heater core leak is contaminating the A/C evaporator with coolant that dissolves UV dye from a previous application

11. On a vehicle with electronic HVAC controls, the technician performs a blend door actuator calibration after replacement. The calibration fails with the message "Unable to find cold stop." The technician inspects the HVAC housing and finds no visible obstructions. What should the technician check next?

A. The HVAC control module for a software update that addresses known calibration incompatibilities with replacement actuators

B. The cabin air filter housing for a filter that has shifted out of position and is mechanically interfering with the blend door

C. The scan tool for a software update since older scan tool versions may not support this vehicle's calibration protocol

D. Whether the new actuator was installed on the correct spline position and the door physically reaches its full cold mechanical stop

12. Technician A says that the purpose of subcooling measurement is to confirm the condenser is producing fully condensed liquid refrigerant before it reaches the metering device. Technician B says that normal subcooling for a properly charged system is typically 10°F–20°F. Who is correct?

A. Technician A only, because the normal subcooling range is actually 5°F–10°F and Technician B's values are too high

B. Technician B only, because subcooling measures the temperature rise at the evaporator not the condenser outlet

C. Both Technician A and Technician B are correct about the purpose and normal range of subcooling measurement

D. Neither Technician A nor Technician B, because subcooling is only applicable to systems using R-12 refrigerant

13. A vehicle's engine runs at 200°F. The customer has the heater set to full hot with the blower on HIGH. The supply hose at the firewall reads 198°F and the return hose reads 165°F. The floor vent temperature is 118°F. The customer complains this is inadequate. What does the 33°F differential between the supply and return hoses indicate?

A. The heater core has a partial restriction reducing flow volume, causing the coolant to spend excessive time inside and lose more heat than normal

B. Normal heat transfer where the coolant delivers heat to the passing air and exits the core at a naturally lower temperature

C. A failing water pump that cannot push adequate coolant volume through the heater core at the current idle speed

D. The thermostat is stuck partially open, reducing the available coolant temperature and causing excessive heat loss

14. On a vehicle with electronic HVAC controls, the scan tool shows the mode door actuator commanded to FLOOR and the actual feedback reads FLOOR. 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 HVAC control module is simultaneously commanding a secondary defrost door open through an undocumented circuit

B. The mode door actuator shaft has disconnected from the physical mode door inside the HVAC housing

C. The mode door has a warped edge that creates an air gap allowing bypass airflow to exit through the defrost path

D. The scan tool is reading the actuator's internal feedback gear position rather than the actual door physical position

15. A vehicle's A/C system has a confirmed refrigerant leak. The system has been empty for approximately two months. The technician repairs the leak, installs a new receiver-drier, and evacuates the system to 490 microns. The vacuum decay test passes. After charging to specification, the system cools to 42°F. However, within one hour, the vent temperature rises to 55°F and the system develops an intermittent cooling loss pattern — 20 minutes cold, 5 minutes warm, repeating. What is the MOST likely cause?

A. The leak repair did not hold and the system is slowly losing charge again, creating the intermittent pattern

B. The compressor sustained internal damage while running empty for two months before the leak repair

C. The new receiver-drier's desiccant was defective and has already saturated, allowing moisture to circulate

D. Moisture remains in the system that the evacuation did not fully remove, causing intermittent freeze-up at the metering device

16. A vehicle's cooling system uses HOAT coolant. The customer added conventional IAT green coolant six months ago to top off the reservoir. The technician opens the reservoir and finds the coolant

has a muddy brown appearance with gel-like material visible. The heater output has decreased steadily over the past three months. What is the correct repair procedure?

A. Drain the contaminated coolant, add a chemical flush agent, run the engine for 30 minutes, drain, and refill with HOAT

B. Simply drain the reservoir and radiator, refill with the correct HOAT coolant, and monitor heater performance

C. Thoroughly flush the entire cooling system including reverse-flushing the heater core, then refill with the correct HOAT coolant

D. Replace the heater core immediately since the gel contamination has permanently restricted the core's internal passages

17. A vehicle has an orifice tube A/C system. The technician removes the orifice tube during routine service and finds the inlet screen is completely clear — no debris, no discoloration, no contamination of any kind. The outlet screen also appears clean. What does this clean condition indicate?

A. The system has never been charged with refrigerant and the clean screens confirm the system is factory-fresh

B. The system's internal components are in good condition with no significant compressor wear or oil degradation

C. The accumulator's desiccant bag has failed and is no longer filtering contaminants from the refrigerant stream

D. The orifice tube was recently replaced by a previous technician and has not been in service long enough to show wear

18. A vehicle's A/C compressor clutch engages normally. The low-side pressure drops to 28 psi and the high-side rises to 195 psi within 15 seconds at 82°F ambient. The vent temperature reaches 42°F within 3 minutes. The technician notes these pressure changes are rapid and decisive. What do these quick, strong pressure separations confirm?

A. The compressor is pumping effectively with good internal compression — the valves and seals are creating strong pressure differential

B. The system is overcharged because a properly charged system would take longer to establish the pressure differential

C. The orifice tube has a partial restriction that is accelerating the pressure separation rate beyond normal parameters

D. The condenser fan is running at excessive speed, which forces the high-side pressure up faster than normal operation

19. On a vehicle with vacuum-operated HVAC controls, all mode positions work correctly during normal driving. However, when the customer drives uphill at full throttle for an extended period, all mode doors default to defrost and remain there until normal driving resumes. What component has MOST likely failed?

A. The mode door actuator springs that should hold the doors in position when vacuum supply temporarily decreases

B. The engine's intake manifold gasket, which develops a vacuum leak specifically under high-load driving conditions

C. The HVAC control panel's vacuum switching valve that opens all ports simultaneously under low-vacuum conditions

D. The vacuum check valve or reservoir that should maintain stored vacuum during periods of low manifold vacuum

20. A vehicle's A/C system was recently charged to the manufacturer's specification of 22 ounces by weight. The vent temperature is 44°F at 86°F ambient. The customer reports that the A/C "cycles too much" — the compressor engages and disengages every 25 seconds. The cycling clutch pressure switch cutout is at 25 psi and cut-in is at 45 psi. Gauge readings confirm the low-side pressure cycles between these values. Is this cycling rate a concern?

A. Yes — the 25-second cycle indicates a marginal undercharge that does not have enough mass to sustain longer on-cycles

B. No — a 25-second cycle with the pressures reaching the specified cutout and cut-in points is within normal operating range

C. Yes — the cycling switch should be replaced because the cutout-to-cut-in spread of 20 psi is too narrow for this system

D. No — but the customer should be advised that normal cycling sounds can be reduced by adding 2 ounces of refrigerant

21. On a vehicle with ATC, the scan tool shows the following: set temperature 72°F, in-car sensor 72°F, ambient sensor 88°F, evaporator temp 37°F, compressor ON, blend door at 18%. The customer complains the air is "not cold enough" from the panel vents. The vent temperature measures 58°F. Is the system malfunctioning?

A. No — the module is correctly blending cold evaporator air with warm heater air to maintain the 72°F set point at 58°F vent delivery

B. Yes — with the cabin already at 72°F the compressor should be off and the 58°F vent air is unnecessary overcooling

C. Yes — the 58°F vent temperature should be closer to 42°F and the 18% blend position is mixing too much warm air

D. No — but only because the ambient temperature of 88°F justifies the continued compressor operation for dehumidification

22. A vehicle has a confirmed A/C leak at the compressor shaft seal. The compressor is 10 years old and produces no abnormal noise. The customer wants the most cost-effective repair. On this vehicle, the shaft seal is independently replaceable. What should the technician recommend?

A. Replace only the shaft seal since the compressor functions normally and this is the most economical repair option

B. Replace the entire compressor because a 10-year-old unit will likely fail soon regardless of the seal repair

C. Apply a sealant additive to the system which is the most cost-effective approach for shaft seal leaks

D. Replace the shaft seal, but also replace the compressor bearings preventatively since they share similar service life

23. A vehicle's cooling system has been holding temperature at 200°F consistently for years. Over the past month, the customer notices the temperature gauge occasionally dips to 185°F during highway driving on cool mornings, then returns to 200°F during city driving. The heater output drops slightly during these highway dips. What is the MOST likely cause?

A. The radiator has developed a partial restriction that paradoxically increases cooling efficiency at highway speed

B. The thermostat is beginning to weaken with age, opening slightly more than designed under the sustained ram airflow cooling of highway driving

C. The engine's cooling fan clutch is engaging at highway speed when it should not, overcooling the engine unnecessarily

D. Normal seasonal behavior caused by the cooler morning ambient temperatures combined with the highway ram airflow

24. On a vehicle with electronic HVAC controls, the customer reports the A/C works perfectly every day except approximately once per week when the compressor does not engage at all for an entire day. The next morning, the system works normally again. There are no DTCs stored during or after the failure events. What should the technician investigate?

A. The HVAC control module for an intermittent software lockup that requires an overnight power-down cycle to reset

B. The cycling clutch pressure switch for a marginal calibration that occasionally trips at the boundary of its range

C. An intermittent electrical fault in the compressor clutch circuit that opens under specific thermal or vibration conditions

D. The refrigerant charge for a slow leak that drops below the low-pressure switch threshold on the hottest weekly day

25. A vehicle's A/C evaporator drain tube has been clogged for approximately two weeks. The customer reports musty odor and water dripping on the passenger floor mat. The technician clears the drain and verifies water flows freely. What additional service should the technician perform?

A. Apply antimicrobial evaporator cleaner to kill the microbial growth that developed during the two weeks of standing water

B. Replace the evaporator since two weeks of standing water has permanently corroded the aluminum tube surfaces

C. Replace the cabin air filter since the clogged drain allowed water to saturate the filter material beyond salvage

D. Flush the refrigerant system since the standing water may have frozen on the evaporator and damaged internal tubes

26. On a vehicle with electronic HVAC controls, the technician notices the blower motor speed increases and decreases gradually over 30-second intervals without any driver input. The temperature setting is at 72°F and the cabin is at 72°F. The scan tool shows the module commanding varying blower speeds. Is this behavior a malfunction?

A. Yes — at set temperature, the blower should maintain a constant low speed and not fluctuate at all

B. Yes — the blower speed variation indicates a failing electronic controller that cannot maintain steady output

C. No — but only if the vehicle has a variable displacement compressor that coordinates with blower speed changes

D. No — the ATC module continuously adjusts blower speed to maintain precise cabin temperature as conditions subtly change

27. Technician A says that when measuring the compressor clutch air gap, the measurement should be taken at 3–4 equally spaced points around the hub to check for uniformity. Technician B says that if the air gap is found to be too wide, shims can be removed from behind the hub to bring the hub closer to the pulley face. Who is correct?

A. Technician A only, because removing shims actually increases the gap rather than reducing it on most designs

B. Both Technician A and Technician B, because multi-point measurement and shim removal are both correct procedures

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

D. Technician B only, because a single measurement at the most accessible point provides adequate gap verification

28. A vehicle has an A/C system that was serviced two months ago with a compressor replacement. The system cooled well after the service. The customer now reports the vent temperature has risen from 42°F to 48°F. The technician recovers 20 ounces from the 22-ounce system. A leak test reveals UV dye at one of the compressor fitting connections. What is the MOST likely cause?

A. The new compressor has a manufacturing defect at the fitting port that allows slow seepage through the casting

B. An O-ring at the compressor fitting was pinched, not lubricated, or incorrectly sized during the installation

C. The compressor's internal shaft seal has already failed on the new unit due to a quality control manufacturing defect

D. The refrigerant hose connected to the compressor fitting has deteriorated internally and is leaking at the crimp

29. On a vehicle with ATC, the scan tool shows the evaporator temperature reading 55°F during A/C operation. The compressor is running. A probe thermometer at the evaporator outlet reads 38°F. The customer complains the A/C is not as cold as expected. What is the primary consequence of the sensor reading warmer than actual?

A. The module believes the evaporator is warmer than it actually is, which may cause it to command more aggressive cooling than the cabin needs

B. The module will disengage the compressor because it interprets the 55°F reading as evidence of a refrigerant leak

C. The module will command the blend door to full cold because it believes the evaporator is not adequately cooled

D. The module reads the 55°F as being above the freeze protection threshold and will allow the evaporator to overcool

30. A vehicle has an A/C system that was properly charged. The technician measures the following at 80°F ambient: low side 30 psi, high side 190 psi, vent temperature 43°F, subcooling 14°F, superheat 10°F. All values are confirmed within manufacturer specifications. What is the correct final step before returning the vehicle to the customer?

A. Perform a 30-minute extended test to verify pressures and temperatures remain stable during continuous operation

B. Verify the condenser fan operates at the correct activation temperature and the compressor clutch cycles normally

C. Recover and recharge the system one additional time to verify the charge weight matches the specification exactly

D. Test drive the vehicle for 20 minutes to verify performance under real-world conditions including stop-and-go traffic

31. A vehicle's A/C system has been diagnosed with a clogged orifice tube. The technician replaces the orifice tube and inspects the old one — the screen is packed with dark brown waxy residue and no metallic particles. What does this debris composition tell the technician about the system's condition?

A. The compressor has catastrophically failed and metallic debris will appear in the system within the next few service cycles

B. The compressor oil has degraded from moisture contamination or thermal breakdown, but no active mechanical failure is occurring

C. The orifice tube debris is normal accumulation that occurs in all systems over time and does not indicate any problem

D. The accumulator desiccant has completely dissolved into the oil stream and is the source of the waxy brown material

32. On a vehicle with electronic HVAC controls, the technician retrieves DTC P0530 — A/C Refrigerant Pressure Sensor Circuit. The scan tool live data shows the pressure reading fluctuating between 0 psi and 400 psi at a rate of several times per second while the system is at rest with the engine off. Normal static pressure should be a steady 92 psi. What is the MOST likely cause?

A. The system has two different pressures in different sections due to an internal restriction creating separate zones

B. The A/C compressor's internal check valve is oscillating and creating rapid pressure fluctuations in the system

C. A faulty pressure sensor or an intermittent wiring fault producing an unstable signal that does not represent actual pressure

D. Normal sensor behavior during the module's self-calibration routine that occurs each time the ignition is turned on

33. A vehicle's heater has been producing less heat over the past year. The technician flushes the heater core and the heat output improves significantly — from 110°F to 132°F floor vent temperature. However, one month later, the customer returns reporting the heat has degraded again to 115°F. What is the MOST likely explanation?

A. The flush dissolved the surface deposits but deeper contamination in the cooling system continues to migrate and re-clog the core

B. The heater core's internal tubes have corroded beyond repair and the thin walls can no longer transfer adequate heat

C. The water pump's impeller has eroded further during the month since the flush, reducing flow below the core's needs

D. Residual contamination in the cooling system that was loosened by the flush has migrated back to the heater core and re-restricted it

34. Technician A says that the compressor's function in the refrigeration cycle is to raise the pressure and temperature of the refrigerant vapor so it can reject heat in the condenser. Technician B says that the compressor also creates the low-pressure condition in the evaporator that allows the refrigerant to boil at a low temperature and absorb heat. Who is correct?

A. Both Technician A and Technician B correctly describe the dual pressure functions of the compressor in the cycle

B. Technician A only, because the low-pressure condition in the evaporator is created by the metering device not the compressor

C. Technician B only, because the compressor's purpose is to create suction rather than to raise discharge temperature

D. Neither Technician A nor Technician B, because the compressor's only function is to circulate refrigerant through the system

35. A vehicle's A/C system has the following gauge readings at 92°F ambient: low side 20 psi, high side 150 psi. The vent temperature is 52°F. The compressor runs continuously without cycling. The suction line at the evaporator outlet feels cold. The technician adds refrigerant and the pressures gradually normalize — low side rises to 33 psi, high side rises to 215 psi. The vent temperature drops to 43°F. What was the original condition?

A. A worn compressor that could not build adequate pressure until the additional refrigerant mass provided more working volume

B. A partially restricted orifice tube that was overcome by the increased refrigerant pressure from the additional charge

C. A low refrigerant charge that produced below-normal pressures, and restoring the correct charge normalized all readings

D. A condenser airflow restriction that cleared itself during the testing period coincidentally as refrigerant was being added

36. On a vehicle with electronic HVAC controls, the technician has replaced the blend door actuator and performed a successful calibration. The customer returns one week later reporting that the vent

temperature never reaches full cold — the minimum is 52°F instead of the expected 40°F. Full hot reaches 135°F normally. What is the MOST likely cause?

A. The evaporator temperature sensor is reading warmer than actual, preventing the module from allowing full cold operation

B. The actuator was installed one spline position off on the blend door shaft, shifting the entire range away from full cold

C. The HVAC control module needs a software reset after actuator replacement to restore its full cold calibration table

D. The new actuator has a narrower internal gear ratio that does not achieve the same mechanical travel as the original

37. A vehicle's cooling system has a slow external leak. The technician pressurizes the system to 16 psi and visually inspects all accessible components — no leak is found. The technician then drives the vehicle for 45 minutes and returns to the shop. Small green coolant drops are visible on the underside of the lower radiator hose. What does this indicate?

A. The lower radiator hose has a pinhole leak or a deteriorated clamp seal that only weeps under the dynamic conditions of driving

B. Condensation from the A/C evaporator is mixing with engine bay contaminants and dripping onto the radiator hose

C. The radiator outlet fitting is seeping coolant that runs along the hose surface and drips from the lowest point

D. The coolant recovery system is overfilling the radiator and the excess drains along the lower hose during driving

38. A vehicle's A/C system has been properly charged and tested. During the performance test, the technician notices the high-side pressure rises from 200 psi to 235 psi over a 15-minute period while all other conditions remain constant — same ambient, same RPM, same blower speed. What is the MOST likely cause of this gradual high-side pressure increase?

A. A slowly failing compressor that is gradually losing its ability to maintain stable discharge pressure regulation

B. The condenser fan relay is intermittently dropping out, reducing condenser airflow and allowing pressure to climb

C. Normal system behavior as the engine bay temperature rises during extended operation, reducing condenser efficiency

D. Progressive engine bay heat-soak during extended operation that gradually warms the condenser environment and reduces heat rejection

39. Technician A says that when adding UV dye to an A/C system for leak detection, the dye should be added in the amount specified by the dye manufacturer — typically 0.25–0.50 ounce. Technician B says that adding too much UV dye can reduce system performance by displacing refrigerant volume and clogging metering device screens. Who is correct?

A. Technician A only, because UV dye is chemically inert and cannot affect system performance regardless of amount

B. Both Technician A and Technician B, because the correct dye amount must be used and excess can cause problems

C. Both Technician A and Technician B are correct about proper dye usage and the risks of excessive application

D. Technician B only, because the standard dye amount is 2 full ounces per application for adequate fluorescence

40. On a vehicle with ATC, the customer reports that the A/C system overcools the cabin on partly cloudy days — the cabin becomes uncomfortably cold despite the set temperature being 72°F. On fully sunny or fully cloudy days, the system maintains temperature correctly. What is the MOST likely explanation?

A. The in-car temperature sensor has a slow response time that cannot track the rapid cabin temperature changes from intermittent clouds

B. The ambient temperature sensor is heat-soaking from intermittent solar exposure and confusing the module's calculations

C. A faulty compressor displacement valve that overreacts to the fluctuating electrical signals from the sun load sensor

D. The sun load sensor fluctuates rapidly between high and low readings as clouds pass, and the module overcompensates for each change

41. A vehicle has an A/C system where the compressor clutch engages but both gauge readings equalize at approximately 80 psi and do not separate — the low side does not drop and the high side does not rise. The compressor pulley spins with the belt. The clutch hub is visually confirmed to be pulled against the pulley. What is the MOST likely cause?

A. A completely blocked condenser that prevents any refrigerant from moving through the high-side circuit under pressure

B. A stuck-wide-open TXV that has eliminated the restriction needed to create a pressure separation in the system

C. The compressor has total internal failure — the shaft may turn but broken valves or scrolls prevent any actual compression

D. The clutch hub is engaging the pulley but slipping — not transferring enough torque to rotate the compressor shaft

42. On a vehicle with electronic HVAC controls, the technician finds the system maintains the set temperature correctly but the customer reports an annoying clicking noise from behind the dashboard every 60 seconds. The noise has been present for two months and is getting progressively louder. The scan tool shows no DTCs and all actuator positions match commands. What is the MOST likely source?

A. A blend door or mode door actuator with progressively stripping gears that click as damaged teeth periodically skip

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

C. An HVAC housing expansion joint that clicks as it thermally cycles between the heating and cooling temperature zones

D. The evaporator condensation drain valve clicking as accumulated water periodically drains in measured bursts

43. A vehicle's engine temperature gauge reads normal at 200°F. The heater produces adequate hot air. However, the customer notices the cooling fan runs continuously at high speed from the moment the engine starts, even when the engine is cold and the A/C is off. No DTCs are stored. What is the MOST likely cause?

A. Normal operation on vehicles with electric cooling fans that are programmed to run continuously for engine protection

B. A failing fan relay that has developed intermittent contact resistance causing the fan to run at variable speeds

C. The radiator thermostat is stuck open, causing the ECM to command the fan at high speed to compensate for the reduced temperature

D. A faulty engine coolant temperature sensor sending an inaccurate signal that causes the ECM to command high-speed fan operation

44. Technician A says that EPA Section 609 certification is required for any technician who repairs or services motor vehicle air conditioning systems involving refrigerant. Technician B says that knowingly venting any amount of refrigerant to the atmosphere during A/C service is a violation of the Clean Air Act. Who is correct?

A. Technician A only, because de minimis amounts of refrigerant released during normal service port disconnection are permitted

B. Both Technician A and Technician B are correct about the certification requirement and the prohibition on intentional venting

C. Technician B only, because Section 609 certification is only required for technicians purchasing refrigerant in bulk containers

D. Neither Technician A nor Technician B, because these regulations apply only to commercial fleet operations not private shops

45. A vehicle's A/C system has been diagnosed with a slow evaporator leak. The labor for evaporator replacement is estimated at 12 hours. The customer asks the technician for the most important reason to proceed with the repair rather than simply recharging annually. What is the single MOST compelling argument?

A. Each recharge cycle without repair introduces moisture and air that progressively corrode internal components, ultimately causing more expensive failures

B. The refrigerant leak allows cabin air to enter the system and dilute the refrigerant charge with atmospheric gases

C. The slow leak releases harmful CFC gases into the atmosphere that deplete the ozone layer and damage the environment

D. The compressor will seize within 6 months of a recharge if the evaporator leak is not repaired promptly

46. On a vehicle with electronic HVAC controls, the technician measures the voltage at the blower motor connector on HIGH speed and reads 14.2V at the positive terminal and 0.1V at the negative (ground) terminal. The blower motor runs at full speed and sounds normal. What can the technician determine from these readings?

A. The blower motor relay has bypassed the electronic controller and is supplying unregulated voltage directly to the motor

B. The readings are abnormal because the ground terminal should read exactly 0.0V for a properly functioning circuit

C. The blower motor has an internal fault that is pulling the ground voltage slightly above zero due to excessive current draw

D. The motor is receiving full voltage (14.1V effective across the motor) with minimal ground circuit resistance — normal operation

47. A vehicle's A/C system has been operating with an overcharge of approximately 4 ounces above the 22-ounce specification. The customer's complaint is poor cooling on hot days. What specific effect does the overcharge have on the system?

A. The excess refrigerant floods the evaporator with liquid that the blower cannot cool effectively at high ambient

B. The overcharge increases the compressor's internal load, causing it to run hotter and produce noisier operation

C. The excess liquid refrigerant backs up in the condenser, reducing effective heat rejection area and elevating pressures

D. The additional refrigerant mass increases the system's total pressure beyond the relief valve threshold causing venting

48. A vehicle's heater produces adequate heat from the floor vents. When the customer selects DEFROST mode, the windshield clears fog effectively. However, the customer notices that the A/C compressor indicator light does not illuminate in defrost mode, and the windshield takes longer to clear than expected in cold, humid conditions. What should the technician check?

A. The defrost ductwork for restrictions that are limiting the volume of air reaching the windshield surface area

B. Whether the A/C compressor is actually engaging in defrost mode — the light may be burned out while the compressor runs, or the compressor may not be activating

C. The heater core for a partial restriction that limits the maximum temperature of the air delivered to the windshield

D. The cabin air filter for moisture saturation that is introducing additional humidity into the defrost airstream

49. Technician A says that a vehicle's A/C system should be performance tested under standardized conditions: engine at 1,500 RPM, blower on HIGH, doors and windows open, and the system in recirculation mode. Technician B says that the ambient temperature must be recorded during the test because vent temperature, gauge pressures, and system capacity all vary with ambient conditions. Who is correct?

A. Both Technician A and Technician B describe important elements of a standardized A/C performance test procedure

B. Technician A only, because ambient temperature does not meaningfully affect the vent temperature during a proper test

C. Technician B only, because the specific engine RPM and blower settings do not significantly impact the test results

D. Neither Technician A nor Technician B, because performance testing is unnecessary if the system cools to below 50°F

50. A vehicle's A/C system has been completely serviced — new compressor, flushed serpentine tube condenser, new orifice tube, new accumulator, new O-rings, proper evacuation to 480 microns, and charged to the manufacturer's 22-ounce specification. The system cools to 42°F with all gauge readings within specification. One month later, the customer returns with a vent temperature of 50°F. The technician recovers 19 ounces. After a thorough leak test, UV dye is found at the condenser outlet fitting. What is the MOST likely root cause?

A. The flushed condenser has internal tube damage that was not visible during the external inspection before reinstallation

B. The condenser outlet fitting has a manufacturing defect that developed a crack under the repeated thermal cycling

C. Residual flushing solvent left in the condenser chemically attacked the outlet fitting O-ring and caused degradation

D. An O-ring at the condenser outlet fitting was pinched, not lubricated, or incorrectly sized during the reassembly

Practice Exam 20: Answer Key and Explanations

1. B — All performance measurements confirm the system is functioning correctly — pressures, vent temperature, subcooling, and superheat are all within specification. Before declaring the system summer-ready, the technician should verify the supporting systems that the static performance test does not evaluate: the condenser fan must activate at the correct temperature threshold and at both speeds if equipped, and the compressor clutch must engage and disengage normally during cycling. These

operational checks confirm the complete integrated system will function under real-world summer conditions.

2. C — Both technicians describe mandatory retrofit requirements. Technician A is correct that mineral oil used with R-12 must be removed and replaced with PAG or POE oil compatible with R-134a — mineral oil does not mix adequately with R-134a and provides insufficient lubrication. Technician B is correct that R-12 service fittings must be converted to R-134a quick-disconnect fittings (to prevent future cross-contamination) and a retrofit label must be applied documenting the refrigerant type, oil type and amount, charge amount, and service information.

3. A — Every system parameter verifies within specification: engine temperature at 205°F, both hoses hot, floor vent temperature at 138°F, and all components functioning correctly. Heater output varies significantly between vehicle designs based on heater core size, ductwork routing, airflow volume, and engine operating temperature. A floor vent temperature of 138°F with 205°F coolant is well within normal range. The customer's previous vehicle may have had a larger heater core or different design that produced higher output.

4. D — A vehicle heat-soaked in 95°F sun to 110°F interior represents an extreme thermal load that the A/C system must overcome before the cabin approaches comfortable temperature. All system parameters — pressures, temperatures, subcooling, superheat — are within specification, confirming the system is operating at full capacity. An 8-minute pull-down from 110°F to 75°F on a 95°F day is normal and demonstrates the system is performing as designed under demanding conditions.

5. C — The A/C was working normally before the windshield installation and the problem appeared immediately after. Mobile windshield technicians work in the cowl area where refrigerant lines, electrical connectors, and HVAC components are located near the windshield base. Both-sides-slightly-elevated pressures with a warmer vent temperature suggest a refrigerant line was kinked, a fitting was bumped loose, or a connection was disturbed during the glass removal and installation process.

6. A — The open in-car sensor circuit causes the module to read −40°F — the default value for an open NTC circuit. The module's control logic compares the in-car reading (−40°F) to the set temperature (typically 72°F or whatever the customer has set). Since −40°F is far below any set point, the module calculates that no cooling is needed — the cabin is already much colder than desired. The module withholds the compressor engagement command because its algorithm determines cooling would make the already-cold cabin even colder.

7. D — The sensing bulb is properly installed and insulated, eliminating installation error. The system charge should be verified, but the question states the system was charged to specification. A superheat of only 2°F — well below the 8–12°F specification — means the evaporator is receiving more liquid refrigerant than it can fully evaporate. The most likely cause is a replacement TXV with a factory superheat setting that is lower than the specification for this application, causing the valve to overfeed the evaporator.

8. B — Intermittent heater output loss lasting 30–60 seconds during highway driving — with a stable engine temperature — three days after a coolant drain-and-refill is the classic pattern of a trapped air pocket. During highway driving, the water pump's variable flow rate and the changing thermal conditions cause the air bubble to shift position inside the heater core, intermittently blocking a coolant passage. When the bubble moves, full flow resumes and heat returns. Properly bleeding the cooling system removes the air pocket.

9. C — Terminal 86 has 12.4V (coil power present) and terminal 85 reads 12.1V — nearly battery voltage at what should be the ground terminal. When the module provides a proper ground, terminal 85 should read near 0V (typically 0.1–0.5V representing the small drop across the module's ground driver). A reading of 12.1V means the ground path is essentially open — voltage passes through the relay coil winding and sits at the ground terminal with no path to chassis. The module is not providing adequate ground or the ground wire is open.

10. C — UV dye found at the evaporator condensation drain confirms the evaporator has a leak. When the evaporator leaks, refrigerant carrying UV dye-laden oil seeps from the core surface inside the HVAC housing. This oily fluorescent residue mixes with the evaporator condensation and exits through the drain tube, where the technician detects it with the UV light. The 4-ounce charge loss over three months correlates with a slow evaporator pinhole leak allowing gradual refrigerant escape.

11. D — The calibration routine drives the blend door to its full cold mechanical stop and expects the actuator to report reaching its endpoint. "Unable to find cold stop" means the actuator could not drive the door to that endpoint. With no visible obstructions found during inspection, the technician should verify the actuator was installed on the correct spline — if offset by one position, the door's mechanical range is shifted and the actuator cannot reach the true cold stop even with a clear path.

12. C — Both technicians correctly describe subcooling fundamentals. Technician A is right that subcooling measurement confirms the condenser is producing fully condensed liquid — the measured outlet temperature below the saturation temperature proves no vapor remains in the liquid line. Technician B is right that normal subcooling for a properly charged system typically falls in the 10°F–20°F range. Together, these two facts form the basis for using subcooling as a charge verification tool.

13. A — A 33°F differential between the supply hose (198°F) and return hose (165°F) is larger than the normal 20°F–30°F range. This excessive temperature drop means the coolant spends too long inside the heater core because the flow rate is reduced by a partial internal restriction. Each unit of coolant loses more heat than normal during its extended transit, producing the large differential. The 118°F floor vent temperature — below normal despite adequate supply temperature — further confirms the restricted core is not passing enough volume for full heat delivery.

14. B — The scan tool confirms the mode door actuator motors to the FLOOR position and the feedback reports FLOOR — the actuator's internal mechanism is functioning correctly. However, strong airflow exits from the defrost vents instead of the floor vents, proving the physical mode door did not actually move to the floor position. The actuator shaft has disconnected from the mode door inside the housing — the shaft rotates and the feedback tracks correctly, but the door remains wherever it was when the mechanical link failed.

15. D — The system was empty for two months, meaning atmospheric moisture entered through the leak. After repair, the evacuation reached 490 microns — acceptable — but a system that was open for two months can absorb substantial moisture. The intermittent cooling loss pattern (20 minutes cold, 5 minutes warm, repeating) is the classic moisture freeze-up cycle: moisture gradually freezes at the cold metering device, blocking flow; the ice melts during the warm period; flow resumes; and the cycle repeats.

16. C — Mixing IAT and HOAT coolants causes a chemical reaction between the incompatible inhibitor chemistries, producing the visible gel-like sludge and muddy brown discoloration. This sludge has already restricted the heater core over three months. Simply draining and refilling will not remove the gel deposits already adhering to internal surfaces. A thorough flush — including reverse-flushing the heater core — is required to physically dislodge and remove the accumulated sludge before refilling with the correct single coolant type.

17. B — A completely clean orifice tube screen — no debris, discoloration, or contamination of any kind — is the best possible finding during an A/C service inspection. It confirms the compressor is not releasing metallic wear particles, the oil has not degraded into sludge or waxy deposits, and the desiccant in the accumulator is intact and not releasing bead material. The system's internal components are in healthy condition with no signs of contamination, wear, or chemical breakdown.

18. A — The low-side pressure drops from static equilibrium to 28 psi and the high-side rises to 195 psi within 15 seconds of compressor engagement — a rapid, decisive pressure separation. This quick response confirms the compressor is pumping effectively with good internal compression. Healthy reed valves, piston rings, or scroll elements are creating a strong seal that efficiently separates the low and

high sides. The 42°F vent temperature within 3 minutes further confirms the entire refrigeration cycle responds promptly.

19. D — During full-throttle uphill driving, engine intake manifold vacuum drops near zero because the throttle is wide open. The vacuum check valve between the manifold and the HVAC vacuum reservoir should maintain stored vacuum for the actuators during these low-vacuum periods. If the check valve has failed, stored vacuum bleeds back to the manifold. If the reservoir has a crack, it cannot maintain vacuum during sustained demand. Either failure depletes actuator vacuum, causing the spring-loaded mode doors to default to defrost.

20. B — The system was charged to the manufacturer's 22-ounce specification by weight. The cycling switch operates at its designed cutout (25 psi) and cut-in (45 psi) points. A 25-second complete cycle (on plus off time) falls within the normal cycling range for 86°F ambient conditions. The customer is simply noticing the normal audible click and RPM dip that accompanies each clutch engagement cycle. All parameters — charge weight, pressures, vent temperature, and cycling points — confirm normal system operation.

21. A — The cabin is at 72°F — exactly at the 72°F set point. The module maintains this precise temperature by blending cold evaporator air (37°F) with warm heater core air through the 18% blend door position, producing a 58°F vent delivery temperature. This moderately cool air maintains the cabin at 72°F by offsetting the heat entering through the windows and from occupants. The compressor runs to provide continuous dehumidification and the cold air source. This is textbook ATC proportional control at equilibrium.

22. D — The compressor shaft seal is independently replaceable on this model and the compressor operates normally with no noise. Replacing only the shaft seal is the most cost-effective repair that directly addresses the confirmed leak. Replacing the entire compressor adds significant unnecessary cost for a unit that functions perfectly. Sealant additives are not an acceptable permanent repair. Preventative bearing replacement during a seal job adds labor cost for components that have not shown any symptoms of failure.

23. B — The temperature dips occur specifically during highway driving on cool mornings — when high-velocity ram air through the radiator combines with cool ambient temperatures to maximize heat rejection. A thermostat that is beginning to weaken with age opens slightly wider than designed under these sustained cooling conditions, allowing more coolant to flow through the radiator than the thermostat should permit. During city driving with lower airflow, the weakened thermostat can still maintain 200°F. This progressive symptom indicates the thermostat should be replaced.

24. C — An intermittent failure that prevents compressor engagement for an entire day — with no DTCs stored and spontaneous recovery the next morning — suggests a thermal-sensitive electrical fault. A connection or component that opens circuit when hot and re-establishes contact after cooling overnight would produce this pattern. The clutch coil winding, a connector terminal, a relay contact, or a wire splice with a thermal-sensitive break would explain the consistent failure-then-recovery cycle tied to temperature changes.

25. A — Two weeks of standing water in the HVAC housing creates an ideal environment for mold, mildew, and bacteria to colonize the evaporator surface and housing interior. Simply clearing the drain removes the water but does not address the microbial growth already established. Applying an antimicrobial evaporator cleaner kills the existing organisms and helps prevent regrowth. Without this treatment, the musty odor will persist because the biological colonies remain on the evaporator fins.

26. D — The ATC module continuously adjusts blower speed as part of its closed-loop temperature control strategy. Even with the cabin at 72°F (matching the set point), subtle changes in conditions — solar load shifting, engine bay temperature fluctuating, door opening, passenger movement — create minor temperature variations. The module detects these through the in-car sensor and adjusts blower speed proportionally to maintain precise temperature. This gradual speed modulation is normal ATC fine-tuning behavior.

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

28. B — A 2-ounce charge loss within two months of a compressor replacement, with UV dye found specifically at a compressor fitting connection, confirms the leak originated during the recent service. The most common cause of post-service fitting leaks is an O-ring that was pinched during assembly, not lubricated with refrigerant oil before installation, or was the incorrect size for the fitting. The technician should replace the O-ring, properly lubricate it, verify correct torque, and recheck for leaks.

29. A — The evaporator sensor reads 55°F while the actual temperature is 38°F — the sensor reads 17°F warmer than reality. The module sees 55°F and believes the evaporator has not reached optimal cooling temperature. In response, the module may command more aggressive compressor operation, a colder blend door position, or higher blower speed to drive the perceived 55°F evaporator temperature lower. The system actually overcools because the real evaporator is already at 38°F while the module pushes for more cooling.

30. B — All performance measurements confirm the refrigeration system is functioning correctly — pressures, vent temperature, subcooling, and superheat are all within specification. Before returning the vehicle, the technician should verify the supporting operational systems: the condenser fan must activate at the correct temperature threshold and at both speeds if equipped, and the compressor clutch must engage and disengage normally. These dynamic operational checks confirm the complete system functions under real-world conditions.

31. B — Dark brown waxy residue on the orifice tube screen without metallic particles indicates the compressor oil has degraded — broken down from moisture contamination, excessive heat exposure, or extended service life beyond the oil's chemical stability. The absence of metallic particles confirms no active mechanical compressor failure is occurring. The system needs the accumulator replaced (fresh desiccant), thorough flushing to remove degraded oil, and a complete recharge with fresh oil and refrigerant.

32. C — The manifold gauges would show stable static pressure if connected, confirming the actual system pressure is steady. The electronic sensor reading fluctuating wildly between 0 and 400 psi while the system is at rest (no compressor operation to create real pressure changes) confirms the signal itself is unstable. A failing pressure transducer, a loose connector with intermittent contact, or a chafed signal wire shorting intermittently produces this erratic pattern that does not represent actual system pressure.

33. D — The flush temporarily restored heat output by removing surface deposits from the heater core, but the underlying contamination source — the rest of the cooling system — was not addressed. Residual corrosion products, scale, and sludge still present in the engine block, radiator, and hoses gradually migrate back to the heater core's narrow passages over the following month. Without flushing the entire cooling system to remove the contamination source, the heater core will repeatedly re-clog after each flush.

34. A — Both technicians correctly describe the compressor's dual pressure functions in the refrigeration cycle. Technician A is right that the compressor raises the pressure and temperature of refrigerant vapor on the discharge side so the condenser can reject heat to the ambient air. Technician B is right that the compressor simultaneously creates the low-pressure condition on the suction side that allows the refrigerant to boil at a low temperature in the evaporator and absorb heat from the cabin air.

35. C — The initial both-sides-low readings (20 psi low / 150 psi high) improved to normal readings (33 psi low / 215 psi high / 43°F vent) after adding refrigerant to specification. This confirms the original condition was simply a low refrigerant charge. Insufficient refrigerant mass produced below-normal pressures on both sides and reduced cooling output. Restoring the correct charge amount by weight brought all parameters back to their normal operating ranges.

36. B — The calibration completed successfully (0%–100% range confirmed), and full hot reaches 135°F normally — but full cold only reaches 52°F instead of 40°F. The full hot position works correctly but the full cold position falls short. This asymmetric range shift — one end correct, the other end offset — is the characteristic pattern of an actuator installed one spline position off. The door reaches full hot mechanically but the shifted range prevents it from reaching true full cold on the opposite end of travel.

37. A — The static pressure test at 16 psi revealed no leak because the system was stationary. During 45 minutes of driving, the lower radiator hose is subjected to dynamic conditions — engine vibration, coolant pressure pulsations from the water pump, thermal expansion and contraction cycles, and physical movement from engine torque reaction. A deteriorated hose clamp seal or a pinhole in the hose material may only weep under these combined dynamic stresses that are absent during a static shop test.

38. D — A gradual 35 psi high-side pressure increase over 15 minutes with all external conditions constant (same ambient, RPM, blower) indicates the condenser's operating environment is changing. During extended engine operation, the engine bay temperature steadily rises from engine heat radiation, exhaust system heat, and reduced convective cooling of stagnant underhood air. This progressive heat-soak warms the air surrounding the condenser, reducing the temperature differential for heat rejection and gradually raising the high-side pressure.

39. C — Both technicians describe correct UV dye usage principles. Technician A is right that UV dye should be added in the manufacturer-specified amount — typically 0.25–0.50 ounce — which provides adequate fluorescence for leak detection. Technician B is right that excessive UV dye can displace refrigerant volume (reducing charge effectiveness) and may clog fine-mesh orifice tube screens or TXV inlet filters, degrading system performance. Using the correct amount is both effective and safe.

40. D — On partly cloudy days, the sun load sensor alternates between high readings (sun exposed) and low readings (cloud shadow) as clouds pass. The module responds to each reading change by adjusting cooling output — increasing cooling when the sensor reports sun, decreasing when it reports shade. However, the module's response rate may overcorrect for each change, producing net overcooling because the cooling system responds faster to increased demand than it reduces output when the cloud passes.

41. C — Both gauges equalize at approximately 80 psi with the clutch visually confirmed to be engaging against the pulley — the compressor shaft is being driven but no pressure differential develops. The compressor has total internal failure: broken reed valves, shattered scroll elements, or a sheared internal coupling allow the shaft to spin freely without actually compressing refrigerant from the low side to the high side. The pressures remain at their static equilibrium because no pumping action occurs.

42. A — A clicking noise every 60 seconds that progressively worsens over two months — with no DTCs and all actuator positions matching commands — is characteristic of a blend or mode door actuator with gears that are progressively stripping. Worn gear teeth periodically skip under load, producing the click. The motor compensates and re-engages the remaining teeth, maintaining the commanded position. Over time, the damage worsens and the clicks become louder as more tooth surface is lost.

43. D — The engine temperature reads normal at 200°F and the heater works well — the cooling system is functioning correctly. However, the fan runs continuously at high speed from cold start with no DTCs. The ECM commands the fan based on the coolant temperature sensor signal. A faulty sensor sending an inaccurate high reading (or a signal the ECM interprets as high temperature) causes the ECM to command defensive high-speed fan operation from the moment the engine starts, regardless of actual coolant temperature.

44. B — Both technicians state correct regulatory facts. Technician A is right that EPA Section 609 certification is legally required for any technician who services motor vehicle A/C systems involving refrigerant handling — recovery, recycling, or charging. Technician B is right that the Clean Air Act prohibits knowingly venting any amount of refrigerant to the atmosphere — this applies to all refrigerant types with no exceptions for small quantities or routine service operations.

45. A — The single most compelling argument against periodic recharging without repair is the progressive system damage from moisture and air contamination. Each time the system runs with a low or empty charge, atmospheric air and moisture enter through the leak. Moisture combines with refrigerant and oil to form hydrofluoric acid that attacks aluminum components — the condenser, evaporator, compressor, and all fittings corrode progressively with each charge cycle. This corrosion damage eventually causes multiple expensive component failures far exceeding the original evaporator replacement cost.

46. D — The positive terminal reads 14.2V (full charging system voltage) and the negative (ground) terminal reads 0.1V — well within the 0.3V maximum acceptable ground voltage drop. The effective voltage across the motor is 14.1V (14.2 − 0.1), confirming the motor receives nearly full available voltage. The motor runs at full speed and sounds normal. Both the power supply and ground circuits are delivering adequate voltage with minimal unwanted resistance. This represents normal, healthy blower motor circuit operation.

47. C — A 4-ounce overcharge (26 ounces in a 22-ounce system) floods the condenser with excess liquid refrigerant. The extra liquid occupies space in the condenser tubes that should be used for the vapor-to-liquid condensation process. With less effective condensing surface area available, the

condenser cannot reject heat as efficiently. High-side pressure rises above normal, subcooling increases above the normal range, and the overall cooling capacity decreases — producing the poor cooling on hot days that the customer reports.

48. B — The A/C compressor indicator light not illuminating in defrost mode could mean the bulb is simply burned out while the compressor actually runs, or the compressor may genuinely not be engaging. Most vehicles automatically engage the compressor in defrost mode to dehumidify the air before it contacts the windshield. Without compressor operation, the warm but humid air hits the cold glass and is less effective at clearing fog. The technician should verify whether the compressor clutch physically engages in defrost mode.

49. A — Both technicians describe essential elements of a standardized performance test. Technician A correctly identifies the controlled conditions: 1,500 RPM provides consistent compressor speed, HIGH blower provides maximum airflow, and open doors prevent the system from recirculating already-cooled air. Technician B correctly emphasizes that ambient temperature must be recorded because it directly affects all system parameters — vent temperature, gauge pressures, and total cooling capacity all vary with ambient conditions.

50. D — UV dye found at the condenser outlet fitting one month after a complete system service — where the condenser was flushed and reinstalled with new O-rings — confirms the leak originated at a connection assembled during the recent service. The most common cause is an O-ring at the condenser outlet fitting that was pinched during installation, not properly lubricated with refrigerant oil, or was the wrong size for the fitting. The technician should replace the O-ring, lubricate properly, torque correctly, and verify no leak before recharging.