PRACTICE EXAM 6: RED SEAL AUTOMOTIVE SERVICE TECHNICIAN SIMULATION (125 QUESTIONS)

1. A technician is working underneath a vehicle supported by a two-post lift. The lift begins making an unusual groaning noise and one of the lift arms appears to be sagging slightly. What is the correct immediate action?

A. Continue working while monitoring the lift noise, since groaning sounds are common during hydraulic pressure equalization between the two lift cylinders

B. Evacuate from under the vehicle immediately, lower the vehicle to the ground, and lock out the lift for inspection and service before it is used again

C. Ask a co-worker to stand at the lift controls and be ready to raise the lift higher if the arm continues to sag, while you finish the current repair task

D. Place additional jack stands under the vehicle as supplemental support while the lift is still raised, then continue working with the dual support in place

2. A technician needs to use a propane torch to heat a seized suspension bolt for removal. The work area is near the fuel tank. What precaution is essential?

A. Proceed with the torch as long as a fire extinguisher is within arm's reach, since the fuel tank's metal shell provides adequate protection from the torch flame

B. Use an electric heat gun instead of the torch for the initial heating attempt, then switch to the torch only if the heat gun does not generate sufficient temperature

C. Wrap the fuel tank with wet shop rags to absorb heat before using the torch, since the wet barrier prevents the tank from reaching its critical ignition temperature

D. Do not use an open flame near the fuel tank — use alternative methods such as an induction heater, penetrating oil, impact tools, or removal of the fuel tank before heating

3. A technician is operating a vehicle on a dynamometer. What safety equipment must be in place before the vehicle is run at speed on the dyno?

A. Wheel restraint straps or chocks securing the drive wheels to the dyno rollers, exhaust extraction connected, and safety barriers positioned to protect personnel from a wheel-off event

B. Only exhaust extraction is required, since the dyno rollers provide sufficient resistance to prevent the vehicle from moving forward during the high-speed test run

C. Only wheel restraint straps are required, since the enclosed dyno room provides adequate protection for personnel and the built-in ventilation handles exhaust gas extraction

D. A full roll cage must be installed inside the vehicle before dynamometer testing, since the deceleration forces during a sudden dyno shutdown can injure the driver inside the vehicle

4. What does a WHMIS 2015 pictogram showing a flame over a circle represent?

A. The product is a flammable liquid that can ignite when exposed to temperatures above its flash point, open flames, or sparks from electrical equipment or static discharge

B. The product is an explosive material that can detonate under confinement, shock, or heat, and must be stored away from all other chemicals in a dedicated blast-resistant cabinet

C. The product is an oxidizer that can intensify a fire or cause materials that do not normally burn to ignite by releasing oxygen or other oxidizing substances during decomposition

D. The product is a compressed gas under pressure that can explode if heated, and the container must be stored below 50°C at all times to prevent catastrophic pressure failure

5. A technician drops a heavy tool onto the shop floor. The tool bounces and strikes the glass front of a nearby chemical storage cabinet, cracking the glass. Chemical containers inside appear undamaged. What is the correct response?

A. Tape the cracked glass with clear packing tape to seal the crack and prevent further breakage, then schedule the cabinet glass replacement for the next maintenance service call

B. Evacuate the immediate area, report the damage to the shop supervisor, and do not use the cabinet until the glass is replaced and the integrity of the stored containers is verified

C. Open the cabinet and inspect each container for damage, then close the cabinet and apply a cardboard patch over the crack to prevent the glass from falling out during normal use

D. Continue working normally since the containers are intact and the cabinet glass is cosmetic only — it does not affect the safety function of the cabinet for chemical storage protection

6. An apprentice asks why the shop has both an eyewash station and a safety shower. In what situation would the safety shower be used instead of the eyewash station?

A. When a chemical splashes onto a large area of the body — such as the torso, arms, or legs — the safety shower provides full-body decontamination that the eyewash cannot cover

B. When the chemical involved has a flash point below 38°C and requires dilution with a high-volume water flow that the eyewash station's lower flow rate cannot provide for the reaction

C. When the chemical splash affects only the hands, the shower provides a higher flow rate that more effectively removes chemicals from the skin surface than the eyewash station stream

D. The safety shower is used exclusively for fire suppression when a technician's clothing ignites, while the eyewash station is used exclusively for chemical splash decontamination of the eyes

7. A vehicle with a damaged fuel line is leaking gasoline onto the shop floor. The technician has placed an absorbent pad over the small puddle. What is the next critical step?

A. Start the vehicle and drive it outside to prevent further fuel accumulation inside the shop, since the open air outside will disperse the fuel vapor below the ignitable concentration

B. Open the shop's overhead doors and turn on the ventilation fans, but avoid activating any electrical switches in the spill area since the fuel vapor could ignite from an electrical arc

C. Mop up the fuel with a standard cotton shop mop and wring the mop into the floor drain, since small amounts of gasoline are diluted and neutralized by the sewer system's water volume

D. Eliminate all ignition sources in the area, ventilate the space, contain and absorb the spill with approved absorbent material, and dispose of contaminated materials as hazardous waste

8. A technician is servicing a vehicle that has aftermarket underbody lighting controlled by a switch near the steering column. The switch is not labeled and the technician is unfamiliar with the modification. What is the concern?

A. The aftermarket wiring may interfere with the scan tool's diagnostic communication protocol, causing false codes and incorrect data readings during the service diagnostic procedure

B. The aftermarket lighting system may draw excessive current from the vehicle's charging system, causing the battery to discharge during the service while the vehicle is not running

C. The unknown aftermarket wiring may be improperly installed — without fuse protection, with incorrect wire gauge, or routed near heat sources — creating a potential fire or short circuit hazard

D. The aftermarket lighting violates Canadian motor vehicle safety standards and the technician must disconnect and remove the system before performing any other service on the vehicle

9. A new technician is assigned to change the engine oil on a vehicle. They notice the vehicle's hood prop rod is bent and does not securely hold the hood in the open position. What must be done before beginning the oil change?

A. The bent prop rod must be replaced, repaired, or a suitable alternative support must be used to secure the hood in the open position before any work begins in the engine bay

B. The technician can proceed with the oil change by resting the hood on their back while they work, since the brief duration of an oil change does not require a fully secure hood support

C. The technician should remove the hood completely before beginning the oil change to eliminate the falling hood hazard entirely rather than attempting to secure the bent prop rod

D. The technician can wedge a shop rag between the hood and the fender to create friction that prevents the hood from closing while the bent prop rod provides partial secondary support

10. An engine has a complaint of knocking noise under load that increases with engine temperature. The scan tool shows the knock sensor is active and the ECM has retarded ignition timing by 8 degrees from the base calibration. Despite this maximum retard, the knock persists. What should be investigated?

A. The octane rating of the fuel currently in the tank, since using fuel below the manufacturer's specified minimum octane is the most common cause of persistent knock despite full ECM correction

B. Excessive carbon buildup in the combustion chambers that has raised the effective compression ratio beyond what the ECM's maximum timing retard can compensate for at the current fuel octane

C. A faulty knock sensor that is generating false signals, causing the ECM to retard timing unnecessarily when no actual detonation is occurring inside the combustion chambers during operation

D. The exhaust gas recirculation system for a flow rate above specification that is diluting the air-fuel charge excessively and creating combustion instability that mimics detonation on the sensor

11. A vehicle's engine has a persistent P0507 (Idle Control System RPM Higher Than Expected) code. The idle speed is 950 RPM instead of the specified 700 RPM. The throttle plate closes fully when the ignition is turned off. What should be checked?

A. The engine's valve clearance on all cylinders, since tight exhaust valves can leak combustion gas into the intake manifold at idle, creating additional airflow that raises the idle speed

B. The throttle position sensor for an offset reading that causes the ECM to command a wider throttle opening than the specified idle position, raising the engine's idle speed above target

C. The camshaft position sensor for a signal drift that causes the ECM to advance the intake cam timing at idle, increasing the effective overlap and drawing more air into the cylinders

D. A vacuum leak that introduces unmetered air past the closed throttle plate, raising the RPM above the ECM's target — the ECM sets P0507 because it cannot reduce the idle to specification

12. A six-cylinder engine has a misfire that occurs only during cranking and the first two seconds of engine operation, then clears completely once the engine fires and runs. What is the most likely cause?

A. The starter motor is cranking the engine too slowly due to a weak battery, and the reduced cranking speed prevents adequate fuel atomization for consistent ignition during the cranking period

B. The crankshaft position sensor's pickup signal is erratic during the low cranking speed, causing the ECM to miscalculate injection and ignition timing until the engine reaches self-sustaining RPM

C. One or more fuel injectors have weak return springs that allow them to dribble fuel during the low fuel pressure of cranking, flooding those cylinders until the pump builds full operating pressure

D. The engine has low compression on one or more cylinders from a slight head gasket leak that seals once the engine reaches operating temperature, but the compression is already low during cold cranking

13. A technician measures fuel pressure on a returnless fuel system. The specification is 400 kPa at key-on engine-off. The measured pressure is 400 kPa at key-on but drops to 350 kPa within 10 seconds of the key being turned off. The specification requires the pressure to hold above 380 kPa for a minimum of 5 minutes. What does this rapid pressure drop indicate?

A. The fuel pump relay is de-energizing too quickly after key-off, cutting power to the pump before the system can pressurize the rail to the holding specification for the key-off test period

B. A fuel leak exists somewhere in the system — at the fuel pump check valve, a leaking injector, or a faulty fuel pressure sensor that vents pressure — allowing the rail to bleed down after shutdown

C. The fuel tank is below one-quarter capacity, and the low fuel level reduces the hydrostatic head pressure that normally assists the check valve in maintaining residual rail pressure after key-off

D. The fuel pressure sensor has a calibration drift that causes it to read progressively lower over time after the pump stops, even though the actual rail pressure remains within the holding specification

14. A vehicle has a P0420 code that has been confirmed by monitoring the downstream oxygen sensor's activity — it mirrors the upstream sensor closely. Before replacing the catalytic converter, what conditions should be verified to ensure the converter is the actual failed component?

A. No active misfires, no exhaust leaks upstream of the converter, correct fuel trim values, and a properly functioning upstream oxygen sensor — since any of these conditions can cause a false P0420

B. The converter's substrate temperature exceeds 400°C during normal driving, since a converter below this temperature cannot efficiently catalyze the exhaust gas reactions for the monitor to pass

C. The converter has accumulated at least 80,000 km of service, since converters rarely fail below this mileage and a premature failure suggests another root cause that must be addressed before replacement

D. The engine oil is clean and at the correct level, since contaminated oil produces exhaust byproducts that coat the downstream sensor and mimic the rapid switching pattern of a degraded converter

15. A diesel engine equipped with a variable-geometry turbocharger (VGT) and EGR has a DTC for VGT actuator performance. The scan tool shows the actuator is mechanically stuck. What is the most common cause of VGT actuator seizure on a diesel engine?

A. Electrical failure of the actuator motor's internal H-bridge driver circuit, which locks the motor in a fixed position and prevents it from responding to the ECM's position commands

B. Contamination of the actuator's mechanical linkage from oil seepage through the turbocharger's center section seal that migrates to the external actuator mechanism and causes binding

C. Faulty ECM programming that sends conflicting position commands to the actuator, causing the motor to oscillate between two positions until it overheats and the internal gears seize permanently

D. Carbon and soot buildup from EGR exhaust gases that accumulates on the VGT vane mechanism and the actuator linkage, binding the vanes in position and preventing movement

16. A vehicle with a 3.5L V6 has a coolant consumption complaint — the reservoir level drops over a period of weeks with no visible external leaks. The exhaust is clear with no white smoke, and the oil shows no contamination. A cooling system pressure test holds pressure for 30 minutes with no drop. What diagnostic test can detect the leak source?

A. A cylinder leak-down test performed on each cylinder while monitoring the coolant reservoir for bubbling, which would indicate the leak path between the cylinder and the cooling system

B. A UV dye test where fluorescent dye is added to the coolant and the engine is run for several heat cycles, then inspected with a UV light for any traces of dye at potential external leak points

C. A block test (combustion leak test) performed with the engine running and the radiator cap removed, checking for the presence of combustion gases in the coolant that would indicate an internal leak

D. A borescope inspection of the exhaust ports through the manifold openings while the engine is pressurized with coolant, checking for visible coolant seepage into the exhaust runners

17. An engine oil pressure gauge shows 60 psi at startup, drops to 40 psi at operating temperature at 2,000 RPM, and reads 15 psi at hot idle. The specification is 25 psi minimum at hot idle. What is the most likely cause of the low hot idle pressure?

A. Worn main and rod bearings that have excessive clearance, allowing oil to escape the bearing journals faster than the pump can supply it at the low output volume of idle speed

B. A restricted oil pickup screen that limits the pump's suction volume at all speeds, producing low pressure across the entire operating range rather than specifically at hot idle only

C. A failed oil pressure relief valve that is stuck open and dumping oil back to the sump at all operating conditions, reducing the available pressure throughout the entire RPM range

D. Contaminated engine oil that has lost its viscosity from fuel dilution, causing the oil film to thin at hot idle when the combination of low pump speed and thin oil cannot maintain adequate pressure

18. A vehicle with a 2.0L turbocharged engine has an oil consumption complaint — the owner adds one liter of oil every 3,000 km. No external leaks are visible and no blue smoke is observed during normal driving. Where is the oil most likely being consumed?

A. Through the exhaust valve guides, which are exposed to higher temperatures on the turbocharged engine and wear their seals faster than a naturally aspirated engine of similar displacement

B. Through the turbocharger's oil seals, where positive crankcase pressure from blowby pushes oil past the shaft seals and into the exhaust housing, where it is burned without producing visible smoke

C. Through the direct injection system, where small amounts of oil are atomized by the high-pressure fuel spray pattern and consumed during combustion without producing visible exhaust smoke

D. Through the turbocharger's oil seals and the PCV system, both of which can consume small amounts of oil that burn in the exhaust and intake systems without producing visible smoke at the tailpipe

19. An engine has a persistent P0446 code (EVAP Vent Control Circuit). The canister vent valve has been replaced but the code returns. What should be checked next?

A. The charcoal canister for saturation from overfilling the fuel tank, since a saturated canister can trigger EVAP codes by preventing the system from properly venting during the monitor test

B. The wiring and connector for the vent valve circuit, since an intermittent open or short in the wiring between the ECM and the vent valve will trigger the circuit code regardless of the valve's condition

C. The EVAP purge valve for a stuck-open condition that allows manifold vacuum to interfere with the vent valve's operation during the EVAP system integrity test monitoring cycle

D. The fuel tank pressure sensor for a drift that causes the ECM to incorrectly interpret the vent valve's operation as faulty when the valve is actually functioning within its normal operating parameters

20. A direct injection diesel engine's injectors require coding (calibration code entry) when replaced. What happens if the replacement injector's calibration code is not entered into the ECM?

A. The engine will not start because the ECM requires the injector calibration code as an authentication key before it will enable the fuel injection system for that specific cylinder

B. The engine will start and run normally for a short period, but the uncoded injector will quickly overheat and fail because the ECM cannot limit its maximum duty cycle without the code

C. The ECM uses default fuel delivery values instead of the injector's specific calibration, which may cause rough running, increased emissions, excessive fuel consumption, or noise from that cylinder

D. The engine's warranty is voided by the uncoded injector, but the engine's operation and emissions are not affected because all injectors within a family have identical flow characteristics

21. An engine runs rough at idle with a P0300 random misfire code. The intake manifold has been removed for inspection and three of the six intake manifold gaskets show signs of degradation — but only on the lower sealing surfaces. What does this specific gasket failure location indicate?

A. The upper gasket surfaces are less exposed to thermal cycling and retain their seal, while the lower surfaces see more heat from the exhaust crossover and degrade from thermal stress

B. The manifold bolts were unevenly torqued during the previous installation, with the lower bolts being under-torqued relative to the upper bolts, creating a differential clamping force

C. A coolant leak from the lower intake passages has been wicking along the gasket surface, chemically attacking the gasket material from the engine block side upward through capillary action

D. The manifold was warped from overheating and the warp created a gap specifically at the lower sealing surface where the manifold's curvature is most pronounced from the thermal distortion

22. A vehicle's fuel economy has decreased by 15% over the past six months. The engine runs smoothly with no check engine light. The LTFT values are +2% on both banks. What should be checked?

A. The thermostat for a stuck-open condition that prevents the engine from reaching its designed operating temperature, causing the ECM to use a less efficient fuel map for the perceived cold engine

B. The mass airflow sensor for contamination that causes overreporting of airflow, since the ECM would command excess fuel that the oxygen sensors correct through negative fuel trims

C. The exhaust oxygen sensors for a lean bias that causes the ECM to add fuel unnecessarily, which would appear as positive fuel trims above the +2% level currently observed on the scan tool

D. The ignition coils for a weak spark condition that reduces combustion efficiency without being severe enough to trigger a misfire code, wasting fuel energy as uncombusted hydrocarbons in the exhaust

23. A four-cylinder engine has a cylinder 3 misfire. The technician performs a compression test and gets 155 psi on cylinders 1, 2, and 4, but only 60 psi on cylinder 3. A wet test raises cylinder 3 to only 70 psi. What does the minimal improvement during the wet test indicate?

A. The piston rings on cylinder 3 are severely damaged beyond the point where oil can seal them, requiring piston and ring replacement along with cylinder honing to restore compression

B. The compression loss is primarily through the piston rings, but the extreme ring wear has created too large a gap for the oil to bridge effectively during the wet test procedure

C. The compression loss is not through the rings — the minimal wet test improvement indicates the leak is past a valve or through the head gasket, since oil cannot seal these leak paths

D. The cylinder wall on cylinder 3 is so severely scored that the oil added during the wet test immediately drains past the scoring without creating the temporary seal needed to improve compression

24. A vehicle has a P0171 (System Too Lean Bank 1) and P0174 (System Too Lean Bank 2) together. Both banks show LTFT of +18% at idle and +12% at cruise. What does the simultaneous lean condition on both banks indicate?

A. Both upstream oxygen sensors have simultaneously developed a lean bias from contamination, causing the ECM to add fuel equally to both banks to compensate for a false lean indication

B. A cause affecting both banks simultaneously — such as low fuel pressure, a contaminated MAF sensor underreporting airflow, or a large central vacuum leak — is creating a system-wide lean condition

C. The catalytic converters on both banks have failed simultaneously, and the downstream sensor feedback is influencing the upstream fuel trim correction algorithm through a cross-reference error

D. The fuel injectors on both banks have simultaneously developed partial restrictions from contaminated fuel, reducing their flow capacity equally across all cylinders at all operating conditions

25. A GDI engine has a misfire at cold startup that clears after 30 seconds. The misfire occurs on cylinders 2 and 3 only. Compression is normal on all cylinders. What is the most likely cause?

A. Carbon buildup on the intake valves of cylinders 2 and 3 that restricts airflow into those cylinders at cold startup when the air density is highest and the restricted flow is most significant

B. The fuel injectors on cylinders 2 and 3 have a reduced spray pattern that affects cold-start atomization but normalizes once the cylinders reach a temperature that aids fuel vaporization

C. The ignition coils on cylinders 2 and 3 have degraded insulation that allows spark energy to leak at cold temperatures, but the insulation recovers as the coils warm and expand to seal the leak path

D. The GDI high-pressure pump's cam lobe has minor wear that affects the pump strokes corresponding to cylinders 2 and 3's injection timing, reducing rail pressure during their specific injection events

26. An engine oil analysis report shows elevated copper levels. What engine component is the most common source of copper contamination in engine oil?

A. The cylinder head gasket's fire ring, which uses a copper coating for high-temperature sealing, releases copper particles as the gasket seating surface wears during thermal cycling

B. The oil cooler housing, which on some engines uses copper alloy construction that corrodes when exposed to degraded or contaminated coolant that breaches the cooler's internal passages

C. The engine bearings, which use a copper-lead or tri-metal overlay that releases copper during the initial break-in period and from progressive bearing surface wear during normal engine operation

D. The piston wrist pin bushings, which are made from a hardened copper alloy that releases copper into the oil as the pins oscillate in their bores during the reciprocating motion of each cycle

27. A diesel engine has a DPF regeneration fault. The scan tool shows that regeneration attempts initiate but abort before completion. The exhaust temperature during regeneration only reaches 450°C — the specification requires 550°C minimum for soot combustion. What is the most likely cause?

A. The DPF substrate has degraded from thermal shock and can no longer absorb enough heat energy to reach the required temperature for passive or active soot combustion during regeneration

B. The DEF injection dosing is too high during regeneration, and the excess urea is acting as a thermal coolant that absorbs heat energy from the exhaust and prevents the temperature from reaching the target

C. The glow plugs or intake air heater has failed, since some diesel engines use these components to supplement exhaust temperature during stationary regeneration to reach the required threshold

D. The diesel oxidation catalyst upstream of the DPF has failed, preventing the exothermic oxidation of post-injected fuel that normally raises exhaust temperatures to the required 550°C for soot combustion

28. A technician is testing a coolant temperature sensor by measuring its resistance at different temperatures. At 25°C the sensor reads 2,400 ohms, and at 80°C it reads 320 ohms. What type of thermistor does this resistance pattern identify?

A. A positive temperature coefficient (PTC) thermistor, because the resistance increases as the temperature increases from the baseline calibration value to the operating temperature range

B. A negative temperature coefficient (NTC) thermistor, because the resistance decreases as the temperature increases — which is the standard type used for automotive coolant temperature sensing

C. A linear thermistor, because the resistance changes proportionally with temperature in a straight-line relationship from the cold baseline to the operating temperature measurement point

D. A reference voltage divider, because the sensor is not a thermistor but rather a fixed-value resistor paired with the ECM's internal reference to produce a voltage output proportional to temperature

29. An engine has been overheated severely — the temperature gauge reached the red zone before the driver shut it off. After the engine cools, the technician inspects the cylinder head and finds the deck surface is warped by 0.15 mm. The manufacturer's maximum warpage specification is 0.05 mm. What repair is necessary?

A. Replace the head gasket only with a multi-layer steel gasket that can compensate for up to 0.20 mm of surface irregularity through its corrugated steel layers and elastomer sealing beads

B. Apply a gasket sealant compound to the existing gasket surface and reinstall the head, since the sealant fills the 0.15 mm gap and creates a reliable seal without machining the warped surface

C. Resurface the cylinder head to restore flatness within the manufacturer's specification before reinstalling it with a new head gasket, verifying the final surface height remains above minimum

D. Replace the cylinder head entirely because any warpage exceeding 0.05 mm indicates the head's metallurgical properties have been permanently altered by the overheating event and cannot be restored

30. An engine has a persistent lean condition with high LTFT (+20%) that does not change between idle and cruise. What does a lean condition that remains constant across all operating conditions indicate?

A. A fuel delivery deficit — such as a weak fuel pump, restricted filter, or failing pressure regulator — that consistently delivers less fuel than the ECM commands across all speeds and loads

B. A massive vacuum leak that is equally significant at both idle and cruise, affecting the air-fuel ratio by the same percentage regardless of the throttle opening and total engine airflow volume

C. A faulty upstream oxygen sensor that has a permanent lean voltage offset, causing the ECM to add the same percentage of fuel correction at all operating conditions to compensate for the false signal

D. A contaminated mass airflow sensor that consistently underreports airflow by a fixed percentage at all flow rates, causing the ECM to deliver proportionally less fuel than the engine actually needs

31. A common rail diesel engine has a hard start condition when cold but starts immediately when warm. The glow plug system has been verified as functional. Fuel pressure during cranking is within specification. What should be investigated next?

A. The starter motor for slow cranking speed that does not generate enough compression heat for cold-start combustion, since the fuel and glow plug systems have been verified as functional

B. The air intake system for a restriction that reduces the air charge density in the cylinders during cold cranking, preventing the compressed air from reaching the autoignition temperature

C. The injector return lines for leakage that allows fuel to drain back during extended cold soak periods, requiring extended cranking to purge air and refill the injectors before they can deliver fuel

D. The compression on all cylinders, since diesel engines depend entirely on compression heat for ignition, and worn rings or valves that reduce compression prevent cold starting while warm starting succeeds due to residual engine heat assisting ignition

32. A vehicle's scan tool displays "Communication Error — Unable to Connect" when plugged into the OBD II DLC. The DLC has battery voltage on pin 16 and good grounds on pins 4 and 5. Termination resistance between pins 6 and 14 reads 65 ohms. What does this indicate?

A. The 65-ohm reading is significantly above the expected 60-ohm specification, indicating one of the two terminating resistors has increased in value and is disrupting the bus signal integrity

B. The 65-ohm reading is close to the expected 60-ohm specification and falls within normal measurement tolerance, indicating the CAN bus termination is likely healthy and the communication error has another cause

C. The 65-ohm reading indicates that one of the two 120-ohm terminating resistors has failed open, leaving only one resistor in the circuit and producing the 65-ohm measurement instead of 60 ohms

D. The 65-ohm reading indicates a severe bus fault where multiple modules have shorted their internal transceivers, adding parallel resistance paths that have reduced the bus impedance below specification

33. A vehicle has intermittent check engine light illumination with no DTCs stored. The light comes on for a few seconds, then turns off. What is the most likely cause?

A. The ECM has a software fault that momentarily illuminates the check engine light during certain operating conditions without generating a corresponding DTC in the module's memory

B. A marginal sensor signal is intermittently crossing the DTC threshold for a brief period but not meeting the continuous duration requirement for the ECM to store a pending or confirmed fault code

C. The instrument cluster has a faulty check engine light LED driver that intermittently grounds the lamp circuit, illuminating the light independently of any ECM command or actual fault condition

D. The check engine light circuit has an intermittent short to ground in the wiring between the ECM and the instrument cluster that momentarily completes the light circuit without an ECM command

34. A vehicle's remote keyless entry range has decreased to less than one meter. New batteries have been installed in all fobs. The vehicle's 12V battery is fully charged. What should be investigated?

A. The keyless entry antenna module or its wiring connection in the vehicle for corrosion, damage, or a loose connector that reduces the receiver's sensitivity and detection range

B. The body control module for a software fault that has reduced the receiver sensitivity setting below the default level, requiring a BCM software update to restore normal range

C. The key fobs for internal circuit board damage from a previous battery leak that has corroded the fob's transmitter components despite the new batteries providing adequate power supply

D. The vehicle's aftermarket window tinting for metallic content that blocks the radio frequency signal from the fob, attenuating the transmission power before it reaches the receiver antenna

35. A vehicle has a "Service Stability System" warning message. The scan tool reveals a DTC for steering angle sensor not initialized. When does the steering angle sensor typically require initialization?

A. After any ignition cycle that exceeds 30 minutes of continuous engine operation, since the SAS sensor accumulates a positional drift over time that must be reset periodically

B. Only after the steering angle sensor hardware has been physically replaced with a new unit, since the factory-calibrated sensor retains its initialization through all normal service events

C. After a wheel alignment, steering component replacement, battery disconnection, or any event that changes the relationship between the steering wheel center position and the front wheel direction

D. Only when the vehicle is equipped with an ADAS lane keep assist system, since vehicles without lane keep assist do not use the steering angle sensor for any stability control function

36. A vehicle has a P0562 code (System Voltage Low) stored in the ECM. The battery and alternator test good. The voltage at the battery terminals is 14.3V with the engine running. What could cause this code?

A. A brief voltage dip during a high-demand electrical event — such as the A/C compressor clutch engagement combined with headlamps, rear defroster, and heated seats — that momentarily dropped system voltage below the ECM's threshold

B. The ECM's internal voltage measurement circuit has a fault that intermittently reads a lower voltage than actually present, triggering the code despite the charging system producing adequate output

C. The alternator's voltage regulator is cycling between high and low output states too rapidly, and the ECM is detecting the low points of the cycle as a system voltage fault condition

D. The battery is absorbing current faster than the alternator can supply it due to a sulfated plate condition that creates a momentary sink, pulling system voltage below the threshold during charge acceptance

37. A vehicle's scan tool shows a U0073 code (Control Module Communication Bus "A" Off) stored in the gateway module. What does this code indicate?

A. The scan tool itself has a communication bus fault that prevents it from connecting to the vehicle's network, and the code is generated by the scan tool's internal diagnostics, not the vehicle

B. A specific CAN bus segment that the gateway monitors has lost all communication — either from a backbone break, both terminators failing, or a module crashing the bus with a stuck dominant signal

C. The gateway module has detected that its internal clock is out of synchronization with the other modules on the network, preventing it from processing the incoming data frames correctly

D. The vehicle's OBD II DLC has a damaged pin that prevents the scan tool from accessing the bus, and the gateway generates this code when it detects the incomplete scan tool connection attempt

38. After a body shop repair involving front bumper and grille replacement, a vehicle's adaptive cruise control no longer functions. The radar sensor behind the grille was transferred from the damaged bumper to the replacement. What is the most likely cause?

A. The radar sensor requires recalibration after removal and reinstallation because even a slight change in its mounting position or angle alters the detection field alignment relative to the vehicle's centerline

B. The replacement grille has a different plastic composition than the original that attenuates the radar signal more than the factory grille, reducing the sensor's range below the functional minimum threshold

C. The body shop disconnected the sensor's wiring during the repair and did not reconnect the calibration reference wire that provides the sensor with its baseline signal for distance calculations

D. The radar sensor was physically damaged during the transfer from the old bumper to the new bumper, even though no external damage is visible, and the internal components have shifted from the handling

39. A vehicle has two U-codes: U0100 (Lost Communication with ECM) and U0101 (Lost Communication with TCM). Both codes are stored in the instrument cluster. No other modules store any U-codes. What is the most significant diagnostic observation?

A. The ECM and TCM share a common power supply fuse, and a blown fuse has simultaneously disabled both modules while all other modules on separate fuses continue to operate normally

B. The instrument cluster has an internal fault in its CAN bus receiver that selectively drops messages from the ECM and TCM while correctly receiving messages from all other modules on the bus

C. The ECM and TCM have been unplugged during a previous service and were not reconnected, which explains why only these two modules are missing from the bus communication

D. Both modules are on the same CAN bus spur or share a common connector, and a fault in the shared wiring has disconnected both from the bus while the backbone remains healthy for other modules

40. A vehicle's parking assist system gives false proximity warnings when no obstacles are present. The warnings occur consistently at the same bumper sensor location. What should be inspected?

A. The vehicle's paint color, since certain metallic paint formulations reflect ultrasonic waves back toward the sensor and can trigger false proximity detections at the sensor nearest to the metallic flake concentration

B. The specific parking sensor for physical damage, contamination, ice buildup, or a mounting issue that causes it to detect the bumper surface or its own echo as a nearby obstacle

C. The parking assist control module for a software fault that is miscalculating the distance from the consistent sensor due to a processor error in the time-of-flight algorithm for that specific channel

D. The wiring harness for the parking assist system for electromagnetic interference from a nearby aftermarket component that is generating a signal at the ultrasonic sensor's operating frequency

41. A vehicle has a "Service Tire Monitor" message displayed on the instrument panel. All four tires are inflated to the correct pressure and a TPMS relearn procedure has been performed. The message persists. What is the most likely cause?

A. One of the TPMS sensors has a failing internal battery that can still transmit pressure data intermittently but cannot respond consistently to the relearn procedure's activation command sequence

B. One of the four TPMS sensors has a dead or dying battery that cannot transmit its pressure data to the module, triggering the service message even though the pressures are physically correct

C. The TPMS module has lost its vehicle-specific configuration data due to a voltage transient and needs to be reprogrammed with the correct tire size and pressure threshold settings for the vehicle

D. The spare tire has a TPMS sensor that is included in the monitoring system, and the spare's pressure has dropped below the warning threshold while the four road tires are all correctly inflated

42. A vehicle's scan tool can communicate with all modules except the ABS module. The ABS warning light is on. The technician checks the ABS module fuse and finds it blown. After replacing the fuse, it blows again immediately. What is the most likely cause?

A. A short circuit in the ABS module's power supply wiring or within the ABS module itself that draws excessive current and immediately exceeds the fuse's rated capacity, causing it to blow on contact

B. The replacement fuse is the wrong amperage rating for the ABS circuit, and the correct higher-rated fuse must be installed to accommodate the ABS pump motor's high inrush current during self-test

C. The ABS pump motor has a seized bearing that causes the motor to draw locked-rotor current when the module attempts to activate it during the power-on self-test sequence after fuse replacement

D. The ABS hydraulic control unit has an internal solenoid that has shorted, creating a direct path to ground through the solenoid winding that exceeds the fuse rating during the module's initialization

43. A technician is performing an as-built data transfer to a replacement BCM. What is the purpose of as-built data in module replacement?

A. As-built data contains the vehicle's maintenance history and service records, which must be transferred to the new module to maintain the vehicle's warranty status and service tracking continuity

B. As-built data contains the customer's personalized settings such as seat positions, mirror angles, and radio presets, which are transferred to the new module to preserve the customer's preferences

C. As-built data contains the vehicle-specific configuration parameters — installed options, VIN data, calibration settings, and feature enablements — that allow the replacement module to function correctly for that specific vehicle

D. As-built data contains the previous module's adaptive learned values for engine idle, shift quality, and fuel trim corrections that are transferred to speed up the new module's learning period

44. A vehicle equipped with a manual transmission has a clutch that grabs suddenly instead of engaging progressively. The pedal travel and free play are within specification. What is the most likely cause?

A. The clutch master cylinder has a faulty internal return spring that prevents the piston from releasing smoothly, causing the hydraulic pressure to drop abruptly rather than gradually during engagement

B. The flywheel friction surface has developed hot spots or hardened areas from overheating that create an uneven friction coefficient, causing the disc to alternate between gripping and slipping at different rotational positions

C. The release bearing has developed a rough spot that causes it to bind at a specific point in its travel, preventing the smooth, progressive release of the pressure plate during pedal release

D. The clutch disc has oil contamination, glazed friction surfaces, or a warped disc that prevents the smooth, progressive engagement needed for the driver to modulate the clutch from disengaged to fully engaged

45. An automatic transmission shifts from first to second normally but flares during the 2-3 upshift and slips in third gear under load. No other shift concerns are present. What does this isolated shift problem indicate?

A. The transmission line pressure is low across all circuits, but the third-gear circuit is the weakest and shows symptoms first because it requires the highest apply pressure of all forward gears

B. The transmission fluid is contaminated with coolant from a failed internal cooler, and the coolant has degraded the friction material in all clutch packs, with the third-gear pack showing the most wear

C. The third-gear clutch pack has worn friction material or a leaking apply piston seal, since the fault is isolated to the specific gear transition that requires that clutch pack to engage and hold

D. The valve body separator plate has a crack that bleeds pressure from the third-gear circuit to an adjacent circuit, but only when the transmission fluid thins at operating temperature from heat exposure

46. A rear-wheel-drive vehicle produces a howling noise from the rear differential that changes pitch with vehicle speed. The noise is present during both acceleration and coasting. What does the noise being present in both drive and coast conditions indicate?

A. The pinion bearings are the source of the noise, since bearing noise is present regardless of whether the ring gear is loaded on the drive or coast side, unlike gear mesh noise which changes with load direction

B. Both the drive-side and coast-side gear mesh patterns are incorrect, indicating the ring and pinion were set up with incorrect backlash and pinion depth during a previous differential service

C. The differential side bearings are worn and allowing the ring gear to shift laterally, altering the gear mesh pattern in both the drive and coast positions as the ring gear moves with each load change

D. The ring and pinion gear set has developed tooth surface damage on both the drive and coast flanks of the teeth, which would require complete gear set replacement to resolve the howling noise

47. A vehicle with an electronically controlled automatic transmission has a DTC indicating the transmission is stuck in a single gear (limp mode). The TCM has entered this mode after detecting an electrical fault. What is the purpose of limp mode?

A. Limp mode allows the transmission to continue operating in a single gear to protect the driver from a sudden loss of power that would leave the vehicle stranded in a dangerous location without any forward motion

B. Limp mode shifts the transmission into reverse only, allowing the driver to back the vehicle to a safe location rather than continuing to drive forward with a potentially dangerous transmission fault condition

C. Limp mode engages the torque converter clutch permanently to bypass the hydraulic clutch circuits entirely, providing a direct mechanical drive path that eliminates the faulty electronic control from the system

D. Limp mode provides a safe, driveable condition using a default hydraulic gear selection that does not require electronic solenoid control, allowing the driver to reach a repair facility without towing

48. A front-wheel-drive vehicle has a clicking noise during sharp turns that has progressively worsened over the past three months. The noise is now audible during gentle turns as well. What does the progression of the noise indicate?

A. The outer CV joint has been contaminated from a torn boot for an extended period, and the progressive wear of the internal components is worsening the noise as the joint deteriorates further with each drive cycle

B. The outer CV joint was clicking due to a loose axle nut that allowed excessive play, and the play has increased over time as the nut has continued to back off from vibration during normal driving operation

C. The inner CV joint has developed a wear pattern that initially produced noise only during sharp turns but has worsened to include gentle turns as the internal tripod roller grooves have deepened with continued use

D. The steering rack has internal wear that has progressively increased the steering play, causing the outer CV joint angle to change more dramatically during turns and produce the clicking at increasingly shallow angles

49. A dual-clutch transmission (DCT) equipped vehicle has a hesitation when pulling away from a stop. The vehicle seems to lurch forward after a brief delay. What is the most likely cause?

A. The DCT's clutch modulation calibration for first-gear launch has degraded beyond the module's adaptive range, and a software update or clutch teach-in procedure is needed to restore smooth engagement

B. The DCT's flywheel has developed a rotational imbalance that creates a vibration during the low-speed clutch engagement phase, which the driver perceives as hesitation before the vehicle moves forward

C. The DCT's hydraulic pump is producing insufficient pressure at idle to preload the first-gear clutch for a quick launch, and the delay is the time needed for the pump to build adequate apply pressure

D. The ECM is commanding a delayed throttle response during the launch to protect the DCT from excessive torque input, and this programmed delay creates the hesitation the driver perceives at departure

50. A vehicle's transfer case has a whining noise that increases with vehicle speed and is present in all transfer case modes including 2WD. What does the noise being present in 2WD indicate?

A. The transfer case input shaft and its bearing are the source, since the input shaft and its bearing rotate in all transfer case modes including 2WD because they are always connected to the transmission output

B. The transfer case chain is the source, since the chain always rotates in all modes on most part-time transfer cases even though only the rear output is engaged in 2WD operation mode

C. The front output shaft bearing is the source, since the front output shaft spins freely in 2WD mode and a worn bearing would produce noise proportional to the speed of the freely rotating shaft

D. The transfer case output shaft to the rear differential is the source, since this shaft and bearing always rotate at vehicle speed and are active in all operating modes of the transfer case including 2WD

51. A clutch hydraulic system has been bled, but the clutch pedal remains spongy and the clutch does not fully disengage. The fluid is clear with no visible bubbles. What is the most likely remaining cause?

A. The bleeder screw on the slave cylinder was not fully tightened after the bleeding procedure, allowing a small amount of air to re-enter the system through the loose bleeder each time the pedal is released

B. The slave cylinder's internal bore is scored, preventing the piston seal from maintaining a full hydraulic lock and allowing the pedal to sink slightly under sustained pressure even without air in the system

C. Air is still trapped in a high point of the hydraulic line that the standard bleeding procedure cannot reach — the line routing may require a specific sequence or vacuum/pressure bleeding to fully purge

D. The clutch master cylinder pushrod is misadjusted and is not allowing the piston to fully retract, blocking the compensating port and preventing the system from relieving residual pressure between applications

52. A rear-wheel-drive vehicle has a clunking noise when shifting between drive and reverse. The noise is a single clunk during each direction change. Excessive play is measured at 35 mm of drive shaft rotation before engagement. The specification is 15 mm maximum. Where should the play be measured individually?

A. Only the transmission output shaft, since internal transmission gear backlash is the only source of driveline play that produces a directional change clunk between forward and reverse engagement

B. The universal joints, the drive shaft slip yoke, and the differential ring-and-pinion backlash should all be checked individually to determine which component or combination of components contributes the excessive total play

C. Only the ring-and-pinion backlash in the differential, since the ring and pinion mesh point is the only location in the driveline where play can accumulate to the measured 35 mm of total free rotation

D. Only the universal joints, since U-joint play is the most common cause of directional change clunks and the only component in the driveline that develops the type of play that produces the single clunk symptom

53. An automatic transmission equipped vehicle has a harsh downshift from third to second gear during normal deceleration. All other shifts — both upshifts and other downshifts — are smooth. What is the most likely cause?

A. The engine braking function is too aggressive during the 3-2 downshift, and the ECM's fuel management during deceleration is creating a torque spike that the transmission cannot absorb smoothly

B. The torque converter clutch is not releasing before the 3-2 downshift occurs, and the direct engine-to-transmission coupling creates a harsh engagement as the engine RPM jumps during the gear change

C. The transmission's main pressure regulator is sticking at high pressure during the deceleration phase, causing all friction elements to apply with excessive force during the 3-2 transition specifically

D. The 3-2 downshift accumulator has a faulty piston seal or spring that cannot cushion the hydraulic pressure application to the second-gear clutch, allowing it to engage abruptly during the deceleration downshift

54. What maintenance item is critical for a differential equipped with a limited-slip (positraction) unit that is NOT required for an open differential?

A. Using the correct gear oil with the manufacturer-specified limited-slip additive (friction modifier) to prevent clutch chatter during differential operation, which an open differential does not require

B. Replacing the differential cover gasket at every fluid change interval because the limited-slip unit generates more internal heat that degrades the gasket faster than in an open differential application

C. Adjusting the limited-slip clutch pack preload at every fluid change interval using the manufacturer's specified shim pack to maintain the correct clamping force on the friction surfaces

D. Replacing the limited-slip spider gears at every 80,000 km interval because the friction modifier in the gear oil accelerates spider gear wear compared to the standard gear oil in an open differential

55. A front-wheel-drive vehicle has a vibration that occurs only during hard braking from highway speed. The vibration is felt through the steering wheel. The brake rotors have been measured and are within DTV and runout specifications. What else could cause a steering wheel vibration during hard braking?

A. A worn inner or outer tie rod end that has play within specification but allows the steering linkage to shift under the dynamic loading of hard braking, transmitting the movement as a vibration

B. An out-of-balance front wheel that produces vibration only at the specific deceleration rate corresponding to a resonant frequency of the steering system during hard braking from highway speed

C. A warped brake dust shield contacting the rotor during the weight transfer of hard braking, creating a vibration that is transmitted through the caliper mount to the knuckle and into the steering

D. A faulty ABS hydraulic control unit that activates the pressure modulation cycle prematurely during hard braking, producing a pulsation that the driver feels through the brake pedal and steering wheel

56. A vehicle with a conventional automatic transmission has a delayed forward engagement that has gradually worsened over time. The fluid level is correct and the fluid color is dark brown with a slightly burnt odor. What do these fluid conditions indicate?

A. The fluid has been recently changed with the incorrect type of ATF that is chemically incompatible with the transmission's friction material, causing the dark color and delayed engagement

B. The fluid has been overheated and degraded over time, and the friction material in the forward clutch pack has worn from the degraded fluid's inability to maintain proper friction characteristics

C. The fluid color is normal for high-mileage ATF that has absorbed heat and carbon particles during normal operation, and the delayed engagement is caused by a separate unrelated mechanical fault

D. The fluid has been contaminated by engine coolant from a breached internal transmission cooler in the radiator, creating the dark color and the delayed engagement from coolant-damaged friction surfaces

57. A part-time four-wheel-drive truck has been operated in 4WD on dry pavement for an extended period. The owner reports difficulty steering, a binding sensation during turns, and a hopping from the front tires. After returning to 2WD, the binding and hopping disappear, but a new vibration is present at highway speed that was not there before. What is the most likely cause of the new vibration?

A. The front drive shaft universal joints have been damaged by the binding forces of dry-pavement 4WD operation and are now producing a vibration at highway speed from the worn joint components

B. The transfer case shift mechanism is not fully disengaging 4WD, leaving the front drive shaft partially engaged and producing a vibration from the residual drag on the front axle components

C. The front tires have developed flat spots from the scrubbing that occurred during the dry-pavement 4WD operation, and the flat spots produce a vibration at highway speed until the tires wear smooth again

D. The front differential has been damaged by the binding forces and has developed a gear noise that manifests as a vibration at highway speed even though the front drive shaft is no longer transmitting torque

58. A manual transmission makes a rattling noise at idle in neutral that disappears when the clutch pedal is depressed. What component is producing the rattle?

A. The release (throw-out) bearing, which is loaded against the pressure plate fingers at idle and produces a rattle from worn bearing surfaces until the clutch pedal presses it more firmly against the fingers

B. The input shaft pilot bearing, which supports the input shaft tip inside the crankshaft and rattles when the shaft is spinning freely at idle but quiets when the clutch disengages and the shaft stops

C. The clutch disc torsional damper springs, which rattle against their stops at idle engine RPM frequencies when the transmission is in neutral and the disc is free to oscillate on the input shaft splines

D. The transmission input shaft and countershaft gear set, which rattle from the torsional pulses of the engine at idle and are silenced when the clutch is depressed and the input shaft stops spinning

59. A vehicle's automatic transmission has a customer complaint of "jerky" low-speed driving — the transmission seems to engage and release repeatedly during slow parking lot maneuvers. What is the most likely cause?

A. The engine idle speed is fluctuating due to an unrelated engine performance issue, and the varying torque output at idle creates the jerky sensation through the torque converter at low speed

B. The throttle position sensor has a dead spot near the closed-throttle position that causes the ECM to cycle between two different torque converter clutch states during low-speed, light-throttle driving

C. The torque converter clutch is engaging during low-speed operation when it should remain unlocked, and the direct coupling at low speed creates a jerky feel as the engine's idle pulses are transmitted directly

D. The transmission's internal check balls in the valve body have worn seats that allow pressure fluctuations in the forward clutch circuit during the low-speed, low-pressure conditions of parking lot driving

60. A vehicle's CV boot on the right front outer joint has been torn for an estimated 5,000 km based on the customer's description. The technician inspects the joint and finds no clicking during turns. Can the joint be saved with a new boot?

A. No — any CV joint that has operated with a torn boot for more than 500 km is considered contaminated beyond repair and must be replaced regardless of current symptoms or visual condition

B. Possibly — if the joint shows no play, no noise, no roughness during rotation, and no visible damage to the internal components when inspected, a new boot with fresh grease may extend its life

C. Yes — all CV joints with torn boots can be repaired by replacing the boot and repacking with grease, since the joint's internal components are designed to operate without the boot for extended periods

D. No — once a CV boot tears, water and contaminants immediately damage the precision-machined internal surfaces, and the joint will fail within the first 1,000 km after a boot-only repair regardless

61. A vehicle's headlamps have different brightness levels — the right headlamp is noticeably brighter than the left. Both bulbs are the same age, type, and wattage. The voltage measured at the right headlamp connector is 12.8V and at the left is 11.2V. What is the primary diagnostic conclusion?

A. The left headlamp circuit has excessive resistance in its supply or ground path that is dropping 1.6V before the voltage reaches the lamp, reducing its brightness compared to the right side

B. The right headlamp has a ground fault that raises its apparent voltage reading above the left side, creating a misleading voltage differential that does not represent actual circuit resistance

C. The alternator's stator winding produces unequal voltage across its three phases, and the two headlamps are fed from different phases that have different output levels at idle speed

D. The BCM intentionally dims the left headlamp slightly to compensate for the asymmetric headlamp beam pattern required by Canadian motor vehicle lighting standards for right-hand traffic

62. A vehicle's blower motor works on high speed only. All lower speeds (1, 2, 3) produce no blower operation. What is the most likely failed component?

A. The blower motor switch, which has failed contacts on the low-speed positions while the high-speed contact that bypasses the resistor block continues to function normally and provide full voltage

B. The HVAC control module, which has lost its PWM output signal capability for the lower speed positions but still commands full voltage to the blower motor relay for the high-speed setting

C. The blower motor itself, which has a faulty internal speed controller that defaults to high speed only when its internal thermal overload protector trips from overheating during extended low-speed operation

D. The blower motor resistor block, which provides stepped resistance for the lower speeds, has burned out — high speed bypasses the resistor block entirely and feeds full voltage directly to the motor

63. A vehicle's battery drains overnight. A parasitic draw test shows 850 milliamps after all modules should have entered sleep mode. The technician begins pulling fuses one at a time. When the BCM fuse is pulled, the draw drops to 25 milliamps. What is the next step?

A. Replace the BCM immediately, since the excessive draw on the BCM fuse confirms the BCM has an internal fault that is preventing it from entering sleep mode after the ignition is turned off

B. Check the battery and charging system for a defect that is causing the BCM to remain in an active diagnostic mode continuously rather than entering its normal sleep state after key-off

C. Identify all components powered through the BCM fuse and systematically disconnect them to determine whether the BCM itself or a component it controls is causing the excessive current draw

D. Reprogram the BCM with the latest software version, since an outdated BCM calibration is the most common cause of excessive parasitic draw on the BCM circuit in this vehicle platform

64. A vehicle's air conditioning compressor clutch engages and immediately disengages, cycling on and off every one to two seconds. The system was recently recharged after a leak repair. What is the most likely cause?

A. The A/C system was overcharged during the recent service, causing the high-pressure cutoff switch to trip immediately upon compressor engagement and cycle the compressor off repeatedly

B. The system is still significantly undercharged despite the recent service, causing the low-pressure cutoff switch to open the clutch circuit as soon as the compressor drops the already-low suction pressure

C. The compressor clutch air gap is too wide from wear, and the magnetic field cannot maintain clutch engagement against the belt tension once the compressor begins loading against the system pressure

D. The A/C refrigerant pressure transducer has a fault that sends an oscillating pressure signal to the ECM, causing it to cycle the compressor clutch on and off based on the erratic pressure reading

65. A vehicle's turn signals work correctly at all four corners, but the hazard flashers do not work — pressing the hazard button produces no flashing on any lamp. What is the most likely cause?

A. All four turn signal bulbs have a dual-filament design where the hazard filament has burned out on all four bulbs while the turn signal filament continues to function normally on each corner

B. The turn signal switch (multifunction switch) has an internal fault that prevents it from routing the hazard flasher signal through the turn signal circuit to the individual lamp circuits at each corner

C. The BCM has a software fault that prevents it from activating the hazard flasher output when the hazard button is pressed, even though it correctly processes the turn signal switch inputs

D. The hazard flasher switch, its relay, or the dedicated hazard flasher circuit has a fault — since the turn signals use a separate circuit path from the hazards, a hazard-specific component has failed

66. A vehicle's heated rear window defroster is drawing 22 amps during operation. The specification is 15 amps maximum. What does the excessive current draw indicate?

A. One or more grid lines have a low-resistance short to the bus bar that creates a parallel current path drawing additional current beyond the grid's designed resistance and normal current draw

B. The defroster relay has welded contacts that are providing unregulated battery voltage to the grid, bypassing the timer circuit and the current-limiting resistor in the defroster control module

C. The rear window glass has developed a conductive film from interior cleaning chemicals that creates an additional current path across the grid lines, adding to the normal grid heating current

D. The defroster timer module is malfunctioning and sending a double-voltage command to the relay, causing the relay to engage with both its normally-open and normally-closed contacts simultaneously

67. A vehicle's power seat adjustment motor runs in one direction but not the other. The switch has been tested and sends the correct signal in both directions. What is the most likely cause?

A. The seat adjustment motor has a faulty internal brush that contacts the commutator in one rotational direction but lifts off in the other direction, providing current flow for only one direction of movement

B. The motor has a seized internal gear that allows rotation in one direction but mechanically locks in the other direction, and the motor stalls against the locked gear when commanded to reverse

C. The motor's control relay has a faulty contact set that completes the circuit for one polarity direction but has a burned or corroded contact that prevents the circuit from completing in the reverse polarity

D. The seat track mechanism has reached its travel limit in one direction and the motor cannot move the seat further, but the driver perceives this as a motor fault because the seat does not respond to the switch

68. A vehicle's A/C system has a musty odor that is most noticeable when the A/C is first turned on. The cabin air filter was recently replaced. What should be serviced to address the odor?

A. The heater core, which accumulates mold on its external fins from condensation that occurs when the A/C and heat are alternated frequently during spring and fall temperature fluctuation periods

B. The HVAC blower motor, which accumulates debris on its squirrel cage that decomposes and produces odors when the motor's heat during operation warms the accumulated organic material

C. The evaporator core, which should be treated with an antimicrobial cleaning agent that kills the mold and mildew growing on its surfaces from the moisture that condenses during A/C operation

D. The A/C condenser, which accumulates road debris between its fins that decomposes and produces odors drawn into the cabin through the fresh air intake during the initial A/C system activation

69. A vehicle has an ADAS blind spot monitoring system that intermittently fails to detect vehicles in the adjacent lane. The radar sensors have been inspected and appear clean and undamaged. What environmental condition can cause intermittent detection failures?

A. Heavy rain, snow, spray from passing vehicles, or ice accumulation on the sensor surface or bumper cover that temporarily attenuates the radar signal below the detection threshold for adjacent vehicles

B. Driving in a tunnel where the concrete walls reflect the radar signal and create ghost echoes that the system's filtering algorithm incorrectly classifies as background noise rather than valid vehicle detections

C. Extremely cold ambient temperatures below −20°C that cause the radar sensor's internal oscillator crystal to shift frequency outside the system's calibrated detection bandwidth for adjacent vehicle tracking

D. High-altitude driving above 2,000 meters where the thinner atmosphere reduces the radar signal's propagation density, decreasing the effective detection range below the minimum for blind spot monitoring

70. A vehicle's electric power steering has a DTC for motor temperature exceeded. The steering assist was temporarily lost. What is the most likely cause?

A. The EPS motor's permanent magnets have partially demagnetized from an external magnetic field (such as parking near an MRI facility), reducing motor efficiency and causing it to overheat from increased current demand

B. The vehicle's battery voltage is chronically low from a failing alternator, causing the EPS motor to draw excessive current to compensate for the reduced voltage while maintaining the same assist force output

C. The vehicle has been driven with low tire pressure that significantly increases the steering effort required, causing the EPS motor to draw high current continuously to provide adequate assist for the heavy steering

D. The EPS motor has been subjected to sustained high-demand steering inputs — such as repeated full-lock parking maneuvers in quick succession — that have exceeded the motor's continuous thermal capacity

71. A vehicle has a parasitic draw that causes a dead battery every four to five days. The parasitic draw test shows 50 milliamps, which is within the acceptable range. The battery tests good with adequate CCA. What could explain the repeated dead battery despite normal draw?

A. The alternator is not fully charging the battery during the customer's short driving trips, and the battery starts each shutdown partially discharged, allowing the normal 50 mA draw to deplete it over several days

B. The vehicle's radio has a delayed shutdown feature that draws 500 milliamps for 30 minutes after key-off before entering sleep mode, and the parasitic draw test was performed after this delay had expired

C. The battery has an internal intermittent fault that causes it to self-discharge at a rate higher than the parasitic draw, but the fault is not present during the controlled conditions of the battery test procedure

D. The vehicle's security system periodically activates the interior lights for three seconds every hour during the armed state, creating current spikes that are not captured by the steady-state parasitic draw test

72. A vehicle's A/C system is fully charged and the compressor runs, but the cooling output is poor. The high-side pressure is normal but the low-side pressure is abnormally low at 70 kPa (10 psi). What does this indicate?

A. The compressor has worn internal valves that allow refrigerant to bypass from the high side back to the low side internally, equalizing the pressures and reducing the system's cooling capacity

B. A restriction exists in the liquid line or expansion device that is preventing adequate refrigerant flow from the high side to the low side, starving the evaporator and producing the abnormally low suction pressure

C. The condenser fan is running at excessive speed, overcooling the condenser and subcooling the refrigerant below its optimal temperature range, which reduces evaporator heat absorption efficiency

D. The evaporator is icing over from excessive refrigerant flow, and the ice buildup is blocking airflow and reducing the heat transfer from the cabin air to the refrigerant in the frozen evaporator core

73. A technician connects a scan tool to diagnose an HVAC blend door actuator. The scan tool commands the actuator to full cold, then to full hot. The actuator responds correctly to both commands. However, the customer reports the temperature is always lukewarm at any setting. What could explain this discrepancy?

A. The scan tool test commands the actuator's motor through its full range, but the motor's internal gear train has stripped and the output shaft does not rotate to move the blend door despite the motor responding

B. The blend door itself has broken free from the actuator shaft, so the actuator moves correctly but the door remains in a fixed mid-range position regardless of the actuator's commanded position

C. The temperature sensor inside the HVAC case has failed, causing the automatic climate control module to continuously override the driver's manual temperature selection with a lukewarm default position

D. The blend door actuator and its door are both functioning correctly, but the heater core is partially restricted, limiting the hot side of the blend to a lukewarm maximum that the blend door cannot overcome

74. A vehicle has a charging system output of 15.8 volts with the engine running. The specification is 13.8 to 14.8 volts. What is the primary concern with this elevated voltage?

A. The overcharge voltage will accelerate electrolyte boiling in the battery, cause premature bulb failure, and damage voltage-sensitive electronic modules and their internal voltage regulators

B. The elevated voltage will cause the fuel injectors to open wider than commanded, delivering excess fuel and creating a rich condition that triggers fuel system DTCs and increases fuel consumption

C. The elevated voltage will cause the alternator's internal temperature to rise beyond its cooling capacity, leading to alternator bearing failure and eventual belt system damage from the seized pulley

D. The elevated voltage is within the acceptable range for a cold battery that requires a higher charge voltage to overcome its increased internal resistance during the initial charging acceptance phase

75. A vehicle's windshield wiper system operates at high speed only — the low-speed and intermittent settings do not function. What is the most likely failed component?

A. The wiper switch, which has a faulty contact for the low-speed and intermittent positions while the high-speed contact that bypasses the control module remains functional and provides full motor voltage

B. The wiper relay, which has welded contacts that provide continuous full voltage to the wiper motor regardless of the switch position, overriding the low-speed and intermittent control circuit signals

C. The wiper motor speed controller or pulse module that provides the reduced voltage and timing for low speed and intermittent operation, while high speed is fed directly and bypasses this controller

D. The wiper motor's internal park switch, which has failed in a position that completes only the high-speed circuit and interrupts the circuit path for the low-speed and intermittent motor winding connections

76. A vehicle's interior lights dim noticeably when the engine is cranked. Is this a concern?

A. Yes — any dimming of interior lights during cranking indicates a battery or cable problem that requires immediate attention before the vehicle is returned to the customer for continued driving

B. No — a brief dimming of interior lights during cranking is normal because the starter motor draws hundreds of amps, temporarily reducing the voltage available to all other circuits during the brief cranking event

C. Yes — the dimming indicates the alternator is not producing voltage during the cranking period, and a properly functioning charging system should prevent any perceptible voltage drop during starting

D. No — the dimming is caused by the ECM intentionally reducing non-essential circuit voltage during cranking to maximize the available current to the starter motor through an active load management strategy

77. A vehicle's scan tool shows the engine coolant temperature at 95°C, but the temperature gauge on the instrument cluster shows the needle slightly below the normal operating range. What could explain this discrepancy?

A. The scan tool is reading from a different temperature sensor than the one that feeds the instrument cluster, and both sensors are reading correctly for their individual locations in the cooling system

B. The scan tool's displayed temperature has a systematic offset from the actual sensor reading due to the conversion algorithm used by the aftermarket scan tool's software for that specific vehicle protocol

C. The instrument cluster gauge is intentionally calibrated to display a slightly lower reading than the actual temperature to prevent driver anxiety about the engine running at normal operating temperature

D. The instrument cluster's stepper motor for the temperature gauge has a fault that prevents it from reaching the full travel range, causing it to display lower than the actual value at the upper end of the range

78. A vehicle's windshield washer system pumps fluid to the windshield but the spray pattern is weak and does not reach the upper portion of the glass. What should be checked?

A. The washer nozzles for mineral deposit buildup that partially blocks the nozzle openings and restricts the spray pattern, reducing the spray reach and preventing fluid from covering the full windshield area

B. The washer pump for worn internal impeller vanes that reduce the pump's pressure output, limiting the distance the fluid can be propelled from the nozzle to the upper portion of the windshield glass

C. The washer fluid reservoir for a crack below the fluid level that allows the pump to draw air along with fluid, reducing the system's effective pressure and limiting the spray pattern's reach distance

D. The washer fluid concentration for excessive water dilution that reduces the fluid's surface tension properties and prevents it from maintaining a cohesive spray pattern over the full windshield distance

79. An ADAS system with automatic emergency braking (AEB) produces a DTC indicating the forward camera needs recalibration. The vehicle has not had a windshield replacement or any body work. What else could trigger a recalibration requirement?

A. A significant change in the vehicle's ride height from new suspension components, heavily loaded cargo, or a lift kit that has altered the camera's view angle relative to the road surface ahead

B. Driving through a car wash with high-pressure spray that temporarily obscures the camera lens, triggering a recalibration request that clears automatically after the lens is clean and dry

C. The camera's internal image sensor has degraded from prolonged UV exposure through the windshield glass, reducing its contrast ratio below the minimum calibration specification for the system

D. A software update applied by the dealer during a routine service visit changed the camera's calibration parameters, and the new software requires a re-calibration to establish the updated baseline values

80. A vehicle's power window goes down when the up switch is pressed and goes up when the down switch is pressed. What is the most likely cause?

A. The window switch is wired correctly but the glass regulator cable has crossed over itself inside the door, reversing the mechanical direction of the glass movement relative to the motor's rotation direction

B. The window motor's power and ground wires have been reversed at the motor connector, causing the motor to rotate in the opposite direction from what the switch commands for each position

C. The BCM's window control algorithm has a software inversion error for that specific window position that reverses the motor polarity commands relative to the switch's up and down input signals

D. The window regulator's internal gear set has been assembled backwards during a previous repair, reversing the mechanical output direction of the regulator for the same motor rotational input direction

81. A vehicle's rear hatch release does not work from the key fob or the interior release button, but the hatch can be opened using the exterior handle/button on the hatch itself. What is the most likely cause?

A. The rear hatch release solenoid or actuator has failed, preventing the electrical release from unlatching the hatch even though the mechanical release at the hatch handle continues to function normally

B. The BCM is not sending the release command to the hatch actuator due to a fault in the BCM's hatch release output circuit, the wiring, or the actuator's electrical connector in the hatch area

C. The vehicle's child safety lock feature has been accidentally activated for the rear hatch, preventing all electrical release methods while allowing the manual exterior release to continue functioning

D. The hatch latch mechanism has a mechanical fault that prevents the electrical release actuator from generating enough force to unlatch it, but the manual release at the handle provides sufficient leverage

82. A vehicle's scan tool data shows the mass airflow sensor reads 2.5 g/s at idle on a 3.0L V6 engine. The expected range is 5.0 to 7.0 g/s. What effect does this underreporting have on the engine?

A. The ECM delivers fuel based on the reported 2.5 g/s instead of the actual 5.0+ g/s, creating a lean condition that the fuel trim system compensates for by adding positive fuel trim correction

B. The ECM ignores the MAF reading at idle and uses the MAP sensor exclusively, so the MAF underreporting has no effect on fuel delivery during idle operation on this particular engine platform

C. The ECM delivers excess fuel because it interprets the low MAF reading as a cold-engine signal that requires enrichment, creating a rich condition that triggers negative fuel trim corrections at idle

D. The MAF underreporting causes the ECM to retard the ignition timing as a protective measure, reducing engine efficiency and producing a rough idle without affecting the fuel delivery calculation

83. A vehicle's starter motor engages (the solenoid clicks and the pinion extends) but the motor does not rotate — there is a single loud click and then silence. The battery voltage drops to 8.2 volts during the attempt. What is the most likely cause?

A. The starter motor's field coils have an open circuit that prevents current from flowing through the motor windings despite the solenoid successfully closing its contacts and connecting battery voltage

B. The starter solenoid's contact disc is severely burned and pitted, preventing adequate current transfer from the battery to the motor even though the solenoid's plunger engages the pinion correctly

C. The engine is hydrolocked from coolant or fuel filling one or more cylinders, mechanically preventing the crankshaft from rotating despite the starter motor receiving full current from the battery and solenoid

D. The battery does not have sufficient power to crank the engine — the voltage drops to 8.2V (below the minimum 9.6V cranking threshold), and the starter cannot generate enough torque to rotate the engine

84. A vehicle has a steering wheel shimmy between 100 and 120 km/h that disappears outside that speed range. The front tires have been balanced and the shimmy persists. What should be checked next?

A. The rear tire balance and condition, since rear tire vibrations can transmit through the vehicle structure and manifest as steering wheel shimmy at specific speed ranges on some vehicle platforms

B. The drive shaft balance on rear-wheel-drive vehicles, since a drive shaft imbalance at the frequency corresponding to the 100-120 km/h range can transmit vibration into the steering system through the chassis

C. The front brake rotors for excessive lateral runout that produces a vibration at the wheel rotational speed corresponding to 100-120 km/h, which transmits through the knuckle into the steering system

D. The front wheel hub assemblies for excessive runout or worn bearings that cause the wheel and tire to wobble at the specific frequency that creates resonance in the steering system at that speed range

85. During an alignment, the technician finds that the rear toe is correct on both sides but the thrust angle is 1.5 degrees to the right. What does this measurement indicate?

A. The rear axle assembly is physically offset to the right relative to the vehicle's geometric centerline, causing the rear wheels to aim to the right even though their individual toe angles are within specification

B. The front steering gear is mounted off-center on the subframe, causing the alignment machine to calculate an apparent thrust angle that does not represent an actual rear axle misalignment condition

C. The front toe is set incorrectly and the alignment machine is calculating the thrust angle error from the front toe deviation rather than from the rear axle position relative to the vehicle centerline

D. The rear wheel speed sensors have different calibration values that cause the alignment machine to calculate an incorrect thrust angle from the wheel speed differential during the measurement procedure

86. A vehicle's brake pedal has a soft, spongy feel but the master cylinder reservoir level is full and there are no visible leaks. A pressure bleed of the brake system does not improve the pedal feel. What should be inspected?

A. The master cylinder for correct bench bleeding before installation, since air trapped in the master cylinder body cannot be removed by wheel-end bleeding and will produce a permanently soft pedal

B. The brake hoses for internal deterioration that creates a one-way valve effect — allowing fluid to pass under pressure but not return to the master cylinder, trapping pressure and creating a soft pedal feel

C. The brake booster for an internal fault that provides excessive assist, making the pedal feel soft when the actual hydraulic pressure and braking force are functioning within normal parameters

D. The master cylinder for an internal piston seal bypass that allows fluid to leak past the piston within the bore, creating a spongy pedal under sustained pressure without any external evidence of leakage

87. A vehicle's ABS activates during normal braking on dry pavement at moderate speeds. The ABS light is not illuminated. What is the most likely cause?

A. The brake pads on one axle are a significantly different friction compound than the other axle, creating an imbalanced braking force distribution that triggers the ABS during otherwise normal deceleration

B. The ABS module's software has degraded from age and is no longer accurately calculating the wheel deceleration thresholds, causing premature activation during normal braking conditions

C. A wheel speed sensor is producing an erratic or intermittent signal that the ABS module interprets as incipient wheel lockup, triggering ABS intervention during braking that does not actually require it

D. The brake proportioning function has failed, sending excessive pressure to one axle that causes those wheels to approach lockup sooner than the other axle during normal moderate braking efforts

88. A customer complains that the vehicle drifts to the right on a flat, straight road. The alignment has been checked and all angles are within specification. Tire pressures are correct. What should be tested next?

A. The road crown, since most roads are crowned (higher in the center) for drainage, and vehicles naturally drift toward the lower edge — which is the right side for right-hand-traffic Canadian roads

B. Swap the front tires left-to-right to test for tire pull (radial pull or ply steer), since an internal construction defect in one tire creates a directional bias independent of alignment and pressure

C. The brake system for a caliper that is dragging on the left side, creating a pulling force toward the right as the left brakes apply light friction that the driver perceives as a rightward drift

D. The steering gear for an internal bias from worn valve lands that provides more hydraulic assist in one direction, gently pushing the steering toward the right during straight-ahead highway driving

89. A vehicle has a clunking noise from the rear suspension when driving over bumps. During inspection, the technician finds that the rear sway bar end links are loose. What symptom would new end links correct?

A. The clunking noise over bumps and improved body roll control during cornering, since the end links connect the sway bar to the suspension and allow it to resist body roll during turns

B. The clunking noise over bumps but not any change in body roll control, since the sway bar itself provides the roll resistance and the end links only eliminate the noise from the loose connection

C. The vehicle's rear toe alignment, since loose end links allow the rear suspension geometry to shift during cornering and the new links will restore the designed rear toe angle during all driving conditions

D. The vehicle's rear ride height, since the sway bar end links support a portion of the vehicle's rear suspension weight and loose links allow the rear to sag below the designed ride height specification

90. A vehicle's brake warning light illuminates when the brake pedal is pressed firmly during a hard stop but turns off during normal braking. What is the most likely cause?

A. The brake pad wear sensors on the front wheels are close to their trigger point and momentarily contact the rotor during the caliper flex of hard braking, completing the warning circuit briefly

B. The ABS hydraulic control unit is activating during the hard stop and the ABS activation signal shares a circuit with the brake warning light, causing both to illuminate simultaneously

C. The brake booster has a vacuum leak that reduces its assist capacity during hard braking, and the reduced assist triggers a pressure-based sensor that illuminates the brake warning light

D. The brake fluid level drops below the warning sensor's threshold during hard braking as the caliper pistons extend further, displacing more fluid from the reservoir and briefly triggering the level sensor

91. A vehicle has a vibration felt in the steering wheel during braking that was not present before a recent brake pad replacement. The rotors were not resurfaced during the pad replacement. What is the most likely cause?

A. The brake pads were installed without performing a rotor runout check, and the existing rotor runout combined with the new pad material is producing a vibration that the old worn pads had conformed to

B. The new brake pads are a different friction compound than the original and produce a different harmonic frequency during contact that creates vibration in the steering system during the braking event

C. The new brake pads have a manufacturing defect where the friction material is not uniformly bonded to the backing plate, creating an uneven contact pattern that produces vibration during braking

D. The brake caliper bolts were not torqued to specification during the pad replacement, allowing the caliper to shift on its bracket during braking and transmit the movement as steering wheel vibration

92. A tire with the marking "P225/55R17 95V" is being replaced. The customer asks what the "V" rating means. What is the correct answer?

A. The "V" indicates the tire's vertical load index, specifying the maximum weight the tire can support when inflated to the maximum pressure rating listed on the sidewall information panel

B. The "V" is the tire's speed rating, indicating the maximum sustained speed the tire is designed to handle safely — "V" corresponds to a maximum speed of 240 km/h under controlled conditions

C. The "V" indicates the tire's traction rating on wet surfaces, with "V" being the highest wet-traction grade available in the consumer tire rating system for passenger vehicle applications

D. The "V" is the tire's temperature resistance grade, indicating the tire's ability to dissipate heat generated during sustained high-speed driving without degradation of the tread compound or casing

93. A vehicle has a front suspension noise that occurs only when the steering wheel is turned while the vehicle is stationary. The noise is a groaning or creaking sound from the right front. What is the most likely cause?

A. A worn right front wheel bearing that produces a groaning noise under the combined loads of vehicle weight and steering forces during stationary turning, which loads the bearing differently than during straight driving

B. A worn right front lower ball joint that produces a creaking noise under the torsional load of stationary steering, where the joint is simultaneously loaded vertically by vehicle weight and rotationally by the steering input

C. The right front brake pad is contacting the rotor during the steering rotation, creating a groaning noise from the pad-to-rotor friction that changes in intensity as the steering angle changes the pad contact pattern

D. A dry or worn upper strut mount bearing on the right front that groans or creaks when the strut must rotate in place during stationary steering, where the full vehicle weight loads the bearing while it turns

94. What is the primary purpose of caster angle in a front wheel alignment?

A. Caster provides directional stability and steering wheel return-to-center by creating a self-centering force at the front wheels that increases with vehicle speed, making the steering track straight

B. Caster controls the inward or outward tilt of the tire relative to vertical, distributing the vehicle's weight evenly across the tire contact patch for even tread wear and maximum traction during cornering

C. Caster determines the toe angle change during steering input, controlling how much the front wheels toe-in or toe-out as the steering wheel is turned through its range of rotation from lock to lock

D. Caster controls the turning radius of the vehicle by determining the angle at which the front wheels pivot during steering, with more caster producing a tighter turning radius for parking maneuvers

95. A vehicle's electric power steering has intermittent heavy steering that occurs without any warning lights or DTCs. The heavy steering episodes last only a few seconds and resolve spontaneously. What should be checked?

A. The EPS motor for an intermittent winding fault that creates a momentary loss of magnetic force, reducing the motor's assist output until the winding contact re-establishes and assist returns to normal

B. The EPS torque sensor for an intermittent signal dropout that briefly prevents the PSCM from determining the driver's steering input, causing it to default to zero assist until the signal returns

C. The EPS system's 12V power supply fuse and connector for corrosion or looseness that intermittently reduces the available voltage to the EPS motor, limiting its torque output during the voltage drop

D. The EPS system's power supply connection, fuse, ground, and module connectors for intermittent contact that briefly interrupts the power or signal path, causing a momentary loss of assist

96. A vehicle's front disc brakes have been recently serviced with new pads and rotors. After the service, the driver reports a grinding noise from the front brakes at low speed. The technician inspects and finds the pads are correctly installed and the rotors are undamaged. What is the most likely cause?

A. The new brake pads have a harder friction compound than the originals, and the compound produces a grinding-like noise during light contact that is normal during the initial break-in period

B. The brake dust shields behind the new rotors are bent and contacting the rotor surface during wheel rotation, producing a metallic grinding noise that is unrelated to the pad-to-rotor contact

C. The caliper slide pins are seized and preventing the caliper from floating correctly on the new, slightly thicker rotors, causing the outboard pad to drag against the rotor during every wheel rotation

D. The wheel speed sensor tone ring is contacting the new rotor due to a slight dimensional difference between the original and replacement rotors, creating a rhythmic grinding noise at low speed

97. A vehicle has a rear wheel bearing noise. The technician raises the vehicle and checks for play at the 12 and 6 o'clock positions. No play is detected. Does this eliminate the wheel bearing as the noise source?

A. Yes — a wheel bearing that shows no play during the hand check test is functioning within specification and the noise source must be elsewhere in the rear suspension or drivetrain components

B. No — some bearing failures produce noise from internal roughness, pitting, or contamination without measurable play, and the bearing should be rotated by hand to check for roughness or noise

C. Yes — the 12 and 6 o'clock check is the definitive test for wheel bearing condition, and any bearing noise without detectable play indicates a tire noise that is being misidentified as a bearing problem

D. No — the bearing can only be evaluated under the vehicle's weight load, and the unloaded hand check cannot detect a bearing that produces noise only when loaded by the vehicle weight during driving

98. A customer reports that the steering wheel is centered but the vehicle tracks slightly to the left on a straight, flat road. The alignment shows the front toe is set correctly as a total value but the individual toe settings show the left wheel at +0.15° toe-in and the right wheel at −0.05° toe-out. What correction is needed?

A. Adjust the individual toe settings to be equal on both sides while maintaining the same total toe value, which will straighten the vehicle's tracking without affecting the steering wheel center position

B. Adjust only the right wheel to match the left wheel's toe-in setting, increasing the total toe value but equalizing the per-wheel toe angles for symmetrical tracking and consistent tire wear

C. No adjustment is needed because the total toe is within specification and the individual per-wheel values do not affect the vehicle's tracking — only the combined total toe determines straight-line stability

D. Adjust both wheels to zero toe to eliminate the tracking deviation, since any toe setting other than zero creates an asymmetric pulling force that causes the vehicle to drift to one side during driving

99. A vehicle's brake caliper has been replaced on the right front. After the replacement, the vehicle pulls to the right during moderate braking. What is the most likely cause?

A. The replacement caliper is for the wrong side of the vehicle (left caliper installed on the right), positioning the bleeder at the bottom where trapped air prevents full hydraulic engagement of the piston

B. The replacement caliper has a different piston bore size than the original, generating a different amount of braking force at the same hydraulic pressure and creating the asymmetric pull during braking

C. The right front brake line was not properly bled after the caliper replacement, and trapped air in the line prevents full hydraulic pressure from reaching the new caliper's piston during brake application

D. The replacement caliper's slide pins are too tight from factory coating, preventing the caliper from floating freely and causing the caliper to apply the pads unevenly against the rotor surface

100. A tire shows center-tread wear — the center of the tread is significantly more worn than the outer edges. What is the most common cause of this wear pattern?

A. Excessive negative camber that concentrates the vehicle's weight on the center portion of the tread contact patch, wearing the center strip faster than the shoulders during straight-line driving

B. Chronic overinflation that crowns the center of the tread outward, concentrating the road contact on the center strip and reducing the shoulder contact, causing the center to wear faster

C. A front toe-out condition that causes the tire to scrub sideways across the road surface, concentrating the friction forces on the center of the tread where the scrubbing angle is steepest

D. Frequent hard braking that locks the wheels momentarily before ABS intervention, creating flat spots in the tread center where the tire contacts the road during the brief lockup events

101. A vehicle's SRS warning light is on and the scan tool shows a DTC for "Driver Frontal Airbag Resistance High." The clockspring has been checked and is within specification. What should be investigated next?

A. The driver's seatbelt pretensioner circuit, since the pretensioner and the frontal airbag share a common ground circuit, and high resistance in the pretensioner ground can appear as a high-resistance airbag code

B. The steering wheel-to-clockspring connector and the airbag module connector for corrosion, contamination, or a partially seated connection that adds resistance to the firing circuit

C. The ACM for an internal fault in the resistance measurement circuit that is falsely detecting high resistance on a circuit that is actually within the specified resistance range for the firing loop

D. The driver's frontal airbag module connector and the clockspring-to-airbag wiring for corrosion, high-resistance connections, or damaged wiring that adds resistance to the deployment circuit

102. A vehicle has a windshield washer system that does not spray. The pump motor can be heard running when the washer is activated. What should be checked?

A. The washer fluid reservoir for a crack that allows the pump to draw air instead of fluid, creating a condition where the motor runs but cannot develop pressure to push fluid through the nozzle lines

B. The washer pump's internal impeller for a disconnection from the motor shaft, since the motor spinning without the impeller connected produces noise but no fluid pressure output through the lines

C. The washer fluid lines for a disconnection, kink, or blockage between the pump outlet and the nozzles, since the pump is running (confirmed by the audible motor) but fluid is not reaching the nozzles

D. The washer fluid reservoir level, since the pump motor will run even when the reservoir is empty, drawing air instead of fluid and producing the running sound without any fluid output at the nozzles

103. A vehicle's automatic headlamp system turns the headlamps on and off correctly based on ambient light, but the dashboard display illumination does not dim when the headlamps turn on. What should be checked?

A. The ambient light sensor for a dual-output fault where the headlamp activation signal works correctly but the dashboard dimming signal output has failed within the same sensor housing

B. The instrument cluster's internal dimming circuit or the dashboard illumination dimmer setting, since the headlamp activation and the dashboard dimming function through separate circuits

C. The BCM's dimming output relay, which controls the dashboard illumination level independently from the headlamp circuit and may have a faulty contact that prevents the dimming signal from reaching the cluster

D. The headlamp switch for a faulty dimmer-integration contact that should signal the instrument cluster to enter night mode when the headlamps activate but has failed in the daytime brightness position

104. A rear passenger door will not open from either the inside or outside handle. The power lock actuator clicks normally when commanded. What is the most likely cause?

A. The door latch mechanism has a mechanical fault — a broken release lever, seized linkage, or jammed latch pawl — that prevents either handle from disengaging the latch despite the lock mechanism working

B. The child safety lock is engaged AND the exterior handle release cable has disconnected, preventing the door from opening from either side despite the lock mechanism functioning correctly

C. The door hinge pins have seized from corrosion, physically preventing the door from swinging open even though the latch mechanism releases correctly when either handle is operated by the user

D. The door striker on the B-pillar has shifted inward from a previous collision repair, jamming the latch in a position where neither release mechanism can disengage the pawl from the striker bolt

105. A vehicle has a persistent windshield fog that forms on the inside of the glass during cold weather, even when the defroster is on. The HVAC system operates normally. What is a common cause of excessive interior windshield fogging?

A. The exterior mirror glass is cracked and allowing cold air to enter the cabin through the mirror housing, creating a localized cold spot on the windshield near the A-pillar that promotes condensation

B. The tinted aftermarket windshield film has deteriorated and is trapping moisture between the film and the glass surface, creating a permanent fog layer that the defroster cannot remove from the outside

C. A heater core leak that releases warm, moist coolant vapor into the HVAC airstream, adding excessive moisture to the cabin air that overwhelms the defroster's ability to keep the windshield clear

D. The cabin air filter has absorbed moisture from a clogged evaporator drain and is releasing that moisture into the cabin airstream, adding humidity that the defroster cannot adequately remove from the air

106. A vehicle's keyless entry system locks all doors but does not unlock the passenger doors — only the driver's door unlocks on the first key fob press. A second press is required to unlock the remaining doors. Is this a fault?

A. Yes — all doors should unlock simultaneously on the first press, and a fault in the BCM's unlock programming is causing the sequential unlock behavior that requires two presses for full vehicle access

B. Yes — the passenger door lock actuators have developed high resistance that prevents them from responding to the first unlock signal but allows them to respond to the second stronger signal transmission

C. No — some vehicles are programmed with a safety feature where the first fob press unlocks only the driver's door and a second press unlocks all remaining doors, which can often be reprogrammed

D. No — the sequential unlock is caused by a weak key fob battery that cannot transmit enough power for all four door receivers to process the unlock command simultaneously on a single button press

117. A hybrid vehicle owner asks why the engine sometimes starts unexpectedly while driving in EV mode at low speed. What is the most accurate explanation?

A. The hybrid battery has a cell imbalance that triggers the engine to start for charging whenever the weakest cell drops below its minimum voltage, which occurs unpredictably during low-speed EV operation

B. The hybrid control module randomly starts the engine at intervals to maintain lubrication and prevent internal corrosion, regardless of the battery state of charge or driving conditions at that moment

C. Several conditions can trigger the engine to start during EV mode — including low battery SOC, high cabin heating demand, high accessory load, or aggressive acceleration that exceeds the motor's maximum output

D. The engine starts because the regenerative braking system has charged the battery above its maximum SOC threshold, and the engine must run to consume the excess energy through the generator load

118. A battery electric vehicle has a fault code for "Isolation Monitor Fault." What system does the isolation monitor protect?

A. The 12V auxiliary system from voltage spikes that occur when the HV contactors open and close, which could damage the sensitive electronic modules connected to the 12V bus network

B. The HV battery cells from overcharging by monitoring the individual cell voltages during charging and disconnecting the charger when any cell reaches its maximum safe voltage threshold

C. The vehicle's CAN bus communication network from electromagnetic interference generated by the HV inverter's high-frequency switching, which could disrupt module communication and cause false DTCs

D. The vehicle occupants and service technicians from electrical shock by continuously monitoring the insulation resistance between the HV electrical system and the vehicle's conductive chassis

119. A plug-in hybrid vehicle has a "Check EV System" warning. The scan tool shows a DTC for HV battery cooling system insufficient flow. What should be checked?

A. The HV battery coolant circuit for low coolant level, a faulty electric coolant pump, air pockets in the circuit, or a restricted coolant passage that prevents adequate flow for battery thermal management

B. The engine cooling system thermostat for a stuck-open condition that is diverting coolant from the HV battery circuit into the engine radiator, starving the battery cooling system of adequate flow

C. The cabin A/C system refrigerant charge, since many hybrid vehicles use the A/C refrigerant circuit to cool the HV battery, and a low charge reduces the cooling capacity for both cabin and battery

D. The HV battery pack itself for an internal temperature sensor fault that is falsely reporting high temperatures and triggering the insufficient flow code even though the cooling system is functioning correctly

120. A hybrid vehicle's 12V auxiliary battery requires frequent replacement — it has been replaced three times in two years. What is the most likely underlying cause?

A. The hybrid vehicle's regenerative braking system produces voltage spikes that damage the 12V battery's internal plates more rapidly than the normal charging cycle of a conventional vehicle alternator

B. The DC-DC converter that charges the 12V battery from the HV system has a fault — either producing insufficient output, cycling erratically, or generating voltage spikes — that prematurely degrades the 12V battery

C. The hybrid vehicle's start-stop system cycles the 12V battery through more deep discharge events than a conventional vehicle, and the standard flooded battery cannot withstand the cycling and should be upgraded to AGM

D. The hybrid vehicle's computer modules draw more current from the 12V system than a conventional vehicle, and the standard battery capacity is insufficient for the higher parasitic draw of the hybrid-specific modules

121. A battery electric vehicle displays "Reduced Charging Rate" during a Level 2 charging session at home. The vehicle has been charging for 30 minutes. What is the most likely cause?

A. The vehicle's onboard charger has overheated during the charging session and is reducing its output current to protect its internal power electronics from thermal damage during the sustained charge event

B. The home's electrical circuit is shared with other appliances, and the EVSE has detected a voltage drop on the circuit from the combined load, reducing the charging current to prevent overloading the circuit

C. The HV battery has reached 80% SOC and the BMS is beginning to taper the charging current as part of the normal constant-voltage charging phase that protects battery longevity above 80% charge level

D. The Level 2 EVSE's internal temperature sensor has detected overheating in the cable or connector, and the station is reducing current output to prevent thermal damage at the connection point

122. What is the function of the resolver sensor on a hybrid or electric vehicle's drive motor?

A. The resolver measures the motor's operating temperature by detecting the change in stator winding resistance that occurs as the motor heats up during sustained high-current operation

B. The resolver monitors the motor's vibration frequency to detect bearing wear or rotor imbalance that could cause damage to the motor if it operates above its maximum safe vibration threshold

C. The resolver measures the HV battery's current output to the motor, providing the inverter with the real-time current feedback needed to regulate the motor's torque output precisely during driving

D. The resolver measures the precise rotational position and speed of the motor's rotor, providing the inverter with the real-time position data needed to correctly commutate the motor's phase currents

123. A customer asks whether their plug-in hybrid vehicle's HV battery can be recycled at the end of its automotive service life. What is the correct answer?

A. Yes — HV batteries from hybrid and electric vehicles are recyclable, and the valuable materials (lithium, cobalt, nickel, manganese) can be recovered through specialized recycling processes

B. No — current technology does not permit cost-effective recycling of lithium-ion batteries, and they are classified as hazardous waste that must be disposed of through specialized landfill containment

C. Yes — but only if the battery is returned to the original vehicle manufacturer, since third-party recycling facilities do not have the proprietary technology to safely process automotive HV battery packs

D. No — lithium-ion batteries cannot be recycled in any form, and the battery pack must be encased in concrete and buried in a designated hazardous materials containment facility at the end of its automotive life

124. A battery electric vehicle's regen braking feels weaker than normal in cold weather. The driver also notices the vehicle takes longer to charge. What is the common factor causing both symptoms?

A. The vehicle's tire pressure has dropped in the cold weather, increasing rolling resistance and masking the regenerative braking deceleration while also increasing the energy consumption that extends charging time

B. The cold weather has increased the viscosity of the motor's lubricant, creating additional mechanical resistance that reduces the motor's efficiency in both regenerative braking and propulsion modes equally

C. Cold temperatures increase the HV battery's internal resistance, which limits both the charging current the battery can accept (slowing charging) and the regenerative braking current (reducing regen deceleration force)

D. The vehicle's HVAC system is consuming additional energy for cabin heating in cold weather, and the system prioritizes cabin comfort over both regenerative braking energy recovery and charging speed

125. A technician is performing routine maintenance on a battery electric vehicle. The service includes tire rotation, cabin air filter replacement, brake fluid inspection, and wiper blade replacement. Is HV de-energization required for any of these services?

A. Yes — any service performed on a BEV requires full HV de-energization as a mandatory safety precaution before any work begins, regardless of whether the service involves HV components directly

B. No — none of these routine maintenance items require interaction with any HV components, and the HV system can remain in its normal state during all of these service procedures

C. Yes — the brake fluid inspection requires HV de-energization because the BEV's brake system uses a high-voltage electric brake booster that must be de-energized before the fluid reservoir is opened

D. Yes — the tire rotation requires HV de-energization because raising the vehicle on a lift activates the BEV's motion detection system, which could close the HV contactors and energize the drive motor

Practice Exam 6: Answer Key and Explanations

1. B — An unusual groaning noise combined with visible sagging of a lift arm indicates a potential hydraulic failure, structural fatigue, or mechanical fault in the lift system. The technician must evacuate from underneath the vehicle immediately — a catastrophic lift failure can drop thousands of pounds without warning. The vehicle must be lowered, the lift locked out, and a qualified lift service technician must inspect and repair the lift before it returns to service.

2. D — Open flame near a fuel tank creates an extreme fire and explosion hazard from both liquid fuel and fuel vapors. Even a tank that appears empty contains explosive vapors in the headspace. Alternative heat sources — induction heaters, extended penetrating oil soak, impact tools, or removing the tank before applying heat — must be used. No amount of shielding, wet rags, or fire extinguisher proximity makes an open flame acceptable near a fuel tank.

3. A — Dynamometer operation requires wheel restraint straps securing the vehicle to the dyno to prevent the vehicle from launching off the rollers, exhaust extraction to prevent CO accumulation in the enclosed space, and safety barriers to protect personnel from wheel or tire separation at high speed. All three safeguards must be in place before running the vehicle at speed on the dyno.

4. C — The flame-over-circle pictogram identifies oxidizing materials. Oxidizers release oxygen or other oxidizing agents that can intensify an existing fire or cause normally non-combustible materials to ignite. In an automotive shop, oxidizing chemicals stored near combustible materials (rags, paper, solvents) create a significantly elevated fire hazard.

5. B — A cracked glass panel on a chemical storage cabinet compromises the cabinet's containment integrity and creates a potential exposure hazard if any container inside has been jarred loose, cracked, or is leaking. The area must be evacuated, the damage reported, and the cabinet must not be used until the glass is replaced and all container integrity is verified by qualified personnel.

6. A — The safety shower provides full-body decontamination for chemical splashes that affect large areas of the body — torso, arms, legs, or multiple body regions simultaneously. The eyewash station is designed specifically for eye and facial decontamination. When a chemical splash covers a large body area, the shower's high-volume water flow is necessary to dilute and remove the chemical quickly.

7. D — A gasoline leak creates multiple immediate hazards: fire from ignition sources, explosion from vapor accumulation, health effects from vapor inhalation, and environmental contamination. The response must address all hazards systematically — eliminate ignition sources first (gasoline vapor can travel along the floor to distant ignition sources), ventilate the space, contain and absorb the spill, and dispose of contaminated materials properly.

8. C — Aftermarket wiring modifications are a common source of electrical fires and circuit damage in vehicles. Without inspecting the installation, the technician cannot know whether the wiring has appropriate fuse protection, correct wire gauge for the current load, proper connections (soldered/crimped vs. twisted), or safe routing away from heat sources and moving components.

9. A — A bent hood prop rod that cannot securely hold the hood open creates a falling-object hazard — the hood can drop onto the technician's head, neck, hands, or back without warning. Before any work begins in the engine bay, the hood must be supported securely by repairing the prop rod, replacing it, or using an alternative support such as a hood support bar or secondary prop.

10. B — The knock sensor is active and the ECM has retarded timing to its maximum (8 degrees), yet knock persists. This means the underlying cause exceeds the ECM's maximum correction range. Excessive carbon deposits on the piston crowns and combustion chamber surfaces raise the effective compression ratio, increasing peak combustion pressure and temperature beyond what maximum timing retard can suppress.

11. D — P0507 indicates the idle RPM is higher than the ECM's target, and the ECM cannot reduce it. A vacuum leak introduces unmetered air past the closed throttle plate, raising the idle speed. The ECM attempts to compensate by closing the IAC or reducing the electronic throttle opening, but if the leak is large enough, the ECM cannot reduce airflow below the leak volume, and the RPM remains elevated.

12. C — A misfire only during the first two seconds of cranking that clears immediately once the engine fires points to a fuel delivery issue during the low-pressure cranking period. Fuel injectors with weak return springs or worn pintle seats dribble rather than atomize during the low fuel pressure of cranking, flooding those cylinders with poorly atomized fuel that cannot ignite until the pump builds full operating pressure.

13. B — The fuel pressure meets specification at key-on (400 kPa) but bleeds down to 350 kPa within 10 seconds — well below the 380 kPa minimum hold specification. Since the system is returnless (no external regulator or return line to leak through), the pressure loss must be through the fuel pump check valve (allowing fuel to drain back to the tank), a leaking fuel injector, or a faulty pressure sensor venting pressure.

14. A — Before condemning the converter, all conditions that can cause a false P0420 must be eliminated: active misfires send unburned fuel into the converter and damage it; exhaust leaks near the upstream sensor allow oxygen to dilute the exhaust and produce false lean readings; incorrect fuel trims indicate a fueling problem that stresses the converter; and a faulty upstream sensor produces incorrect switching that mimics a converter fault.

15. D — VGT actuator seizure on diesel engines is most commonly caused by carbon and soot accumulation from EGR exhaust gases that coats the vane mechanism, actuator linkage, and vane pivot points inside the turbocharger housing. The soot bakes onto the surfaces from exhaust heat, progressively restricting movement until the vanes and linkage bind completely and cannot respond to actuator commands.

16. C — Coolant consumption with no visible external leak, no white smoke, no oil contamination, and a cooling system that holds pressure suggests a very small internal leak. A combustion gas leak test (block test) detects the presence of combustion gases (CO_2) in the coolant, which confirms an internal path between the combustion chamber and the cooling jacket — even one too small to produce visible white smoke or fail a pressure test.

17. A — The pressure pattern — high at cold startup (60 psi), normal at warm cruise (40 psi), and low at hot idle (15 psi below the 25 psi minimum) — indicates the oil system can maintain pressure when the pump speed is high and the oil is thick, but fails specifically at hot idle where pump speed is lowest and oil viscosity is thinnest. Worn bearings with excessive clearance allow oil to escape faster than the pump can supply at the low output of idle speed.

18. D — Modern turbocharged engines can consume oil through multiple paths without producing visible smoke. The turbocharger's center section oil seals can leak small amounts of oil into both the exhaust housing (burned by exhaust heat) and the intake side (burned during combustion). The PCV system also recirculates crankcase oil mist into the intake. Both paths consume oil in quantities too small to produce visible tailpipe smoke.

19. B — The P0446 code specifically identifies a circuit fault — not a system leak or flow problem. Replacing the vent valve addressed the valve itself, but if the wiring or connector has an intermittent open circuit, high-resistance connection, or short, the code will return regardless of the valve's condition. The circuit between the ECM and the vent valve must be tested for continuity, resistance, and proper connector engagement.

20. C — Modern common rail diesel injectors have manufacturing variations in their flow characteristics. Each injector is tested at the factory and assigned a unique calibration code that quantifies its specific flow rate at a reference pressure. The ECM uses this code to calculate the precise pulse width for each individual injector. Without the code, the ECM uses default values that may not match the new injector's actual flow, causing rough running and emissions issues.

21. A — The lower gasket surfaces are the sealing boundary between the intake manifold and the engine block (or valley). On V-configuration engines, the lower intake passages carry both air and coolant. The lower sealing surfaces are exposed to the highest thermal stress from the exhaust crossover and engine heat, causing the gasket material to deteriorate from the bottom up — the upper surfaces are cooler and more protected.

22. A — A 15% fuel economy decrease with no check engine light, normal fuel trims (+2%), and smooth engine operation eliminates fuel system and ignition faults. A stuck-open thermostat prevents the engine from reaching its designed operating temperature, causing the ECM to maintain a slightly enriched fuel map for the perceived sub-optimal temperature condition. The P0128 code may not yet have met its drive cycle criteria.

23. C — A wet compression test adds oil to seal the piston rings. If the compression loss is through the rings, the oil temporarily seals the gap and the reading rises significantly. A reading that rises only 10 psi (from 60 to 70) indicates the rings are not the primary leak path — the compression is escaping past a valve (burned, bent, or poorly seated) or through the head gasket to an adjacent cylinder or coolant passage.

24. B — Both banks showing significant positive fuel trims simultaneously eliminates individual cylinder or bank-specific faults. A system-wide lean condition affects both banks equally and is caused by a common element: low fuel pressure from a weak pump or restricted filter, a contaminated MAF sensor underreporting total engine airflow, or a large vacuum leak at a centrally located component feeding both banks.

25. A — A cold-start misfire on specific cylinders of a GDI engine that clears after 30 seconds is consistent with intake valve carbon buildup. Carbon deposits restrict the airflow into the affected cylinders, and the restriction is most significant at cold startup when the air is dense and the engine's airflow demand is highest. As the engine warms and the intake charge thins, the restriction becomes proportionally less significant.

26. C — Copper is a primary component of engine bearing overlays — the thin copper-lead or tri-metal layer that provides the bearing's friction surface. Elevated copper in oil analysis indicates bearing surface wear. New engines show elevated copper during break-in as the bearing surfaces seat, and high-mileage engines show increasing copper as the bearing overlay wears progressively thinner.

27. D — Active regeneration relies on the diesel oxidation catalyst (DOC) to ignite the unburned fuel from post-injection, generating the exothermic reaction that raises exhaust temperatures to 550°C+. If the DOC has failed (from age, poisoning, or substrate damage), the post-injected fuel passes through without being oxidized, and the exhaust temperature never reaches the threshold required for soot combustion in the DPF.

28. B — The resistance decreasing as temperature increases (2,400 ohms at 25°C dropping to 320 ohms at 80°C) is the defining characteristic of a negative temperature coefficient (NTC) thermistor. NTC thermistors are the standard sensor type for automotive coolant and intake air temperature measurement. A PTC thermistor would show increasing resistance with increasing temperature.

29. C — A warpage of 0.15 mm exceeds the 0.05 mm maximum specification by three times. The head must be resurfaced (milled) on a precision surface grinder to restore flatness within the specification before reinstallation. After resurfacing, the final surface height must be measured to verify it remains above the manufacturer's minimum deck height — excessive material removal reduces the combustion chamber volume and increases compression ratio.

30. A — A lean LTFT that remains constant (+20%) at both idle and cruise eliminates vacuum leaks (which are proportionally larger at idle) and MAF contamination (which typically affects one operating range more than another). A fuel delivery deficit — weak pump, restricted filter, or low-set pressure

regulator — delivers consistently less fuel than the ECM commands at every operating point, producing the uniform lean condition.

31. D — With the fuel system verified (adequate cranking pressure) and the glow plug system confirmed functional, the remaining variable for cold diesel starting is compression. Diesel engines rely entirely on compression heat for fuel ignition. Worn piston rings or valves that reduce compression below the cold-start autoignition threshold prevent starting in cold conditions, but the residual heat of a warm engine compensates for the reduced compression.

32. B — The expected CAN bus termination resistance is 60 ohms (two 120-ohm resistors in parallel). A reading of 65 ohms is within normal measurement tolerance of a handheld DVOM — factors including probe contact resistance, temperature, and meter accuracy account for the 5-ohm deviation. The termination is likely healthy, and the scan tool communication error should be investigated elsewhere.

33. B — An intermittent check engine light that illuminates briefly and extinguishes without storing a DTC indicates a sensor or system parameter that momentarily crosses the fault threshold but does not remain outside the threshold long enough to meet the DTC storage criteria (which typically require continuous or repeated exceedances over a defined number of drive cycles).

34. A — With fresh fob batteries confirmed and the vehicle's 12V battery fully charged, the reduced range is caused by the vehicle-side receiver system. The keyless entry antenna module or its wiring connection — corroded terminals, a damaged antenna cable, or a loose connector — reduces the receiver's sensitivity to the fob's RF signal, requiring the fob to be much closer before the signal is strong enough to trigger a response.

35. C — The steering angle sensor must be initialized (recalibrated) after any event that changes the relationship between the steering wheel's center position and the direction the front wheels are actually pointing. This includes wheel alignment (which changes toe and may shift the steering wheel center), steering component replacement, battery disconnection (which can clear the stored center reference), and steering column service.

36. A — A P0562 code indicates the ECM detected system voltage below its minimum threshold. With a healthy battery and alternator confirmed, the most likely cause is a momentary voltage dip during a high-demand electrical event — the A/C clutch engaging simultaneously with headlamps, heated seats, and rear defroster can briefly pull the system voltage below the ECM's threshold before the alternator responds to the load increase.

37. B — U0073 (Control Module Communication Bus "A" Off) stored in the gateway module indicates that an entire CAN bus segment has lost communication. The gateway monitors each bus segment it bridges, and when a segment goes completely silent (from a backbone break, both terminators lost, or a module crashing the bus), the gateway stores this code identifying which specific bus has failed.

38. C — Radar sensors require precise alignment relative to the vehicle's centerline and horizontal plane. Removing the sensor from one bumper and reinstalling it on a replacement bumper inevitably changes the mounting position by millimeters — enough to misalign the radar beam. The sensor must be recalibrated using the manufacturer's static or dynamic calibration procedure after any removal and reinstallation.

39. D — Both the ECM and TCM have lost communication, while no other modules report U-codes. This means the bus backbone is likely healthy (other modules communicate normally). The most logical explanation is that both modules share a common connection point — the same spur wiring, the same connector, or the same power/ground circuit — and a single fault at that shared point has disconnected both simultaneously.

40. B — A parking sensor producing consistent false readings at one specific location points to a physical problem with that individual sensor — physical damage (even a small crack), contamination (dirt, ice, wax buildup), or a mounting issue that causes the sensor to detect the bumper surface or its own housing echo. Cleaning and inspecting the specific sensor resolves the majority of single-location false detection complaints.

41. B — The "Service Tire Monitor" message persists despite correct pressures and a completed relearn because the TPMS module detects a system fault — most commonly a sensor with a dead or dying battery that cannot transmit data. TPMS sensor batteries have a finite lifespan (typically 5 to 10 years), and a failed battery produces no transmission, triggering the service message regardless of actual tire pressure.

42. A — A fuse that blows immediately upon replacement indicates a short circuit that exceeds the fuse rating the instant power is applied. The short is either in the ABS module's power supply wiring (a chafed wire grounding against the vehicle body) or within the ABS module itself (a shorted internal component). Systematic isolation — disconnecting the module and checking if the fuse holds — determines whether the short is in the wiring or the module.

43. C — As-built data contains the vehicle-specific configuration that tells a module how to behave for that particular vehicle — which options are installed (sunroof, heated seats, TPMS type), the VIN,

market-specific calibrations, and feature enablements. Without this data, a replacement module operates with default generic settings that may not match the vehicle's actual equipment, causing features to malfunction or be unavailable.

44. D — A clutch that grabs suddenly rather than engaging progressively has lost its ability to provide smooth, modulated friction engagement. Oil contamination on the disc surface (from a rear main seal or input shaft seal leak), glazed friction material (from overheating), or a warped disc all prevent the progressive slip needed for smooth engagement — the disc either grips fully or doesn't grip at all.

45. C — A flare and slip isolated to one specific gear transition (2-3) while all other shifts are normal identifies the friction element unique to that gear change. The third-gear clutch pack has worn friction material, a leaking apply piston seal, or a faulty apply circuit that cannot generate or maintain sufficient clamping pressure to engage and hold the clutch under load.

46. A — Gear mesh noise changes character between drive (acceleration) and coast (deceleration) because the load shifts from the drive side to the coast side of the gear teeth. Bearing noise, however, is constant regardless of load direction because the bearing is loaded by the shaft's weight and rotational forces in all conditions. Noise present in both drive and coast is characteristic of pinion bearing wear.

47. D — Limp mode (also called failsafe mode) is a protective strategy that selects a single gear using default hydraulic pressure paths that do not require electronic solenoid control. This provides the driver with a driveable condition — typically second or third gear — that allows them to reach a repair facility at reduced performance rather than being completely stranded by the electronic fault.

48. A — Outer CV joint clicking that starts during sharp turns and progressively worsens to include gentle turns indicates advancing wear from ongoing contamination. The torn boot allowed water, dirt, and road debris to contaminate the joint's grease, and the abrasive mixture is progressively wearing the ball grooves, cage, and inner race. By the time clicking occurs, the joint is already beyond repair.

49. C — The 3-2 downshift accumulator cushions the second-gear clutch application during deceleration downshifts. A faulty piston seal or weakened spring allows the apply pressure to spike rather than rise gradually, causing the second-gear clutch to engage abruptly. The harshness is specific to the 3-2 transition because each shift has its own dedicated accumulator circuit.

50. D — The transfer case output shaft to the rear differential rotates at vehicle speed in all operating modes — 2WD, 4WD High, and 4WD Low — because the rear wheels always drive through this shaft.

The input shaft, front output, and chain are the components that change their engagement status between modes. A bearing on the always-active rear output shaft produces noise in every mode.

51. C — Standard gravity or pressure bleeding may not purge air from high points in the hydraulic line routing. Many clutch hydraulic systems have line configurations where air can become trapped in a bend or loop that the bleeding fluid cannot reach. Vacuum bleeding, pressure bleeding, or specific manufacturer-prescribed bleeding sequences may be required to reach and purge these trapped air pockets.

52. B — Total driveline play is the sum of play at every connection point in the driveline. To identify which component(s) contribute the excessive 35 mm total, each potential source — U-joint bearing cap play, slip yoke spline clearance, and ring-and-pinion backlash — must be measured individually. This isolates the specific component(s) that need service rather than replacing the entire driveline.

53. D — A harsh downshift isolated to one specific gear transition (3-2 during deceleration) while all other shifts are smooth points to the accumulator for that specific shift. The accumulator's piston seal has hardened or its spring has weakened, failing to absorb and gradually release the apply pressure. The clutch engages abruptly instead of progressively, producing the harsh deceleration downshift.

54. A — Limited-slip differentials use clutch packs that require specific friction modifier additive in the gear oil. Without the correct additive, the clutch plates alternate between grabbing and slipping during differential speed differences (turns), producing the characteristic chatter. Open differentials use spider gears without friction surfaces and do not require friction modifier additive.

55. B — With the rotors confirmed within DTV and runout specifications, the pulsation during hard braking is not from the rotors. A worn tie rod end or ball joint that has play within the specification's pass range but near its limit can shift under the dynamic forces of hard braking, transmitting movement through the steering linkage as a vibration felt in the steering wheel during heavy braking only.

56. B — Dark brown fluid with a burnt odor indicates the ATF has been overheated and degraded over time. Overheated fluid loses its friction modifier properties, causing the clutch friction material to slip, overheat further, and wear. The progressive worsening of the delayed engagement tracks the progressive degradation of the forward clutch pack's friction material from the degraded fluid.

57. C — Driving in 4WD on dry pavement forces the front tires to scrub sideways during every turn because the locked drivetrain cannot accommodate the front-to-rear speed difference. This scrubbing

generates extreme heat and mechanical stress on the tire tread surface, creating flat spots that produce a vibration at highway speed. The flat spots may wear smooth over time, or the tires may need replacement.

58. D — At idle in neutral with the clutch engaged, the engine's torsional pulses are transmitted through the clutch disc to the input shaft and countershaft gear set. The backlash between the gear teeth allows them to rattle as the torsional pulses accelerate and decelerate the gears. When the clutch pedal is depressed, the input shaft stops spinning, the gears stop oscillating, and the rattle disappears.

59. C — The TCC should remain unlocked during low-speed, light-throttle driving to allow the torque converter's fluid coupling to absorb the engine's idle pulses. If the TCC engages at low speed, the direct mechanical coupling transmits every engine pulse through the drivetrain, producing the jerky, lurching feel. A TCC solenoid fault, contaminated fluid, or incorrect calibration can cause premature TCC engagement.

60. B — A CV joint that has operated with a torn boot for an estimated 5,000 km but shows no clicking, no play, and no roughness may still have serviceable internal components. If the joint passes a thorough inspection (no detectable play, smooth rotation, no visible damage to the internal surfaces), a new boot with fresh grease may extend its useful life. However, the joint must be monitored closely and the customer advised that it may develop symptoms later.

61. A — A 1.6-volt difference between two identical circuits (12.8V right vs. 11.2V left) with the same load means 1.6 volts is being consumed by unwanted resistance in the left headlamp's supply or ground circuit. The resistance source — corroded connector, damaged wire, loose splice, or corroded ground point — must be located through voltage drop testing along the left circuit's path from the fuse to the ground.

62. D — The blower motor resistor block (or resistor pack) provides stepped speed reduction for the lower blower speeds by inserting calibrated resistors in series with the motor. High speed bypasses the resistor block entirely, feeding full battery voltage directly to the motor through a relay. When the resistor block burns out (which it commonly does, starting with the lowest-speed resistor), all lower speeds are lost while high speed continues.

63. C — Pulling the BCM fuse identified that the excessive draw is on the BCM circuit, but the BCM fuse powers multiple components — not just the BCM module. Interior lights, door lock actuators, mirror heaters, and other accessories may share the BCM fuse. Each component on that circuit must be

systematically disconnected to determine whether the BCM itself or a component it powers is the source.

64. B — Rapid compressor cycling (on-off every 1-2 seconds) immediately after a recharge indicates the low-pressure cutoff switch is opening the circuit each time the compressor drops the already-low suction pressure below the switch's threshold. The system is still significantly undercharged — the original leak was not fully sealed, the charge weight was incorrect, or the system was not properly evacuated before charging.

65. D — Turn signals work on all four corners (proving the bulbs, wiring, and grounds are functional), but hazard flashers produce nothing. On many vehicles, the hazard and turn signal functions use different flasher modules, relays, or circuit paths through the BCM. A failed hazard-specific component — the hazard switch, its dedicated relay, or the BCM's hazard output circuit — has failed while the turn signal circuit remains functional.

66. A — The rear defroster grid is a parallel resistance network — multiple conductive lines connected between two bus bars. If one or more grid lines develops a low-resistance short to a bus bar, additional current flows through the shortened path, increasing total circuit current above the designed specification. This draws excess current from the power supply and can overheat the affected grid section.

67. A — The switch sends the correct signal in both directions (confirmed by testing), but the motor only runs in one direction. A motor with a worn or broken internal brush maintains contact with the commutator in one rotational direction but lifts off the commutator when the polarity reverses for the opposite direction, interrupting current flow and preventing rotation in that direction.

68. C — The musty odor is caused by mold and mildew growing on the evaporator core surface. Moisture from condensation remains on the evaporator fins in the warm, dark HVAC case after the A/C turns off. Replacing the cabin air filter (which the customer already did) does not address the source — the evaporator must be treated with an antimicrobial cleaning agent that kills the existing mold and inhibits regrowth.

69. A — Heavy rain, snow, road spray from passing vehicles, and ice accumulation on the sensor surface or bumper cover are the most common environmental causes of intermittent blind spot detection failures. These conditions temporarily attenuate the radar signal below the detection threshold, and the system returns to normal once the sensor area is clear. This is a designed operational limitation.

70. D — The EPS motor has a continuous thermal rating (the power level it can sustain indefinitely) and a peak rating (the power level it can deliver in short bursts). Sustained high-demand steering — repeated full-lock parking maneuvers in quick succession, for example — can exceed the continuous rating and cause the motor to overheat. The module reduces or disables assist to protect the motor from thermal damage.

71. B — The 50 mA parasitic draw is within spec, the battery tests good, and the CCA is adequate — yet the battery still dies in 4-5 days. The most likely explanation is that the battery is not being fully recharged during driving. Short trips (under 20 minutes) do not allow the alternator to fully replenish the energy used for starting and accessories, so each shutdown starts with a partially discharged battery that the normal 50 mA draw depletes.

72. B — Normal high-side pressure with abnormally low low-side pressure indicates a restriction between the high and low sides. The expansion device, liquid line, or receiver-drier has a blockage that prevents adequate refrigerant from flowing to the evaporator. The compressor pulls the low side down because it is pumping refrigerant out of the evaporator faster than it can be replenished through the restriction.

73. C — The scan tool confirmed the actuator motor responds to commands. However, if the output shaft has stripped or the shaft coupling to the blend door has broken, the motor runs through its range without actually moving the door. The door sits in a fixed mid-range position, blending hot and cold air to a lukewarm mix regardless of what the motor does, producing the constant lukewarm complaint.

74. A — System voltage of 15.8V exceeds the maximum specification by 1.0V. Overcharging at this voltage accelerates battery electrolyte boiling (reducing battery life and creating an explosion hazard from hydrogen gas), causes premature bulb filament failure from excessive current, and can damage voltage-sensitive electronic modules whose internal regulators are designed for a maximum of 14.8V.

75. C — On many wiper systems, high speed feeds full voltage directly to the wiper motor through a dedicated relay circuit, bypassing the speed controller entirely. The lower speeds and intermittent function route through a pulse module, speed controller, or park switch circuit that modulates the motor voltage or timing. A failed speed controller disables low and intermittent functions while high speed operates normally through its direct circuit.

76. B — A brief dimming of interior lights during engine cranking is completely normal. The starter motor draws 150 to 300+ amps during cranking, temporarily reducing the battery voltage from its

resting 12.6V to approximately 9.5–10.5V. This voltage drop is visible as a brief dimming of lights and is inherent to the high-current demand of the starting event. It is not indicative of a fault.

77. C — Many manufacturers intentionally calibrate the instrument cluster temperature gauge to display a slightly lower or centered reading to prevent driver anxiety. The gauge is designed to show "normal" across a wide range of actual temperatures (typically 80°C to 105°C), only rising visibly when the temperature exceeds the normal operating range. The scan tool reads the actual sensor value without this cosmetic calibration.

78. A — Washer nozzles have very small orifice openings that accumulate mineral deposits from the water content in the washer fluid and from environmental contaminants. These deposits progressively restrict the openings, reducing the spray pressure and changing the spray pattern. Cleaning the nozzles with a pin or fine wire, or replacing clogged nozzles, restores the original spray pattern and reach.

79. B — A significant change in the vehicle's ride height — from installing larger tires, adding a suspension lift, installing lowering springs, or carrying a heavy load — changes the camera's viewing angle relative to the road surface. Even a 1-2 degree change in the camera's pitch angle shifts the detection zone and lane marking reference, requiring recalibration to restore accurate ADAS function for the new ride height.

80. A — When the up switch produces down movement and the down switch produces up movement, the motor's power and ground wires have been reversed at the motor connector. The motor rotates in the correct direction for its wiring polarity, but the polarity is backwards relative to the switch's intended function. Reversing the connector or the wire positions at the motor corrects the direction.

81. D — The exterior hatch handle operates mechanically, using physical leverage to release the latch. The key fob and interior release button use an electrical solenoid or actuator. If the actuator has failed (mechanically stuck, burned coil, or stripped gear), it cannot generate the force to unlatch the hatch despite receiving the electrical command, while the mechanical handle bypasses the actuator entirely.

82. A — The ECM calculates fuel delivery based on the MAF signal. With the MAF reading 2.5 g/s instead of the actual 5.0+ g/s, the ECM delivers fuel for only 2.5 g/s of air when the engine is actually ingesting twice that amount. The resulting lean condition triggers positive fuel trim corrections as the O_2 sensors detect the lean exhaust and the ECM adds fuel to compensate.

83. B — The solenoid clicks (proving the coil circuit works and the plunger moves), the pinion extends, but the motor does not turn and the voltage drops to 8.2V (proving massive current is flowing). The solenoid's internal contact disc — which connects the battery terminal to the motor terminal when the plunger pulls it closed — is severely burned or pitted and cannot pass the hundreds of amps the motor needs.

84. C — A steering wheel shimmy at a specific speed range that persists after front tire balancing points to front brake rotor lateral runout. The runout pushes the brake pads outward with each revolution, transmitting a vibration through the caliper-to-knuckle mount into the steering linkage. This vibration occurs at the specific wheel rotational speed corresponding to 100-120 km/h regardless of whether the brakes are applied.

85. A — Individual rear toe angles can each be within specification while the combined thrust angle is out of specification if the rear axle assembly is physically offset. The rear wheels each point the correct direction relative to the axle, but the axle itself is shifted to the right of the vehicle's geometric centerline — from shifted spring mounts, a bent axle housing, or frame damage.

86. D — A soft, spongy pedal with full fluid level, no leaks, and no improvement after bleeding indicates internal master cylinder seal bypass. The piston seals have worn and allow fluid to leak past the pistons within the bore under sustained pressure, absorbing pedal travel without generating proportional hydraulic pressure at the calipers. This internal leak produces no external evidence.

87. C — ABS activation during normal braking on dry pavement without the ABS light illuminated (no stored permanent fault) indicates an intermittent sensor signal problem. A wheel speed sensor producing erratic pulses — from a cracked tone ring, contaminated sensor tip, excessive air gap, or damaged wiring — gives the ABS module false readings that mimic incipient wheel lockup, triggering unnecessary intervention.

88. B — With alignment within specification, pressures correct, and road crown accounted for, the next diagnostic step is a tire swap test. Swapping the front tires left-to-right isolates tire pull (radial pull or ply steer) — an internal construction defect that creates a directional bias built into the tire. If the drift direction changes with the tire swap, the tire is confirmed as the cause.

89. A — Sway bar end links connect the sway bar to the suspension components (struts or control arms). When the end links are loose, the sway bar rattles at the connection points over bumps (producing the clunk) and cannot effectively resist body roll during cornering (because the loose connection delays

force transfer). New end links eliminate both the clunk noise and restore the sway bar's roll-control function.

90. D — The brake fluid level sensor in the master cylinder reservoir is triggered by the fluid level dropping below its threshold. During hard braking, the caliper pistons extend further than during light braking, displacing more fluid from the reservoir. If the fluid level is already near the sensor's threshold, the additional displacement during hard braking briefly drops the level below the sensor, illuminating the warning light momentarily.

91. C — Before the pad replacement, the old pads had worn to conform to the existing rotor's runout pattern — the pad surfaces had developed matching high and low spots. New flat pads contact the rotor unevenly because they haven't yet conformed to the rotor's runout. A rotor runout check should have been performed before installing new pads, and the rotor resurfaced if runout exceeded specification.

92. B — The letter at the end of a tire size designation is the speed rating. "V" indicates the tire is rated for sustained speeds up to 240 km/h. The speed rating is determined by the tire's construction, tread compound, and heat dissipation characteristics. Replacement tires must have a speed rating equal to or higher than the vehicle manufacturer's specification.

93. D — A groaning or creaking noise during stationary steering from a specific corner is characteristic of a dry or worn upper strut mount bearing. The bearing must rotate the entire strut assembly during steering while supporting the vehicle's full weight. When the bearing is dry, corroded, or worn, the combined rotational and compressive loads produce the groaning noise that is most pronounced during slow, loaded steering.

94. A — Caster is the fore-aft tilt of the steering axis. Positive caster places the steering axis pivot point ahead of the tire's contact patch, creating a trailing effect similar to a shopping cart caster. This trailing effect generates a self-centering force that increases with vehicle speed, providing directional stability and returning the steering wheel to center after a turn.

95. D — Intermittent heavy steering lasting only seconds with no warning lights or DTCs points to a brief power or signal interruption in the EPS system. A loose power supply connector, corroded ground, marginally seated module connector, or intermittent fuse contact can momentarily interrupt the EPS circuit. The module loses power or signal for seconds, assist drops to zero, then the contact re-establishes and assist returns.

96. B — New pads and rotors are correctly installed, yet a grinding noise is present. The most common cause is a brake dust shield (backing plate) that was bent during the rotor installation and is now contacting the new rotor's surface. The thin metal shield can be easily deformed by the new rotor during installation, and even light contact produces a grinding or scraping noise that the driver perceives as a brake problem.

97. B — Some wheel bearing failures begin as internal surface roughness (pitting, spalling, or contamination damage) that produces noise during loaded rotation but does not yet create measurable play. The bearing feels smooth during a hand-spin check because the loads are too light to engage the damaged surfaces. Spinning the wheel by hand and feeling/listening for roughness, grinding, or cyclic noise can detect these early-stage failures.

98. C — The total front toe is correct but unevenly distributed — the left wheel has more toe-in (+0.15°) while the right has slight toe-out (−0.05°). This uneven distribution creates a net directional force toward the left because the left wheel's stronger toe-in pulls the vehicle leftward more than the right wheel's slight toe-out pulls it rightward. Equalizing the per-wheel toe settings eliminates the tracking deviation.

99. B — After right front caliper replacement, a pull to the right indicates the right side is now generating more braking force than the left. The most likely cause is that the right brake line was properly bled (new caliper has full hydraulic contact), while the opposite side's caliper has developed a partially seized piston or worn pads that generate less force — a pre-existing asymmetry that was masked before the replacement and became apparent with the new caliper's improved performance.

100. B — Center-tread wear with full-depth shoulders is caused by chronic overinflation. Excessive tire pressure crowns the tread center outward, concentrating the tire's contact with the road on the center strip while lifting the shoulders away from the surface. Over thousands of kilometers, the center wears significantly faster than the edges. Setting the pressure to the door jamb placard specification prevents this pattern.

101. D — "Driver Frontal Airbag Resistance High" with the clockspring verified good means the excess resistance is between the clockspring and the airbag module. The connector at the airbag module, the short wiring run between the clockspring and the module, or corrosion at either connection point is adding resistance to the firing circuit. Even small amounts of corrosion at these connectors can push the circuit resistance above the ACM's acceptable window.

102. C — The pump motor is running (audible confirmation), so the pump, its wiring, and its fuse are functional. But no fluid reaches the windshield. The blockage or disconnection is between the pump's

output and the nozzles — a disconnected hose at the pump or nozzle, a kinked line, a cracked line that leaks fluid before it reaches the nozzles, or clogged nozzles that cannot pass the fluid despite adequate pump pressure.

103. B — The headlamp activation and dashboard dimming are typically controlled through separate circuits, even when triggered by the same ambient light sensor or BCM function. The headlamps turn on correctly (proving the light sensor and BCM headlamp output are functional), but the dashboard does not dim — indicating the dashboard illumination dimming circuit has a separate fault, or the dimmer setting has been manually adjusted.

104. A — The power lock actuator clicks (proving the electrical lock/unlock circuit is functional), but the door cannot be opened from either handle. Both handles operate the same latch mechanism through different mechanical linkages. If neither handle can release the latch, the latch mechanism itself has failed — a broken internal release lever, a seized pawl, or a jammed latch body prevents the latch from disengaging.

105. C — A heater core leak releases warm, glycol-laden coolant vapor into the HVAC airstream. This vapor carries significantly more moisture than normal cabin air, and the excess moisture condenses on the cold windshield surface faster than the defroster can evaporate it. The characteristic sweet antifreeze smell accompanying the persistent fogging confirms the heater core as the moisture source.

106. C — Many vehicles are factory-programmed with a two-stage unlock feature: the first fob press unlocks only the driver's door (for security — preventing all doors from unlocking simultaneously in a parking lot), and the second press unlocks all remaining doors. This is a configurable feature that can typically be changed through the vehicle's settings menu or by a dealer programming update.

107. A — A hybrid vehicle's electric drivetrain is significantly quieter than an ICE, making noises from other sources — such as a stone trapped between the brake rotor and dust shield — audible that would normally be masked by engine noise. The rhythmic clicking at wheel speed is a mechanical interference contact, not a drivetrain electrical fault.

108. D — The isolation resistance of 200 kΩ is exactly at the calculated minimum threshold (500 Ω/V × 400V = 200,000 Ω). While technically not below the minimum, being at the absolute boundary means any further insulation degradation — from moisture, abrasion, or aging — will drop the reading below the threshold and create a potential shock hazard. The degradation source must be identified and repaired proactively.

109. C — The BMS reports 100% SOC and the temperature is normal, yet the range is only 60% of the rated specification. Normal battery capacity degradation from aging and charge-discharge cycling has permanently reduced the total energy storage. 100% of a degraded battery stores less total energy (kWh) than 100% of a new battery, directly reducing the distance the vehicle can travel per charge.

110. B — The inverter contains large filter capacitors that, when empty, look like a dead short to the battery. If the main contactors closed directly against empty capacitors, the resulting inrush current (potentially thousands of amps) would weld the contactor contacts and damage the capacitors. The pre-charge circuit uses a resistor in series with a pre-charge contactor to gradually fill the capacitors before the main contactors close.

111. D — With only 72% state of health remaining, the battery stores 28% less energy than when new. The hybrid control module starts the ICE engine sooner because the reduced battery capacity reaches its minimum SOC threshold more quickly during driving. More frequent and longer ICE run time directly increases fuel consumption, producing the fuel economy decrease the owner has observed.

112. A — Many BEV manufacturers program the BMS to significantly reduce or terminate DC fast charging above 80% SOC. Charging lithium-ion cells at high current rates above 80% accelerates degradation from lithium plating, internal heating, and electrolyte decomposition. The BMS tapers the current dramatically to protect long-term battery health, making the last 20% take disproportionately longer.

113. C — Most hybrid and many BEV battery packs have a dedicated liquid cooling circuit that is completely separate from the engine cooling system. This circuit has its own reservoir, electric coolant pump, and often a dedicated heat exchanger or chiller. The coolant type and specification may differ from the engine coolant. The HV battery cooling circuit must be inspected and serviced independently.

114. B — Sustained high-power demand at highway speed combined with 38°C ambient temperature pushes the HV battery and inverter power electronics toward their thermal limits. The BMS and motor controller progressively reduce available power to prevent component temperatures from exceeding safe thresholds. This thermal derating is a normal protective function that resolves when the thermal load decreases.

115. A — A charge port locking mechanism physically secures the charging connector into the port during active charging. This lock also prevents the vehicle from being placed in Ready mode (which would enable the drive motor) while the connector is detected in the port. The vehicle cannot be shifted

into Drive or Reverse until the connector is released and removed, preventing drive-away with the cable attached.

116. C — Lithium-ion batteries can experience thermal runaway — a self-sustaining, exothermic chain reaction — under specific conditions such as physical cell damage, manufacturing defects, or extreme heat exposure. However, automotive HV batteries are engineered with multiple layers of protection: BMS cell-level monitoring, thermal management systems, fire-resistant cell separators, fused cell connections, and reinforced pack housings designed to prevent and contain thermal events.

117. C — The hybrid control module starts the engine during EV mode for several legitimate operational reasons: the HV battery SOC has dropped below the minimum threshold, the cabin heater demands more energy than the battery can efficiently provide, the accessory electrical load exceeds the battery's output capacity, or the driver's acceleration demand exceeds the electric motor's maximum power output. All of these are normal system responses, not faults.

118. D — The isolation monitor continuously measures the insulation resistance between the entire high-voltage electrical system and the vehicle's conductive chassis (body, frame, suspension). Its purpose is to detect any degradation in the insulation barrier that could allow current to leak from the HV system to the chassis, creating a shock hazard for occupants who contact the vehicle body or for technicians during service.

119. A — The HV battery cooling circuit is a dedicated liquid cooling loop with its own electric pump, reservoir, and heat exchanger. A "insufficient flow" DTC points to a fault within this dedicated circuit — low coolant level from a leak, a failed electric coolant pump, air pockets blocking flow, or a restricted passage. Each of these reduces the coolant flow rate below the BMS's required threshold for adequate battery thermal management.

120. C — Hybrid vehicles with start-stop systems cycle the 12V battery through significantly more discharge-recharge events than a conventional vehicle. Each engine-off period at a traffic light discharges the 12V battery, and each restart recharges it. A standard flooded lead-acid battery cannot withstand this deep cycling frequency and fails prematurely. Upgrading to an AGM battery designed for deep-cycle applications resolves the repeated failure pattern.

121. B — A "Reduced Charging Rate" message during a home Level 2 session after 30 minutes of normal charging commonly indicates the home electrical circuit is being loaded by other appliances. When the EVSE detects a voltage drop on its supply circuit from the combined load of the vehicle

charger plus household appliances, it reduces the charging current to prevent overloading the circuit breaker and household wiring.

122. D — The resolver is an electromagnetic sensor that measures the precise angular position and rotational speed of the motor's rotor in real time. The inverter requires this position data to correctly time the switching of current between the motor's phase windings (commutation). Without accurate rotor position feedback, the inverter cannot efficiently drive the motor or control its torque output.

123. A — HV batteries from hybrid and electric vehicles are recyclable. Specialized recycling facilities recover valuable materials including lithium, cobalt, nickel, manganese, copper, and aluminum through hydrometallurgical and pyrometallurgical processes. Additionally, batteries that have degraded below automotive standards but still retain 70-80% capacity are increasingly being repurposed for stationary energy storage applications before eventual recycling.

124. C — Cold temperatures increase the internal resistance of lithium-ion battery cells. Higher internal resistance limits both the maximum current the battery can accept during charging (slowing the charge rate) and the maximum current the battery can deliver during regenerative braking (reducing the regen deceleration force). Both symptoms share the same root cause — increased cell resistance from cold temperature.

125. B — Tire rotation, cabin air filter replacement, brake fluid inspection, and wiper blade replacement are all routine maintenance procedures that involve only conventional 12V components and mechanical parts. None of these services require interaction with any HV components, orange cables, or HV battery systems. The HV system can safely remain in its normal state throughout all of these procedures.