# PRACTICE EXAM 8: RED SEAL AUTOMOTIVE SERVICE TECHNICIAN SIMULATION (125 QUESTIONS)

1. A technician is removing a rusted brake line from a vehicle. The line fitting cracks and brake fluid sprays onto the technician's face, narrowly missing the eyes. The technician is wearing safety glasses but no face shield. What should be done immediately?

A. Wipe the fluid from the face with a clean shop rag and continue the repair, since brake fluid on intact skin causes only minor irritation that resolves without treatment

B. Continue wearing the safety glasses and finish removing the brake line before addressing the fluid contact, since the current position under the vehicle makes leaving the job hazardous

C. Flush the affected facial areas with clean water at the nearest eyewash station or sink for several minutes, and inspect the eyes for any fluid contact despite the safety glasses' protection

D. Apply the shop's chemical neutralization spray to the affected areas to deactivate the brake fluid's glycol compounds before flushing, since water alone does not neutralize glycol chemicals

2. A technician is pressure-washing an engine bay with a high-pressure water sprayer. What is the primary electrical hazard of this practice?

A. The high-pressure water can force moisture into the alternator's internal windings, permanently damaging the rectifier diodes and voltage regulator from internal short circuits

B. Water forced into electrical connectors, module housings, and sensor connections can cause corrosion, short circuits, intermittent faults, and DTCs that may not appear until days or weeks later

C. The water pressure can strip the insulation from wiring harness conductors, exposing bare copper that creates immediate short circuits to the engine block and other grounded surfaces

D. The water temperature from pressure washing is hot enough to melt the plastic connector bodies and wiring loom covers, creating permanent damage to the harness routing and retention

3. A vehicle arrives at the shop with a strong gasoline odor. The technician identifies a crack in the fuel rail that is actively weeping fuel onto the hot engine. What is the highest-priority action?

A. Place absorbent pads under the leak to contain the fuel while the vehicle is assessed for the repair scope and the necessary parts are ordered from the supplier

B. Spray the leaking area with cold water to cool the engine surface and dilute the fuel, reducing the fire risk until the repair can be properly scheduled and the parts obtained

C. Open all shop doors and activate the overhead ventilation to dilute the fuel vapor concentration while the technician begins disconnecting the fuel rail for replacement

D. Do not start or move the vehicle further inside the shop — evacuate the area, eliminate ignition sources, ventilate the space, and address the active fuel leak as a fire emergency before any other action

4. A technician is working under the hood of a running vehicle. The cooling fan is electric and is not currently spinning. Why must the technician still exercise caution around the fan blades?

A. Electric cooling fans can activate without warning at any time based on coolant temperature, A/C engagement, or module command, and can cause severe lacerations or amputations

B. The fan blade tips extend beyond the fan shroud on most vehicles, creating a striking hazard even when the fan is stationary if the technician reaches past the shroud during service

C. The fan motor generates a static electrical charge when stationary that can deliver a shock to anyone who contacts the fan blade or motor housing while reaching near the fan assembly

D. The fan blades are made of brittle composite material that fractures when contacted, creating sharp fragments that can cause deep puncture wounds if the fan is accidentally bumped or rotated

5. A technician needs to access the underside of a vehicle that is too low to fit a floor jack underneath. What is the correct approach to safely raise this vehicle?

A. Place the floor jack on a stack of wood blocks to raise its starting height, then jack the vehicle from the stacked platform to achieve adequate clearance for the jack saddle contact

B. Drive the vehicle's front wheels onto ramps first to gain initial clearance, then use the floor jack at the designated lift points to raise the vehicle further, and place jack stands for support

C. Use a pry bar to lever the front bumper upward while a co-worker slides the floor jack underneath, then jack the vehicle once the jack is positioned under the front crossmember contact

D. Partially deflate the vehicle's tires to lower the ride height enough for the floor jack to fit underneath, then reinflate the tires after the vehicle is raised and supported on jack stands

6. A technician discovers that a co-worker has been using a cracked extension cord to power a drop light in the shop. The outer insulation is split in two places, exposing the inner conductor insulation. What is the hazard?

A. The cracked insulation allows moisture to wick into the copper conductors through capillary action, creating galvanic corrosion that increases resistance and causes the cord to overheat

B. The cracked insulation allows electromagnetic interference to escape from the conductors, disrupting the shop's sensitive electronic equipment and potentially causing false readings on scan tools

C. The cracked insulation creates a tripping hazard because the exposed inner insulation is a different color than the outer jacket, making it harder to see against the shop's floor surface

D. The cracked outer insulation can allow the inner conductors to contact grounded metal surfaces or each other if the inner insulation is also compromised, creating a shock or fire hazard

7. A technician completes a brake pad replacement and needs to test drive the vehicle to verify the repair. Before leaving the shop, what safety check must be performed?

A. Pump the brake pedal several times with the engine running to verify a firm pedal before moving the vehicle, since the caliper pistons must be advanced to contact the new pads first

B. Check the tire pressures on all four tires to ensure they meet the manufacturer's specification before the test drive, since uneven pressures could affect the brake test results during driving

C. Test the ABS system by performing a hard stop in the shop parking lot before driving on public roads, confirming the ABS activates and releases correctly during the emergency stop maneuver

D. Verify the lug nut torque on all four wheels using a torque wrench, since the wheels were removed during the brake service and the lug nuts must be confirmed at specification before driving

8. What is the correct way to carry a fully charged lead-acid battery?

A. Carry the battery by the terminal posts using insulated pliers, since the posts are the strongest structural point on the battery and provide the most secure grip during transport

B. Carry the battery with one hand on the positive terminal and one hand on the negative terminal to balance the weight evenly and prevent the battery from tipping or dropping during transport

C. Use a battery carrier tool that grips the base or carry the battery by its built-in handle, keeping it upright to prevent electrolyte spillage and away from the body to avoid acid contact

D. Tilt the battery on its side and carry it under one arm like a book, since the sealed maintenance-free design prevents any electrolyte from escaping even when the battery is tilted on its side

9. A shop receives a vehicle that was involved in a flood. The interior has standing water above the floor level. What is the primary hazard technicians must consider before entering the vehicle?

A. The standing water may contain sewage or industrial contaminants that create a biohazard requiring PPE including waterproof boots, gloves, and respiratory protection before entry

B. The standing water has corroded the seat adjustment tracks to the point where the seat may collapse when the technician sits in it, creating a fall hazard inside the flooded vehicle cabin

C. The vehicle's carpet padding has absorbed water and increased in weight beyond the structural capacity of the floor pan, which may collapse under the technician's additional weight

D. The standing water may be in contact with live electrical circuits under the carpet, creating a potential electrical shock hazard that must be assessed before the technician enters the vehicle

10. A vehicle with a 3.5L V6 has a P0300 random misfire code. The freeze frame shows the misfire occurs at 1,200 RPM, 32% engine load, and 45°C coolant temperature. What is significant about the 45°C coolant temperature in the freeze frame?

A. The misfire was captured during the engine warmup phase, which suggests the fault is temperature-sensitive and may only occur when the engine is cold or during the transition to operating temperature

B. The 45°C reading is above the normal cold-start temperature, confirming the engine was fully warm and the misfire is not related to cold-start enrichment or warmup fuel strategy conditions

C. The 45°C reading indicates the coolant temperature sensor has failed, since a running engine at 1,200 RPM should be well above 80°C, and the incorrect temperature is likely causing the misfire

D. The 45°C reading is irrelevant to the misfire diagnosis because the coolant temperature does not affect combustion quality at any operating point on a modern computer-controlled engine

11. A four-cylinder engine has a P0304 misfire code on cylinder 4. The technician swaps the ignition coil from cylinder 4 to cylinder 2, clears codes, and test drives. The misfire remains on cylinder 4 — it does not follow the coil. The technician then swaps the fuel injector from cylinder 4 to cylinder 1, clears codes, and test drives. The misfire remains on cylinder 4. What diagnostic conclusion can be drawn?

A. The spark plug on cylinder 4 is the cause, since it was not swapped during the coil and injector tests and remains as the only ignition or fuel component not eliminated from the suspect list

B. Both the coil and injector are eliminated as causes. The fault is either the spark plug on cylinder 4, the cylinder's compression, or the wiring/connector specific to that cylinder position

C. The misfire is caused by an ECM injector driver fault for cylinder 4 that prevents any injector installed at that position from receiving the correct signal regardless of which physical injector is used

D. The wiring harness for cylinder 4's coil connector has a high-resistance fault that was not disrupted by the coil swap, and the same harness condition caused the misfire to remain at that position

12. An engine oil pressure warning light flickers briefly at idle when the engine is hot and the vehicle is stopped at a traffic light. The light turns off when the engine speed increases above idle. The oil level is correct and the correct viscosity oil was used at the last change. What is the most likely cause?

A. The oil pressure sensor has a fault that causes it to drop its signal at the specific voltage generated at hot idle, then restores the signal as the voltage increases slightly with RPM above idle

B. The oil filter bypass valve has opened from a restriction in the filter element, and the reduced filtered oil flow at hot idle drops the pressure below the sensor's warning threshold temporarily

C. The oil pump's internal relief valve spring has weakened from fatigue and is opening at hot idle pressure, venting oil back to the sump when the pump's output is at its lowest rotational speed

D. Worn engine bearings with increased clearance allow oil to escape faster than the pump can supply at the low output of hot idle, dropping the pressure briefly below the warning light threshold

13. A technician is diagnosing a no-start condition on a gasoline engine. The engine cranks normally. The scan tool shows no crankshaft position sensor signal during cranking. What should be checked first?

A. The crankshaft position sensor's air gap, connector, wiring, and the condition of the reluctor ring — since the ECM uses the CKP signal as the primary timing reference for fuel and ignition

B. The camshaft position sensor first, since many engines use the CMP signal as the primary reference and only fall back to the CKP signal when the CMP is unavailable during cranking

C. The distributor for a broken drive gear, since the CKP sensor is driven by the distributor on this engine and a broken gear would prevent the sensor from generating its signal during cranking

D. The timing belt or chain for a catastrophic failure that has stopped the crankshaft from rotating, since the scan tool shows no CKP signal despite the starter motor attempting to crank the engine

14. A vehicle has a rich condition with negative fuel trims (LTFT −15%) and elevated CO at the tailpipe. The MAF sensor reads correctly per the scan tool specification. No vacuum leaks are present. What should be investigated?

A. The fuel injectors for leaking internally, since dribbling injectors add unmetered fuel to the cylinders that the ECM cannot subtract because it doesn't know the fuel was delivered outside the pulse width

B. The upstream oxygen sensors for a lean bias that causes the ECM to add fuel unnecessarily, since the ECM would show positive (not negative) fuel trims if it were adding fuel to correct a perceived lean

C. The fuel pressure for a reading above specification, leaking injectors delivering fuel outside the commanded pulse width, or a stuck-open EVAP purge valve adding fuel vapor to the intake uncontrolled

D. The catalytic converter for a failure that is back-pressuring the exhaust and preventing the engine from scavenging properly, creating a rich condition from trapped exhaust gas in the combustion chambers

15. An engine has a P0401 (EGR Insufficient Flow) code. The scan tool commands the EGR valve to open 50%. The engine RPM drops slightly when the valve opens, but the code returns after a drive cycle. What does the RPM drop during the commanded test confirm?

A. The EGR valve is opening and exhaust gas is flowing, but the flow volume may be less than the specification the ECM's EGR monitor expects during the actual driving conditions of the monitor test

B. The EGR valve is operating correctly and the code is a false detection caused by a software calibration error in the ECM's EGR monitoring algorithm that should be addressed with a software update

C. The EGR valve opens but the RPM drop indicates it is opening in the wrong direction (allowing air in instead of exhaust gas out), which produces the RPM drop without providing actual EGR flow

D. The EGR cooler has failed and is preventing the exhaust gas from reaching the correct temperature for the EGR monitor to detect it, even though flow is present and causes the idle RPM to drop

16. A direct injection diesel engine's fuel injectors have been inspected and one injector shows a return fuel quantity three times higher than the other five injectors during the injector balance rate test. What does the excessive return quantity indicate?

A. The injector is returning fuel at a normal rate and the other five injectors have restricted return lines that artificially reduce their measured return quantities during the balance rate test

B. The injector has excellent internal sealing and is returning excess fuel because it is delivering less than commanded, sending the unused portion back through the return line during each cycle

C. The injector's internal sealing surfaces are worn, allowing fuel to bypass the injector's internal components and return to the tank without being injected into the combustion chamber at the commanded pressure

D. The injector is delivering the correct quantity to the cylinder but the return line has a restriction downstream that creates backpressure, forcing more fuel than normal back through the return path

17. A vehicle's engine stumbles momentarily during hard acceleration but recovers within one second. The scan tool shows a brief dip in fuel pressure during the stumble. What is the most likely cause?

A. The ignition coils are producing weak spark under the high cylinder pressures of hard acceleration, and the momentary misfire is misinterpreted by the scan tool as a fuel pressure dip from the RPM change

B. The throttle body has a carbon deposit at the edge of the throttle plate that momentarily restricts airflow during the rapid opening transition, causing the stumble before the plate clears the deposit

C. The fuel pump cannot maintain adequate flow volume during the sudden high-demand transition to hard acceleration, causing a momentary pressure drop that creates the stumble until the pump catches up

D. The variable valve timing system's oil control valve has a delayed response to the sudden load change, retarding the cam timing momentarily before the valve moves to the correct high-load position

18. An engine has a P0016 code (CKP-CMP Correlation Bank 1 Sensor A). The timing chain was replaced 15,000 km ago. The engine runs with slightly reduced power but no other symptoms. What should be checked before assuming the new chain has already stretched?

A. The VVT oil control valve on bank 1 intake for a sticking condition that holds the camshaft in a partially advanced or retarded position, creating a correlation error between the CKP and CMP signals

B. The CKP sensor itself for a signal amplitude that has weakened from an increased air gap or contaminated sensor tip, causing the ECM to misinterpret the timing of the crankshaft position signal

C. The ECM's software calibration for a known issue with the correlation monitoring algorithm that may have been addressed in a TSB or software update since the timing chain was replaced

D. The camshaft phaser's internal lockpin mechanism for a failure that prevents the phaser from returning to its default position during startup, holding the cam in an unexpected position during cold operation

19. A diesel engine produces excessive black smoke during acceleration. The turbocharger boost pressure reaches specification. The air filter is clean. What else could cause the excessive black smoke despite adequate boost?

A. The intercooler has an internal restriction from accumulated oil residue that is reducing the air charge density despite the boost pressure being at specification at the compressor outlet before the cooler

B. The exhaust gas recirculation valve is stuck open, diluting the intake charge with excessive inert exhaust gas and displacing the fresh oxygen-rich air needed for complete diesel combustion

C. The glow plug system is failing to preheat the combustion chambers adequately during cold operation, but this would only cause white smoke at startup rather than black smoke during acceleration

D. The fuel injection timing has advanced beyond specification, causing the fuel to ignite too early in the compression stroke when air temperature is insufficient for complete combustion of the fuel charge

20. A five-gas exhaust analyzer shows the following results at 2,500 RPM on a warm engine: HC = 45 ppm, CO = 0.2%, $CO_2$ = 15.1%, $O_2$ = 0.3%. What do these readings indicate about the engine's combustion and catalyst efficiency?

A. The readings indicate a lean misfire condition because the HC is too low and the $O_2$ should be higher if combustion were occurring efficiently at the correct air-fuel ratio for this engine speed

B. The readings indicate a rich condition because the $CO_2$ percentage is above the maximum expected value, and the high $CO_2$ indicates excess fuel being converted through the catalytic converter

C. The readings indicate a properly functioning engine with efficient combustion and an effective catalytic converter — low HC, low CO, high $CO_2$, and low $O_2$ are the signatures of a healthy system

D. The readings are inconclusive because the five-gas analyzer cannot provide meaningful data at 2,500 RPM, as the analysis is only valid at idle speed where the exhaust composition is stable

21. An engine has a slight coolant leak that has been traced to the water pump weep hole. The leak is a slow drip that leaves a small puddle overnight. What does a leak from the weep hole specifically indicate?

A. The water pump housing gasket has failed between the pump body and the engine block, allowing coolant to seep past the gasket and exit through the weep hole drainage path to the exterior

B. The cooling system pressure cap is holding pressure above specification, forcing coolant past the pump's internal seal and out through the weep hole, which serves as the system's overpressure relief

C. The water pump's internal shaft seal has failed, allowing coolant to leak past the seal from the pressurized cooling jacket side to the atmosphere through the weep hole that separates the coolant from the bearing

D. The thermostat is stuck closed, creating excessive system pressure that forces coolant through the water pump's bearing housing and out the weep hole, which serves as the emergency pressure relief

22. A vehicle has a rough idle and elevated HC emissions. The scan tool shows stable fuel trims near zero and no misfire codes are present. A cylinder power balance test shows all six cylinders contribute equally. What could still cause the rough idle and elevated HC?

A. A catalytic converter that has degraded and is no longer oxidizing the hydrocarbons in the exhaust, causing the elevated tailpipe HC without affecting the engine's combustion quality or fuel trim values

B. An exhaust manifold leak that introduces fresh air into the exhaust stream, diluting the exhaust and causing the gas analyzer to report a falsely high HC reading from the oxygen contamination

C. A fouled mass airflow sensor that is simultaneously overreporting and underreporting airflow at different throttle positions, creating a balanced average that keeps fuel trims near zero despite poor combustion

D. A restricted fuel return line that maintains correct pressure at the rail but creates pulsations in the fuel delivery that produce the rough idle sensation without affecting the cylinder balance or fuel trims

23. A turbocharged engine has a DTC for wastegate position error. The scan tool shows the wastegate is commanded fully closed but the actual position reads 15% open. What symptom would this produce?

A. Excessive boost pressure that exceeds the target because the wastegate is closed beyond its commanded position, forcing all exhaust through the turbine and generating more boost than requested

B. Normal boost pressure at all operating conditions because the 15% discrepancy is within the ECM's acceptable tolerance range and does not affect the turbocharger's ability to meet the boost target

C. Erratic boost pressure that oscillates between overboost and underboost as the ECM attempts to correct the wastegate position but overshoots in both directions due to the position sensor error

D. Reduced boost pressure because the partially open wastegate allows exhaust gas to bypass the turbine even when the ECM commands full closure, reducing the energy available to drive the compressor

24. A vehicle's scan tool data shows that the engine coolant temperature reads −40°C with the engine at operating temperature. The actual temperature measured with an infrared thermometer at the thermostat housing is 92°C. What is the most likely cause of the −40°C reading?

A. The coolant temperature sensor has been replaced with the wrong part number that has a different resistance curve, producing the extreme low reading at the actual operating temperature

B. The ECT sensor circuit has an open circuit — either in the sensor's internal thermistor element, its wiring, or its connector — and −40°C is the default value the ECM displays when it sees maximum resistance (open circuit) on the sensor input

C. The ECM's internal analog-to-digital converter for the ECT sensor channel has failed, producing a fixed minimum value regardless of the actual voltage signal received from the functional sensor circuit

D. The coolant temperature sensor ground wire has high resistance from corrosion at its splice, creating a voltage offset that the ECM interprets as the extreme cold temperature of −40°C on its calibration curve

25. A diesel engine equipped with selective catalytic reduction (SCR) has a NOx sensor downstream of the SCR catalyst that reads higher than expected NOx levels. The DEF quality and quantity are confirmed correct. What should be checked?

A. The turbocharger for an overspeeding condition that increases the combustion temperature beyond the SCR catalyst's reduction window, producing NOx levels that exceed the system's capacity

B. The EGR system is not recirculating enough exhaust to control combustion temperatures, allowing excessive NOx formation that the SCR system cannot fully reduce despite adequate DEF delivery

C. The diesel oxidation catalyst upstream of the SCR for a failure that is allowing unburned hydrocarbons to poison the SCR catalyst surface and prevent it from performing the NOx reduction reactions

D. The fuel injection timing for a deviation that is causing combustion to occur at a higher pressure and temperature than designed, producing NOx levels beyond what the correctly functioning SCR can reduce

26. An engine has a persistent P0442 code (EVAP System Small Leak Detected). The fuel cap seals correctly and a smoke test reveals no visible leaks. What specialized technique can locate a very small EVAP leak that smoke testing cannot visualize?

A. A nitrogen pressure decay test where the system is sealed and pressurized with dry nitrogen, then monitored with a precision pressure gauge for a gradual pressure drop that indicates a leak too small for visible smoke

B. A refrigerant leak detector repurposed for EVAP testing by injecting a small amount of refrigerant into the system and scanning all components with the electronic detector for the escaping refrigerant molecules

C. An ultrasonic leak detector that listens for the high-frequency sound produced by air escaping through a small orifice, which is inaudible to the human ear but detectable by the specialized microphone

D. A dye injection test where fluorescent dye is added to the fuel and the entire EVAP system is inspected under UV light after several drive cycles to locate the dye residue at the leak point

27. An engine has an intermittent stalling condition that occurs only when the vehicle makes sharp left turns. The engine restarts immediately. What is the most likely cause?

A. The fuel level is very low, and the sharp left turn causes the fuel to slosh away from the fuel pump pickup tube, momentarily uncovering the pickup and causing the pump to draw air instead of fuel

B. A loose or corroded electrical connector or ground strap on the driver's (left) side of the engine bay that momentarily loses contact when the engine shifts on its mounts during the sharp left turn

C. The crankshaft position sensor's air gap is at its maximum specification, and the engine's shift during the left turn increases the gap beyond the sensor's detection range, dropping the CKP signal

D. The power steering pump's load during the sharp left turn overwhelms the engine's idle speed compensation, and the engine stalls from the excessive parasitic load before the ECM can increase the idle

28. A vehicle has a lean condition on one bank only. The fuel trims normalize when the upstream oxygen sensor connector for that bank is disconnected. What does this tell the technician?

A. Disconnecting the sensor forces the ECM into open-loop mode with a fixed fuel map, which masks the lean condition but does not eliminate it — the lean cause still exists but is not being corrected

B. The lean condition is being caused by the fuel trim system's response to a faulty upstream oxygen sensor signal, not by an actual lean mixture — the sensor is providing false lean data to the ECM

C. The wiring harness for the upstream sensor has a short to ground that pulls the sensor's signal low, mimicking a lean reading, and disconnecting the sensor removes the shorted wire from the circuit

D. The upstream oxygen sensor on the affected bank is reporting a false lean condition due to internal contamination or electrical drift, causing the ECM to add fuel unnecessarily based on the erroneous signal

29. A naturally aspirated engine has a low power complaint. The scan tool shows the calculated engine load at WOT is 78%. A healthy engine of this type should show 85-95% calculated load at WOT. What does the reduced load reading indicate?

A. The engine is not ingesting as much air as the ECM expects at wide-open throttle, which could be caused by a restricted air filter, restricted exhaust, a timing deviation, or low compression reducing volumetric efficiency

B. The fuel pump is producing adequate pressure but insufficient volume, and the ECM reduces the calculated load display to protect the catalytic converter from the lean condition during WOT operation

C. The ECM's internal load calculation algorithm has a calibration error that can be corrected with a software update, since the engine's actual performance may be normal despite the low displayed load value

D. The engine's variable valve timing system is stuck in the low-RPM fuel economy position and cannot shift to the high-RPM power position, reducing the volumetric efficiency at WOT by restricting valve timing

30. A vehicle has a P0300 random misfire code that only occurs during the first two minutes of driving after a cold start. The misfire clears completely once the engine reaches operating temperature. What temperature-dependent condition could cause this pattern?

A. The cold-start enrichment strategy is commanding excessive fuel that temporarily floods multiple cylinders until the engine warms enough for the ECM to transition from open-loop cold enrichment to closed-loop control

B. The exhaust manifold gaskets have minor leaks that allow cold outside air to be drawn past the gaskets during the high manifold vacuum of cold idle, diluting the exhaust and triggering false misfire detection

C. The intake manifold runner flaps are stuck in the high-RPM position, and the increased runner cross-section at cold idle reduces the air velocity below the threshold needed for reliable fuel atomization

D. The cylinder head's valve guide seals have hardened from heat cycling and contracted at cold temperatures, allowing oil to seep past them and foul the spark plugs until the seals warm and expand to seal

31. A diesel engine has a hard start condition. During cranking, the fuel rail pressure builds to only 40% of the specified cranking pressure. The low-pressure supply pump produces adequate pressure at its outlet. What component between the supply pump and the rail is most likely causing the pressure shortfall?

A. The fuel injectors have excessive internal return leak rates that drain the rail faster than the high-pressure pump can fill it during the low cranking speed, preventing the rail from reaching starting pressure

B. The fuel rail itself has a crack that leaks under the high pressure of the common rail system, allowing fuel to escape externally before the rail can build to the specified cranking pressure during starting

C. The fuel rail pressure sensor has a calibration offset that causes it to underreport the actual pressure, creating the appearance of low pressure when the rail is actually at or near the specification

D. The high-pressure fuel pump has worn internal components (pistons, check valves, or seals) that cannot generate the specified rail pressure at the low rotational speed of engine cranking

32. A vehicle's instrument cluster randomly resets — the gauges sweep to zero and return to their normal positions, then resume normal display. This happens once or twice per drive cycle. No DTCs are stored in any module. What is the most likely cause?

A. The instrument cluster has a failing internal power supply capacitor that periodically drops voltage below the minimum, causing the cluster's microprocessor to briefly reset before the capacitor recovers

B. The instrument cluster's power or ground connection has an intermittent contact fault that causes a brief power interruption, triggering the cluster's power-on self-test routine (the gauge sweep) each time

C. The CAN bus has a brief communication dropout that causes the cluster to lose its data feed momentarily, triggering the gauge sweep as the cluster re-initializes its data display after the dropout

D. The BCM is commanding the cluster to perform a self-test as part of a periodic diagnostic routine that runs during normal driving, and the gauge sweep is the visible manifestation of this scheduled test

33. A vehicle's rear camera image appears on the infotainment screen when reverse is selected, but the image is extremely dark — nearly black. The camera worked correctly until recently. What is the most likely cause?

A. The camera's lens is physically blocked by dirt, mud, or snow that has accumulated on the lens surface, preventing light from reaching the image sensor inside the camera housing during reverse operation

B. The infotainment head unit's brightness setting for the camera input has been accidentally reduced to minimum by a passenger who accessed the settings menu while using the rear seat entertainment controls

C. The camera's internal image sensor has failed and is producing a black image signal that the head unit displays accurately — the camera's power and communication are functional but its image output is not

D. The camera's power supply has a high-resistance connection that provides enough voltage for the camera to power on and communicate but insufficient voltage for the image sensor's illumination and processing

34. After programming a replacement ECM, the vehicle starts but the A/C compressor does not engage. No A/C-related DTCs are present. All other systems function normally. What is the most likely cause?

A. The replacement ECM's as-built configuration data does not include the A/C compressor option, and the ECM is not commanding the compressor relay because it believes the vehicle has no A/C system

B. The A/C compressor clutch relay was accidentally left disconnected during the ECM replacement and was not reconnected, preventing the relay from receiving the ECM's engage command signal

C. The replacement ECM requires a separate A/C system initialization procedure that pairs the new module with the existing A/C pressure transducer before the ECM will enable compressor operation

D. The A/C refrigerant pressure sensor needs to be recalibrated to the replacement ECM's internal reference voltage, since the new ECM's reference may differ slightly from the original module's output

35. A vehicle has multiple DTCs across several modules — all related to signal plausibility or range errors rather than communication loss. What type of fault could produce multiple plausibility codes simultaneously across different systems?

A. A charging system voltage that is out of specification (too high or too low) can cause multiple sensor signals throughout the vehicle to read outside their expected ranges, triggering plausibility codes across systems

B. A software version mismatch between the ECM and other modules following a partial software update can cause the modules to interpret each other's data with different scaling factors, producing range errors

C. A failing CAN bus terminating resistor that has drifted from 120 ohms to 150 ohms can corrupt data values on the bus, causing receiving modules to see out-of-range values from correctly functioning sensors

D. A single faulty wheel speed sensor can cascade plausibility errors through the ABS, ESC, transmission, and engine modules because all systems reference the wheel speed data for their calculations

36. A vehicle's scan tool shows that the transmission control module is in "Recovery Mode" after the ECM was reprogrammed. The TCM has no DTCs. What does recovery mode indicate?

A. The TCM has detected that its stored calibration data does not match the new ECM's software version and has entered a protective operating mode until the TCM is also updated to the matching version

B. The TCM has detected an internal hardware fault in its solenoid driver circuits and has disabled all electronic shift control, defaulting to a hydraulic-only operating mode for limited drivability

C. The TCM is performing an extended self-learning cycle after the ECM reprogramming and will exit recovery mode automatically after approximately 50 km of mixed driving conditions are completed

D. The TCM has been placed in recovery mode by the programming tool and requires a manual reset command through the scan tool to return to normal operating mode after the ECM programming session

37. A technician is diagnosing a CAN bus fault. The oscilloscope shows CAN-H pulsing between 2.5V and 3.5V correctly, but CAN-L shows a flat line at 0V instead of pulsing between 2.5V and 1.5V. What does the CAN-L at 0V indicate?

A. The CAN-L wire has an open circuit at the point where it connects to the first module on the bus, preventing any module from generating the CAN-L complementary signal on the disconnected wire

B. A module on the bus has a failed CAN transceiver that is clamping the CAN-L line to ground, preventing the normal 2.5V bias from appearing and eliminating the differential signal on that line

C. The CAN bus is operating in a degraded single-wire mode where only CAN-H carries the data signal and CAN-L is intentionally grounded by the modules as a reference for the remaining active signal

D. The CAN-L wire has a short to ground somewhere in the harness — either a chafed wire contacting body metal, a connector pin shorted to the housing, or a module with an internally grounded CAN-L pin

38. A vehicle's remote start system successfully starts the engine, but the engine shuts off after exactly three seconds. No DTCs are stored. What is the most common cause of this behavior?

A. The vehicle's immobilizer system is detecting the start as an unauthorized attempt because the key fob's transponder signal is not present inside the vehicle during the remote start engine operation

B. The engine oil pressure has not risen to the minimum threshold within the three-second window that the remote start system uses as a safety check before allowing continued engine operation

C. The remote start system detects a safety condition that requires engine shutdown — most commonly the hood is reported as open by the hood latch switch, which many systems require to be closed for safety

D. The vehicle's fuel level is below the minimum threshold for remote start operation, and the system shuts the engine off after three seconds to prevent the vehicle from running out of fuel while unattended

39. A vehicle's adaptive cruise control maintains speed on the highway but does not slow down when approaching a vehicle ahead — the driver must manually brake. The system shows no fault messages. What should be checked?

A. The driver's seat belt buckle switch, since some ACC systems require the driver's seatbelt to be fastened before they will engage the automatic braking function during following-distance control

B. The ACC system's following-distance setting, which may have been set to the maximum (farthest) distance that the vehicle ahead has not yet entered, making the system appear to not respond

C. The forward radar sensor calibration data for a drift from its original settings that has narrowed the sensor's detection beam width, causing it to miss vehicles that are not directly centered in its detection cone

D. The forward radar sensor for contamination, misalignment, or an obstruction that allows the ACC speed control function to operate (using wheel speed) but prevents the distance detection that triggers automatic deceleration

40. A technician needs to perform a battery disconnect on a vehicle with multiple electronic features (power seats, sunroof, windows, radio, clock, etc.). What step should be taken before disconnecting the battery to minimize the post-reconnection work?

A. Document all customer personalization settings (radio presets, seat positions, mirror angles, climate preferences) since many of these settings will be lost during the battery disconnection event

B. Record the current odometer reading in writing before disconnecting the battery, since some vehicles lose their accumulated mileage data when battery power is removed from the instrument cluster

C. Remove all fuses from the fuse box before disconnecting the battery to prevent any voltage spikes from reaching the modules when the battery cable is removed from the terminal post

D. Run the engine at 2,000 RPM for five minutes before disconnecting to ensure all module capacitors are fully charged and will retain their data for the maximum duration during the battery-disconnected period

41. A vehicle's ambient temperature display reads −10°C on a day when the actual temperature is 22°C. What is the most likely cause?

A. The instrument cluster's internal temperature compensation circuit has failed, adding a fixed negative offset to the ambient temperature reading that makes it appear significantly colder than actual

B. The BCM is receiving the correct ambient temperature data from the sensor but is applying an incorrect calibration table from a different vehicle model's software loaded during a previous programming session

C. The ambient temperature sensor — typically located behind the front bumper or grille — has a fault (open circuit, short circuit, or contamination) that produces an incorrect resistance value at the current temperature

D. The HVAC system is currently in recirculation mode, and the sensor is reading the cold A/C discharge temperature from the evaporator instead of the outside ambient air temperature from behind the grille

42. What does the "pending" status of a DTC in the scan tool data indicate?

A. The fault condition has been detected by the monitor but has not yet occurred enough times or on enough consecutive drive cycles to meet the criteria for confirming the code and illuminating the check engine light

B. The DTC was previously confirmed and the check engine light was illuminated, but the fault has not recurred during the most recent drive cycle and the ECM is waiting to clear it automatically

C. The DTC is waiting for the technician to acknowledge it with the scan tool before the ECM will promote it to a confirmed code, since pending codes require manual confirmation before illuminating the MIL

D. The monitoring system has detected a marginal condition that is approaching but has not yet crossed the fault threshold, and the pending code serves as an early warning before the actual fault develops

43. A vehicle has a U0155 code (Lost Communication with Instrument Panel Cluster) stored in the ECM. The instrument cluster is completely dark — no gauges, no warning lights, no display. What is the most likely cause?

A. The CAN bus backbone has a complete failure that prevents all module communication, but the instrument cluster is the only module that displays symptoms visually while other modules operate silently

B. The instrument cluster has lost its software during a corrupted update attempt and requires reprogramming with the manufacturer's diagnostic tool before it can resume operation on the network

C. The instrument cluster has a complete power supply or ground failure that prevents it from operating and communicating — since it cannot power on, it cannot participate on the CAN bus, causing the U-code

D. The instrument cluster has a failed internal CAN transceiver that prevents communication while all other cluster functions (gauges, lights) should still operate on the cluster's independent local power circuit

44. A manual transmission vehicle makes a buzzing noise at idle in neutral with the clutch engaged. The noise disappears when the clutch pedal is depressed even slightly. Shifting into any gear also eliminates the noise. What is the source of the buzz?

A. The transmission's countershaft or input shaft gear set rattles from the engine's torsional pulses at idle, and either depressing the clutch (stopping input shaft rotation) or selecting a gear (loading the gears) eliminates the rattle

B. The release bearing is vibrating against the pressure plate diaphragm spring fingers at the light contact pressure of the idle position, and depressing the pedal either loads or unloads the bearing to stop the vibration

C. The pilot bearing is worn and allows the input shaft tip to vibrate inside the crankshaft bore at idle frequency, and depressing the clutch shifts the shaft position enough to change the vibration pattern

D. The flywheel's ring gear is loose and vibrating against the flywheel body at the specific frequency of idle RPM, and engaging a gear loads the ring gear through the starter motor circuit and stops the vibration

45. An automatic transmission shifts firmly from 1st to 2nd at light throttle, but all other shifts (2-3, 3-4, and downshifts) are smooth. What does this isolated harsh shift indicate?

A. The 1-2 shift solenoid is responding too quickly, causing an abrupt pressure rise that applies the second-gear clutch pack faster than the accumulator can cushion the engagement during the transition

B. The main line pressure regulator is set too high for all circuits, but the 1-2 shift is the most sensitive to excessive pressure because it occurs at the lowest vehicle speed where the shock is most perceptible

C. The 1-2 accumulator piston seal is leaking or the accumulator spring is broken, preventing the accumulator from cushioning the second-gear clutch apply pressure during the shift transition event

D. The first-gear one-way clutch is not releasing cleanly during the 1-2 shift, momentarily causing both first and second gear to be simultaneously engaged before the one-way clutch fully releases

46. A four-wheel-drive truck has a transfer case that shifts smoothly between 2H and 4H but makes a loud grinding noise when attempting to shift into 4L. The vehicle is stopped with the transmission in neutral. What is the most likely cause?

A. The transfer case's low-range synchronizer or sliding gear mechanism is worn and cannot match the speeds of the two gear sets during the engagement attempt, causing the grinding as the teeth clash

B. The transfer case fluid is contaminated with water that has frozen inside the low-range gear set and is mechanically preventing the sliding gear from meshing with the low-range drive gear during the shift

C. The front axle disconnect mechanism is interfering with the 4L engagement because the front axle must be disconnected before the low-range set can engage on this specific transfer case configuration

D. The transmission is not fully in neutral despite the shift lever being in the neutral position, and residual transmission gear loading is preventing the transfer case from completing the low-range engagement

47. A front-wheel-drive vehicle equipped with an automatic transaxle has a rhythmic vibration at highway speed. The vibration frequency does not change with engine RPM — it remains constant

relative to vehicle speed. The tires have been balanced and the vibration persists. What should be checked?

A. The engine mounts for deterioration that allows the engine to vibrate at a frequency that happens to correspond to the vehicle speed, creating the perception of a speed-related vibration from the powertrain

B. The transaxle mounts for deterioration that allows the transaxle to shift under acceleration forces, changing the half-shaft angles and producing a vibration proportional to wheel rotational speed

C. The exhaust system flex pipe for a failure that allows the exhaust pipe to contact the vehicle body at a specific resonance point that corresponds to the wheel speed at the affected highway speed range

D. The half-shaft(s) for a bent shaft, damaged CV joint, or missing balance weight that produces a vibration proportional to wheel speed, since the half-shafts rotate at wheel speed on a FWD vehicle

48. A customer reports that their automatic transmission "slips" during 1-2 upshifts when the vehicle is cold, but shifts normally once the transmission reaches operating temperature. What does this temperature-dependent behavior indicate?

A. The cold transmission fluid is too thick to flow through the valve body passages quickly enough to apply the second-gear clutch in time, causing a momentary flare that feels like a slip during the 1-2 shift

B. The 1-2 shift clutch pack has a worn piston seal that leaks when the fluid is cold and thick, but seals adequately once the fluid warms and the seal softens and expands to its operating temperature flexibility

C. The torque converter is allowing excessive slippage during cold operation because the cold, viscous fluid cannot generate the hydrodynamic coupling force needed for a crisp 1-2 shift engagement event

D. The transmission's electronic pressure control solenoid commands lower pressure during cold operation as a protective measure, and the reduced pressure causes the perceived slip during the 1-2 shift transition

49. A rear differential produces a rhythmic "clunking" noise only during slow, tight turns in a parking lot. The noise occurs at a regular interval and comes from the rear axle area. The vehicle has a conventional open differential. What is the most likely cause?

A. The ring and pinion gear mesh has developed a pattern defect from a previous improper setup, and the mesh noise is only audible during the low-speed, low-noise conditions of parking lot maneuvering

B. The differential's spider gears and the side gear thrust washers are worn, and the spider gears are catching and releasing on the worn thrust surfaces during the slow speed differential action of tight turns

C. A chipped or broken tooth on the ring gear that produces a single clunk per revolution of the ring gear, audible only during the quiet, low-speed conditions where road and tire noise do not mask the sound

D. The axle shaft splines are worn and the shafts are catching and releasing within the side gear splines as torque transfers between the left and right wheels during the differential action of tight parking turns

50. A vehicle with an electronically controlled automatic transmission has a DTC for "Slip Detected" in the torque converter clutch circuit. The scan tool data shows the input speed and output speed should be equal when the TCC is locked, but a 50 RPM difference exists. What does the 50 RPM slip indicate?

A. The torque converter clutch is not achieving full lockup due to worn friction material, insufficient apply pressure, contaminated fluid, or a mechanical fault in the converter that allows the 50 RPM slip

B. A 50 RPM difference between input and output speed is within the normal operating tolerance for a locked torque converter clutch and does not indicate a fault — the DTC is a false detection from sensor noise

C. The input speed sensor is reading slightly high due to a calibration drift, creating an apparent 50 RPM difference that does not represent actual mechanical slip in the torque converter clutch apply mechanism

D. The transmission output speed sensor has a mounting fault that positions it closer to the tone ring than specified, causing it to produce a higher-frequency signal that the TCM calculates as 50 RPM fewer

51. A dual-clutch transmission (DCT) has a fault code for clutch 1 slip. The scan tool data shows the clutch 1 touch point has moved significantly from its original learned position. What does this touch point migration indicate?

A. The clutch 1 hydraulic actuator has developed an internal leak that requires more piston travel to build adequate clamping force, and the touch point migration reflects the additional travel needed

B. The clutch 1 friction material has worn significantly, requiring the clutch actuator to travel further before the disc contacts the pressure plate — the touch point migration reflects the physical wear of the disc

C. The mechatronic unit's position sensor for clutch 1 has drifted from calibration, reporting a different position than the actual piston travel, and the apparent touch point migration is a sensor error

D. The clutch 1 release bearing has worn, adding dead travel to the actuator's stroke that must be taken up before the clamping force begins, shifting the touch point without any clutch disc wear present

52. A customer complains of a vibration during acceleration that is felt through the steering wheel. The vibration is absent during steady cruising and coasting. The vehicle is front-wheel-drive. What is the most likely cause?

A. An unbalanced front tire that produces vibration at a specific wheel speed coincidentally reached only during the RPM range of acceleration, disappearing at the constant wheel speed of cruising

B. A worn engine mount that allows the engine and transaxle to shift under acceleration torque, changing the half-shaft operating angles and producing vibration transmitted through the steering column

C. A worn intermediate steering shaft universal joint that binds under the torsional loads transmitted through the subframe during acceleration, creating a vibration felt in the steering wheel during the load event

D. A worn or damaged inner CV joint (tripod joint) that produces vibration under the acceleration torque loading of the half-shaft but is unloaded and silent during cruising and coasting conditions

53. A vehicle's clutch pedal effort has gradually increased over the past several months. The pedal feel is progressively stiffer, and the clutch still engages at the correct point. What is the most likely cause?

A. The pressure plate diaphragm spring has increased in tension from heat-induced metallurgical changes, requiring more pedal effort to deflect the spring and release the clutch disc from the flywheel face

B. The clutch master cylinder's internal bore is corroding, creating friction between the piston seal and the bore wall that adds progressive resistance to the pedal effort as the corrosion worsens over time

C. The release bearing guide tube (the sleeve the bearing slides on) has corroded or worn, creating friction that progressively increases the effort required to slide the bearing along the tube during pedal operation

D. The clutch cable (on cable-operated systems) or the clutch hydraulic hose (on hydraulic systems) has developed internal deterioration that restricts movement and progressively increases the pedal resistance

54. An AWD vehicle has a vibration at 80 km/h that was not present before a rear differential service. The differential was drained and refilled with the correct gear oil specification. What could the technician have done incorrectly during the service?

A. The differential drain plug was reinstalled with a damaged crush washer that is allowing a slow fluid leak, and the reduced fluid level has caused bearing noise that manifests as a vibration at highway speed

B. The differential was overfilled, and the excess fluid is foaming from gear churning at highway speed, creating hydraulic interference with the ring and pinion mesh that produces the speed-dependent vibration

C. The differential cover was reinstalled with a section of the gasket pinched or misaligned, creating a leak that has already reduced the fluid level below the minimum for adequate gear and bearing lubrication

D. The wrong gear oil viscosity or specification was used despite the label matching, and the incorrect fluid properties are causing the ring and pinion to operate at a different mesh pattern that produces vibration

55. A vehicle's automatic transmission shifts normally but the shift indicator on the instrument cluster shows the wrong gear — it displays "3" when the transmission is actually in 4th gear. No DTCs are stored. What is the most likely cause?

A. The transmission range sensor (manual lever position sensor) has a calibration error in the display output that is separate from its shift control output, causing the cluster to display the incorrect gear position

B. The instrument cluster's shift indicator circuit has a display fault that is showing an incorrect gear position based on a miscalculation of the CAN bus data it receives from the TCM during normal operation

C. The TCM is commanding the correct shift but broadcasting an incorrect gear position on the CAN bus to the instrument cluster due to a software fault or a lookup table error in the TCM's programming

D. The transmission's internal position sensors (input speed, output speed) have slight calibration differences that cause the TCM to calculate the wrong gear ratio for display while commanding the correct shift

56. A rear-wheel-drive vehicle has a single "clunk" when the vehicle transitions from coasting to acceleration. The U-joints have been replaced recently. What should be checked for as the source of the remaining clunk?

A. The transmission output shaft bearing for play that allows the shaft to shift position when the torque direction reverses from deceleration to acceleration, producing the single clunk during the load reversal

B. The differential pinion nut for insufficient torque that allows the pinion to shift forward and backward in its bore during load reversals, creating the clunk that occurs during the coast-to-drive transition

C. The engine or transmission mount for deterioration that allows the powertrain to shift on the mounts during the coast-to-drive torque transition, producing a single clunk as the mount's dead zone is traversed

D. The ring and pinion backlash for excessive clearance that allows the ring gear to separate from and then re-engage with the pinion during the torque reversal from coast to drive, producing the single clunk

57. A customer reports that their manual transmission "grinds" when downshifting from 3rd to 2nd gear at speeds above 40 km/h. Downshifts at lower speeds are smooth. What is the most likely cause?

A. The 2nd gear synchronizer is worn and cannot overcome the large speed differential between the engine and the transmission required for the 3rd-to-2nd downshift at the higher vehicle speed

B. The clutch is not fully releasing during the downshift, leaving the input shaft spinning too fast relative to the 2nd gear's required speed at 40+ km/h, causing the synchronizer to be overwhelmed

C. The transmission oil has lost its viscosity from contamination and cannot provide the lubrication needed for the synchronizer's friction surface to match speeds during the high-speed downshift attempt

D. The shift linkage is preventing the full travel needed for 2nd gear engagement during quick downshifts, causing the sleeve to contact the gear teeth before the synchronizer completes speed matching

58. A vehicle's electronically controlled automatic transmission occasionally fails to downshift when the accelerator pedal is pressed firmly for passing. The transmission stays in the current gear instead of downshifting. What is the most likely cause?

A. The throttle position sensor has a dead spot at the specific pedal position used for the passing maneuver, preventing the TCM from detecting the driver's demand for a passing downshift at that input level

B. The transmission's line pressure is insufficient to quickly engage the lower-gear clutch pack during a high-speed downshift, so the TCM prevents the shift to avoid a harsh engagement that could damage internals

C. The kickdown function requires a specific pedal position (typically past a detent) or rate of pedal application that the driver is not achieving, and the TCM does not command the downshift without the correct input

D. The torque converter clutch is engaged during the cruising condition and the TCM must release the TCC before commanding the downshift, and the delay in TCC release prevents the downshift from occurring in time

59. A front-wheel-drive vehicle has a clicking noise from both front wheels during turns, but the clicking is equally loud in both left and right turns. Normally, outer CV joint clicking is louder in one direction than the other. What does the equal clicking in both directions suggest?

A. Both outer CV joints have failed simultaneously and have reached the same level of internal wear, producing equal noise regardless of turning direction because both joints are equally damaged

B. The front wheel bearings are the source rather than the CV joints, since bearing noise is constant regardless of turning direction while CV joint noise is directional based on which side is loaded

C. The noise is from the ABS tone rings contacting the wheel speed sensors during suspension compression in turns, producing a clicking that occurs equally in both turning directions from both front wheels

D. The noise source is the front differential rather than the CV joints, since the differential spider gears click equally during both left and right turns as they accommodate the speed difference between wheels

60. A vehicle's automatic transmission has been recently rebuilt. During the test drive, the transmission shifts at the correct RPM and vehicle speed but every shift feels slightly soft — not slipping, but lacking the crisp engagement of a properly functioning transmission. What is the most likely cause?

A. The rebuilt transmission needs several hundred kilometers of driving for the new clutch friction material to bed in and achieve its full friction coefficient against the freshly machined steel reaction plates

B. The rebuilt transmission's torque converter was reused without being flushed or replaced, and contaminated fluid from the converter is mixing with the fresh fluid and reducing the new clutches' friction performance

C. The valve body separator plate was installed incorrectly during the rebuild, creating a minor cross-leak between two circuits that reduces the apply pressure to all clutch packs by a small but consistent amount

D. The transmission's electronic pressure control solenoid was not replaced during the rebuild and has worn to the point where it cannot command the full line pressure specified for crisp clutch engagement at each shift

61. A vehicle's headlamp circuit is controlled by the BCM through a solid-state driver (no relay). The headlamps flicker intermittently. The BCM commands show the headlamp output is steady. What does the steady BCM command with flickering output suggest?

A. The headlamp bulbs are at the end of their service life and the filaments are breaking down, producing intermittent contact that causes flickering independent of the BCM's steady output command

B. The alternator has excessive AC ripple from a failing diode that modulates the power bus voltage, causing the headlamp current to fluctuate despite the BCM commanding a constant output to the lamps

C. The BCM's internal solid-state output driver is failing intermittently, producing a flickering output despite the software command being steady — the hardware output does not match the software command

D. The wiring between the BCM and the headlamp connectors has an intermittent resistance fault that causes the voltage at the lamps to fluctuate despite the BCM providing a steady voltage at its output pin

62. A vehicle's scan tool data shows the barometric pressure sensor reads 85 kPa. The vehicle is being tested at an elevation near sea level where the expected barometric pressure is approximately 101 kPa. What effect does this incorrect low reading have on engine operation?

A. The ECM compensates for the low barometric reading by increasing turbocharger boost pressure to maintain the target manifold absolute pressure, which overworks the turbo and shortens its service life

B. The low barometric reading has no effect on engine operation because modern engines use the MAP sensor exclusively for fuel calculation and the barometric pressure is used only for the OBD II readiness monitors

C. The ECM calculates air density based on barometric pressure — the low reading causes the ECM to believe it is at high altitude with thinner air, reducing fuel delivery and ignition advance accordingly

D. The ECM uses the barometric reading to adjust the catalytic converter monitoring threshold, and the incorrect reading causes false P0420 catalyst efficiency codes without affecting engine performance

63. A vehicle's power window regulator cable has broken, leaving the window stuck in the down position during winter. A temporary repair is needed until the parts arrive. What is the safest temporary solution?

A. Apply a large piece of clear packing tape over the window opening from the outside of the vehicle to seal the opening against weather until the replacement regulator arrives for proper installation

B. Remove the interior door panel, manually raise the glass to the closed position, and secure it in place with tape or a wedge from inside the door until the replacement regulator is installed properly

C. Stuff shop rags into the gap between the glass and the window frame to block wind and rain entry, then tape a plastic sheet over the exterior of the door to provide additional weather sealing protection

D. Leave the window in the down position and advise the customer to park in a garage until the replacement part arrives, since any temporary repair risks damaging the door's interior trim or wiring

64. A vehicle has a charging system output of 14.4V at idle. When the headlamps, rear defroster, blower motor, and heated seats are all turned on simultaneously, the voltage drops to 13.1V. Is this voltage drop a concern?

A. Yes — the voltage should not drop below 14.0V under any accessory load condition, and the 1.3V drop indicates the alternator cannot meet the vehicle's total electrical demand at idle speed

B. No — a voltage drop from 14.4V to 13.1V under heavy electrical load at idle is within the normal range, as long as the voltage does not drop below approximately 12.8V to 13.0V with all loads active

C. Yes — the voltage drop indicates the battery cables have excessive resistance that limits the alternator's ability to maintain system voltage under the high-current demand of all accessories operating simultaneously

D. No — the voltage drop is within normal range because the vehicle's intelligent charging system intentionally reduces alternator output during high idle loads to prevent the serpentine belt from overheating

65. A vehicle's horn sounds a short chirp when the key fob lock button is pressed. The customer reports the chirp has become noticeably quieter over the past few months. What is the most likely cause?

A. The horn is wearing out internally from the repeated brief activations of the lock confirmation chirp and needs to be replaced to restore the original volume level of the key fob lock confirmation sound

B. The BCM's horn output driver is degrading from the high-frequency pulsing of the lock chirp command, reducing the current it delivers to the horn for the chirp compared to a full horn activation command

C. The key fob's battery is weakening, and the reduced signal strength causes the BCM to command a shorter, lower-power chirp rather than the full-duration, full-power chirp of a strong fob signal reception

D. The horn diaphragm has accumulated corrosion or debris that is dampening its vibration, or the horn's internal contact points are corroding, reducing the horn's sound output level during the chirp activation

66. A vehicle's A/C compressor clutch engages but the clutch plate slips — the pulley spins faster than the hub. The system pressures do not reach normal operating levels. What is the most likely cause?

A. The refrigerant system is severely overcharged, and the excessive head pressure creates a compressor load that exceeds the clutch's friction capacity, causing the plate to slip against the pulley

B. The compressor's internal relief valve has opened due to excessive head pressure, and the vented refrigerant is reducing the compressor load while the clutch appears to slip from the unloaded condition

C. The A/C compressor is mechanically seized or nearly seized internally, creating a torque load that exceeds the clutch's electromagnetic clamping force, and the drive plate slips against the spinning pulley

D. The compressor clutch air gap has widened beyond specification from wear, reducing the electromagnetic attraction between the plate and the pulley face to the point where the clutch can no longer transmit full torque

67. A vehicle's electric cooling fans run at high speed as soon as the ignition is turned on, even when the engine is cold. The engine coolant temperature on the scan tool reads 25°C (correct ambient temperature). What is the most likely cause?

A. The cooling fan relay has failed with welded contacts in the closed position, providing continuous battery power to the fan motors regardless of the ECM's command or the actual coolant temperature state

B. The ECM's fan control output circuit has developed a short to ground that provides a permanent ground signal to the fan relay coil, energizing the relay regardless of the coolant temperature reading

C. The A/C system has a fault that is sending a continuous "A/C on" signal to the fan control circuit, commanding high-speed fans as if the A/C compressor were engaged even though the A/C is not selected

D. The ECM has detected a coolant temperature sensor fault and is commanding maximum fan speed as a protective default to prevent overheating, even though the displayed temperature appears correct on the scan tool

68. A vehicle's windshield washer fluid freezes in the lines and nozzles during winter operation. The reservoir fluid is not frozen. What is the most likely cause?

A. The washer fluid concentrate was mixed with the correct proportion of water but the water source contained minerals that lowered the freeze point protection of the mixed solution below the concentrate's rating

B. The washer fluid in the reservoir has adequate freeze protection, but the fluid remaining in the exposed lines and nozzles from the previous use has been diluted by rainwater entering through the nozzle openings

C. The washer pump generates enough heat during operation to prevent freezing in the reservoir, but the fluid in the unheated lines and nozzles cools to ambient temperature and freezes between uses in extreme cold

D. The reservoir fluid was recently refilled with undiluted concentrate, but the lines and nozzles still contain previously diluted fluid from before the refill that has a higher freeze point than the new concentrate

69. A vehicle's scan tool shows that the A/C system's evaporator temperature is 0°C. The compressor is still running and has not cycled off. What is the risk if the compressor continues to operate at this evaporator temperature?

A. The evaporator's aluminum fins will corrode from the repeated freeze-thaw cycling, eventually perforating the fin surfaces and creating a refrigerant leak at the corroded fin-to-tube joints

B. The compressor will overheat because the returning suction gas temperature is too cold, providing insufficient heat to prevent the compressor's discharge temperature from exceeding the oil's thermal limit

C. The evaporator surface will ice over, progressively blocking the airflow through the fins until the HVAC system produces no airflow at the vents despite the blower motor running at full speed

D. The refrigerant returning to the compressor will be liquid rather than gas (liquid slugging), potentially causing mechanical damage to the compressor's valves, pistons, or scroll components on the suction stroke

70. A vehicle's headlamp aim has been checked and the left headlamp aims correctly but the right headlamp aims low and to the right. The adjuster screws on the right headlamp have not been moved. What could have changed the right headlamp's aim?

A. The right front tire has lower pressure than the left, tilting the vehicle to the right and angling both headlamps in that direction, but the left lamp's angle change falls within the tolerance while the right does not

B. A previous collision repair on the right front corner of the vehicle has left the headlamp mounting structure misaligned, positioning the headlamp housing at an angle that directs the beam low and to the right

C. The right headlamp housing is filled with condensation from a failed seal, and the weight of the trapped water has shifted the housing's center of gravity downward, tilting the beam aim low and to the right

D. The right headlamp's internal reflector has shifted from its factory position due to thermal cycling, redirecting the light pattern lower and to the right despite the external housing remaining correctly aimed

71. A vehicle's brake lights do not illuminate when the brake pedal is pressed. The tail lights and turn signals work correctly. A test light at the brake light switch connector shows 12V at the input terminal. Pressing the pedal does not produce voltage at the switch's output terminal. What is the fault?

A. The brake light switch has failed in the open position and is not passing voltage from its input terminal to its output terminal when the brake pedal is pressed to close the switch contacts

B. The brake light fuse has blown, preventing voltage from reaching the switch's output terminal even when the switch contacts close, since the output circuit is fused separately from the input circuit

C. The brake light bulbs have all burned out simultaneously, preventing any current from flowing through the switch's output circuit even when the switch closes and provides voltage to the output terminal

D. The BCM is not providing the ground signal required to complete the brake light switch circuit, since modern vehicles route the brake light switch output through the BCM for CAN bus brake status reporting

72. A vehicle's A/C system has low refrigerant pressure on both sides and poor cooling. The technician adds a UV dye to the system and runs the A/C for 15 minutes. Inspection with a UV light reveals dye at the compressor shaft seal area. What is the correct repair?

A. Replace only the compressor shaft seal using a seal replacement kit, since the compressor itself is functioning correctly and the leak is limited to the easily replaceable external shaft seal component

B. Replace the compressor assembly, since the shaft seal is not a serviceable component on most modern compressors and is integrated into the compressor housing, requiring complete compressor replacement

C. Tighten the compressor shaft nut to increase the seal preload, since the dye at the seal area indicates the seal has simply lost its clamping force and requires retorquing rather than component replacement

D. Add a refrigerant system seal conditioner additive that swells and rejuvenates the shaft seal material, restoring its sealing capability without disassembly, and recharge the system to the correct weight

73. A vehicle's electronic power steering system has intermittent heavy steering that occurs only during the first five minutes of driving on cold mornings. The steering is normal for the rest of the day. No DTCs are stored. What is the most likely cause?

A. The EPS motor's brushes have worn to the point where they make intermittent contact at cold temperatures when the brush springs have contracted, and the brushes warm and expand to restore full contact

B. The EPS torque sensor has a cold-sensitive element that produces an erratic signal at low temperatures, preventing the PSCM from accurately determining the driver's steering input until the sensor warms up

C. The EPS motor draws high inrush current at cold temperatures due to increased winding resistance, and the vehicle's battery cannot supply the demand until the motor warms slightly from initial operation

D. The EPS system's power supply connector has marginal contact resistance that increases when cold (metal contraction widens the gap), reducing the available current until the connector warms and expands

74. A vehicle's climate control system maintains 22°C when set to 22°C but cannot maintain 18°C when set to 18°C — the cabin temperature remains above the set point. All other settings (fan speed, mode, air distribution) respond correctly. What should be investigated?

A. The cabin temperature sensor for a drift that causes it to report a temperature lower than actual, making the system believe the set point has been reached when the cabin is actually warmer than 18°C

B. The evaporator temperature, since the A/C system may not be producing cold enough air to bring the cabin below 22°C, and the system operates at its cooling capacity limit when 18°C is requested

C. The blend door actuator's full-travel range, since the actuator may not be reaching the full-cold end of its travel due to a mechanical restriction or calibration error that limits its movement short of maximum cooling

D. The outside ambient temperature sensor for a fault that causes the climate control module to limit the cooling output based on an incorrect ambient reading that the system interprets as too cold for further cooling

75. A vehicle has an intermittent electrical fault that causes the windshield wipers to activate on their own for one or two sweeps, then stop. The wiper switch is in the off position. What should be checked?

A. The wiper motor's park switch for an intermittent fault that sends a false "wipe" signal to the BCM, causing the wipers to complete a single cycle before the park switch re-opens and stops the motor

B. The multifunction switch (wiper switch) for an intermittent internal contact on the single-wipe or wash position that briefly closes and sends a wipe command before the contact opens again

C. The BCM for a software fault that intermittently generates a wiper activation command independent of the wiper switch input, commanding one or two sweep cycles before the software error self-corrects

D. The rain sensor (if equipped) for contamination or a fault that intermittently detects moisture on the windshield and commands a wipe cycle, or the BCM's wiper output circuit for an intermittent signal glitch

76. A vehicle with an automatic climate control system has a complaint that the driver's side vent temperature is correct but the air volume from the driver's side vents is noticeably lower than the passenger side. Both sides are set to the same temperature and fan speed. What should be investigated?

A. The cabin air filter for uneven loading, since debris can accumulate more on one side of the filter than the other, creating a flow restriction that preferentially reduces airflow to the vents on the loaded side

B. The driver's side ductwork for a restriction, disconnected joint, or collapsed section that reduces the airflow volume to the driver's side vents while the passenger side receives unimpeded airflow from the blower

C. The blower motor for a faulty impeller blade that creates an asymmetric airflow pattern, directing more air toward the passenger side duct intake while reducing the airflow toward the driver's side duct

D. The HVAC mode door for a partial restriction in the driver's side position that limits the opening to the driver's dash vents while the passenger side mode door opening is at full aperture for maximum flow

77. A vehicle's battery tests "Good" on a conductance tester but the vehicle will not start in cold weather (−25°C). The battery cranks the engine very slowly. What is the most likely explanation?

A. The conductance test was performed at room temperature, and the battery's CCA rating decreases significantly at −25°C — the battery may test good at 20°C but cannot produce adequate cranking current at −25°C

B. The engine oil viscosity is too high for the cold temperature, creating excessive cranking resistance that overwhelms the battery's CCA capacity regardless of the battery's actual state of health condition

C. The starter motor draws significantly more current at −25°C because its internal resistance increases from cold copper windings, and the increased current demand exceeds the battery's cold weather output

D. The battery's cold cranking amp rating is marginally adequate for the vehicle and can start the engine at moderate temperatures, but the combination of reduced battery output and increased engine resistance at −25°C prevents starting

78. A vehicle has a "Service Airbag" warning. The scan tool shows a DTC for the passenger side impact sensor circuit — high resistance. The vehicle was recently in for body work on the passenger side door. What is the most likely cause?

A. The body shop damaged the side impact sensor during the door repair or failed to reconnect the sensor's wiring connector after reinstalling the door trim panel over the sensor mounting area

B. The body shop accidentally deployed the side curtain airbag during the repair and replaced it with a non-OEM module that has a different resistance value than the factory specification for the circuit

C. The passenger side impact sensor has been contaminated by body repair chemicals (primers, solvents) that have seeped into the sensor's electrical connector and created a high-resistance corrosion layer

D. The SRS module has detected that the passenger door was removed during the body repair and has stored the high-resistance code as a tamper detection alert that requires a dealer-level security reset

79. A vehicle has a power seat that moves in all directions except forward. The motor can be heard running when the forward switch is pressed but the seat does not move. What is the most likely cause?

A. The seat track is obstructed by a foreign object (pen, coin, debris) that has lodged between the track rails and prevents the seat from moving forward while allowing movement in all other directions

B. The forward drive mechanism — the motor gear, cable, or track drive component specific to the forward/backward axis — has stripped or broken, allowing the motor to spin without moving the seat forward

C. The seat motor's thermal overload protector has tripped for the forward direction circuit from previous excessive use, and the motor runs but produces no torque until the protector cools and resets

D. The seat's electronic position sensor has lost its forward travel reference, and the seat control module is commanding the motor but limiting its torque output to protect the mechanism during the lost-reference condition

80. A vehicle's exterior mirror turn signal repeater illuminates when the left turn signal is activated but the right mirror repeater does not illuminate when the right turn signal is activated. The right exterior turn signal lamp at the rear of the vehicle works correctly. What should be checked?

A. The right mirror repeater LED or its wiring — since the rear turn signal works (proving the flasher, switch, and main turn signal circuit are functional), the fault is isolated to the mirror repeater branch circuit

B. The BCM's right turn signal output for a partial fault that activates the rear lamp circuit but not the mirror repeater circuit, since the BCM may control these outputs through separate internal driver circuits

C. The right mirror assembly's internal connector, since the mirror housing contains the repeater LED and its connection to the vehicle harness may be loose, corroded, or damaged inside the mirror housing

D. The multifunction turn signal switch for a partial contact fault that activates the right rear turn signal circuit but not the mirror repeater circuit due to separate switch contacts for each output destination

81. A vehicle's engine cooling fans operate only when the A/C is on. When the A/C is off and the engine reaches the fan activation temperature, the fans do not activate. The scan tool confirms the coolant temperature exceeds the fan activation threshold. What is the most likely cause?

A. The coolant temperature sensor has a fault that reads correctly for the scan tool data display but does not generate the correct signal format for the fan control circuit's activation threshold comparator

B. The fan relay for the temperature-activated circuit has failed, but the separate A/C fan circuit uses a different relay path that bypasses the failed relay and successfully activates the fans when A/C is commanded

C. The ECM's fan control output for the temperature-activated circuit has failed, preventing the ECM from commanding the relay even though it correctly reads the temperature and displays it on the scan tool

D. The engine thermostat is stuck partially open, causing the actual coolant temperature at the fan switch location to be lower than the temperature at the ECT sensor location where the scan tool reading originates

82. A vehicle's transmission shifts normally but the backup lights do not illuminate when reverse is selected. All other exterior lights work correctly. What should be checked?

A. The neutral safety switch (transmission range sensor) for a fault in the reverse position contact that should activate the backup lights when reverse gear is selected by the driver through the shift mechanism

B. The BCM for a configuration error that has the backup light output disabled, since the BCM controls the backup lamp circuit on this vehicle and a software fault could prevent the reverse light output command

C. The reverse light switch or the transmission range sensor's reverse position signal, since the switch that activates the backup lights may be separate from the neutral safety switch on some transmission designs

D. The backup light bulb circuit — the switch or range sensor, the fuse, the relay (if used), the wiring, and the bulb or LED connections — for a fault at any point in the reverse lamp circuit path

83. A vehicle's A/C system has been recovered, evacuated, and recharged to the correct weight. The compressor engages and the system pressures look normal on the manifold gauges. However, the vent temperature is only 12°C when the specification is 3°C to 7°C. What should be checked?

A. The cabin air filter for restriction that reduces the airflow across the evaporator, causing the evaporator temperature to drop correctly but the reduced air volume limits the cooling effect at the vent outlets

B. The blend door for a partial opening to the heater core that allows warm air to mix with the cold air from the evaporator, raising the vent temperature above the system's cooling capacity even with correct pressures

C. The refrigerant charge weight for a slight undercharge that produces normal-appearing gauge readings but delivers insufficient cooling at the evaporator to achieve the specified vent temperature range

D. The evaporator temperature sensor for an offset reading that cycles the compressor off before the evaporator reaches its optimal operating temperature, limiting the minimum achievable vent temperature

84. A vehicle pulls to the right during straight-line driving. The alignment is within specification on all four wheels. The tire pressures are correct. The front tires are swapped left-to-right and the pull switches to the left. What does this confirm?

A. The right front tire has an internal ply steer or radial pull defect that creates a directional pull regardless of alignment, and swapping it to the left side reverses the pull direction to the left

B. The right front wheel has a bend that creates an apparent camber change at road speed, producing the pull that follows the wheel rather than the tire when swapped to the opposite side of the vehicle

C. The left front brake caliper is dragging slightly, and swapping the tires changed the rolling resistance balance between the two sides, causing the pull direction to switch with the tire swap

D. Both front struts have different damping rates from wear, and swapping the tires changed the weight distribution that interacts with the mismatched damping to reverse the pull direction

85. A vehicle's ABS system has a DTC for the right rear wheel speed sensor. The sensor resistance is within specification. The tone ring has been inspected and shows no visible damage. The air gap is within specification. What should be checked next?

A. The ABS module's internal circuit for the right rear sensor channel, since all external components have been verified as functional and the remaining suspect is the module's input processing circuit

B. The sensor's AC output signal quality using an oscilloscope during wheel rotation to verify the waveform amplitude, frequency, and pattern are consistent without dropouts or erratic voltage spikes

C. The wheel bearing for excessive play that would cause the tone ring to wobble relative to the sensor during rotation, creating a variable signal that the ABS module interprets as a sensor circuit fault

D. The sensor wiring harness for a routing problem that positions the wire too close to a high-current conductor, inducing electromagnetic interference that corrupts the sensor signal during normal vehicle operation

86. A vehicle has a steering wheel vibration only during braking from highway speed (100+ km/h). The vibration is not present during normal driving or during braking at lower speeds. The front brake rotors have been resurfaced and the vibration improved but returned after 5,000 km. What is the underlying cause that keeps creating the vibration?

A. The brake pads are a semi-metallic compound that deposits unevenly on the rotor surface during highway-speed braking, creating thickness variation that produces the vibration that resurfacing temporarily removes

B. The hub assembly has excessive lateral runout that forces even a newly resurfaced rotor to develop thickness variation as the pads contact the wobbling rotor surface, reproducing the vibration within a few thousand kilometers

C. The caliper slide pins are seized, preventing the caliper from floating and causing uneven pad wear that creates a vibration cycle — new pads would temporarily resolve the vibration but the root cause remains

D. The front wheel bearings are worn and allow the hub and rotor to wobble under the dynamic loads of high-speed braking, creating a variable rotor-to-pad contact that produces the vibration specifically during hard deceleration

87. A vehicle with electronic stability control has the ESC indicator light illuminated steadily (not flashing). The scan tool shows a DTC for the steering angle sensor. What does the steady (non-flashing) ESC light indicate?

A. The ESC system is actively intervening because the steering angle sensor fault is causing the system to misinterpret the vehicle's directional behavior and apply corrective braking continuously during driving

B. The ESC system has been disabled due to the steering angle sensor fault and will not provide stability control intervention until the sensor fault is repaired and the DTC is cleared from the ABS/ESC module

C. The ESC system is operating in a degraded mode that provides partial stability control using the remaining functional sensors while the steering angle sensor fault is present and unrepaired

D. The ESC light is illuminated as a reminder that the steering angle sensor calibration is due for its scheduled maintenance interval and will turn off after the calibration is performed by the technician

88. A technician is performing a four-wheel alignment on a vehicle. The vehicle's tire pressures are set to the door placard specification before beginning the alignment. Why is correct tire pressure critical before performing an alignment?

A. Incorrect tire pressures change the tire's contact patch shape and rolling circumference, which affects the alignment machine's ability to read the camber and caster angles accurately from the wheel sensors

B. Incorrect tire pressures change the vehicle's ride height, which directly affects the suspension geometry — camber, caster, and toe all change with ride height, producing inaccurate alignment readings

C. Incorrect tire pressures cause the alignment machine's wheel clamps to mount at a different position on the tire sidewall, creating a measurement offset that adds systematic error to all four wheel readings

D. Incorrect tire pressures cause the tire's sidewall to flex unevenly, which generates vibrations during the alignment machine's rolling compensation procedure that prevent accurate measurement of the wheel angles

89. A vehicle has a single-piston floating caliper that has been serviced with new brake pads. After the service, the inner pad wears to minimum thickness within 10,000 km while the outer pad still has 80% of its material remaining. What is the most likely cause?

A. The brake rotor has excessive thickness on the outboard side that prevents the outer pad from making full contact with the rotor surface during each braking event, concentrating all the friction work on the inner pad

B. The caliper piston seal is not retracting the piston after each brake application, leaving the inner pad in continuous light contact with the rotor between braking events and causing accelerated wear on that pad only

C. The caliper slide pins are seized or corroded, preventing the caliper from floating to equalize pad pressure — the piston pushes the inner pad against the rotor but the caliper cannot pull the outer pad inward equally

D. The brake hose has an internal collapse that traps pressure on the caliper piston after each brake application, keeping the inner pad applied against the rotor between stops while the outer pad retracts normally

90. A vehicle's power steering pump produces a whining noise that increases with engine RPM. The fluid level is correct and the fluid appears clean. What is the most likely cause?

A. The power steering pump's internal vanes or gears have worn, creating internal clearance that allows fluid to bypass the pumping elements, producing the speed-dependent whine from the turbulence

B. The power steering belt is glazed and slipping on the pump pulley, creating a speed-dependent whine that increases with RPM as the belt speed increases and the slippage becomes more pronounced

C. Air has entered the power steering system through a deteriorated hose, a loose fitting, or a failing pump shaft seal, and the aerated fluid produces the characteristic whining noise as it circulates

D. The power steering fluid is the incorrect specification, and the fluid's viscosity properties create excessive internal friction that produces the whining noise during normal pump operation at all engine speeds

91. A customer reports that the vehicle's steering feels "loose" at highway speed — it requires frequent small corrections to maintain a straight path. The alignment is within specification and tire pressures are correct. What should be inspected?

A. The power steering system for excessive internal leakage that reduces the hydraulic assist's ability to provide centering force at highway speed, allowing the steering to drift from center position

B. The steering and suspension components — including tie rod ends, ball joints, control arm bushings, rack mount bushings, and wheel bearings — for accumulated play that produces the vague steering feel

C. The front struts for worn internal valving that allows the suspension to oscillate at highway speed, transmitting the oscillation through the steering linkage as a sensation of steering looseness at the wheel

D. The steering column for a loose universal joint that absorbs small steering inputs before transmitting them to the rack, creating a dead zone at center that the driver perceives as looseness at highway speed

92. A vehicle has a brake pedal that feels normal for the first application after sitting overnight but becomes spongy on subsequent applications. Bleeding the system does not improve the condition. What is the most likely cause?

A. The master cylinder's secondary piston seal is bypassing under sustained use — the first application uses the seal's residual set, but subsequent applications allow fluid to leak past the weakened seal

B. The brake calipers have excessive piston travel from worn pads that require more fluid displacement on the first firm application but then trap air in the expanded system volume on subsequent applications

C. The brake booster has an internal fault that provides correct assist on the first application but overassists on subsequent applications, pushing the pedal further and creating the perception of a spongy feel

D. A brake hose is expanding under pressure — the first application fills the expanded volume, and subsequent applications must refill the hose expansion before building effective pressure at the caliper

93. A tire has a small nail in the tread area. The tire holds air and the customer wants a repair rather than replacement. What must the technician verify before determining if the tire can be safely repaired?

A. The nail has not penetrated the tire's inner liner, since a nail that is embedded in the tread but has not reached the inner liner can simply be removed without any repair needed to the tire structure

B. The puncture is within the repairable area (the center tread zone, not the shoulder or sidewall), the puncture diameter does not exceed the maximum repairable size, and the interior shows no hidden damage

C. The tire has at least 4/32" of remaining tread depth, since industry standards prohibit repairing any tire that has tread depth below this minimum regardless of the puncture location or size in the tread

D. The nail has not damaged the tire's steel belts, which can be verified by measuring the tire's electrical conductivity from bead to bead using a digital multimeter set to the resistance function

94. A vehicle has a rear brake drum that is seized to the hub and cannot be removed by pulling. What technique should be used to free the drum?

A. Heat the drum with a torch to expand the metal and break the corrosion bond between the drum and the hub surface, then pull the drum while it is still expanded from the applied thermal energy

B. Apply penetrating oil at the hub-to-drum contact area, allow it to soak, and use the drum's built-in threaded adjuster access holes to back off the brake shoe adjustment if the shoes are holding the drum

C. Strike the drum aggressively with a large hammer to shock-break the corrosion bond between the drum and the hub, since the cast iron drum can withstand the impact without damage or cracking

D. Use a large pry bar between the drum and the backing plate to lever the drum away from the hub surface, applying progressive force at multiple points around the circumference to break the corrosion evenly

95. A vehicle equipped with TPMS has a warning light that illuminates after one tire is replaced with a new tire of the same size. The new tire is inflated to the correct pressure. A TPMS relearn has been performed. The light remains on. What is the most likely cause?

A. The new tire was mounted on a wheel that does not have a TPMS sensor, and the system cannot detect a sensor at that wheel position despite the relearn being performed on the three existing sensors

B. The TPMS sensor in the wheel with the new tire was damaged during the tire mounting process when the tire machine's bead breaker or mounting head contacted and broke the sensor stem or housing

C. The replacement tire's rubber compound has a different RF attenuation than the original tire, blocking the TPMS sensor's radio frequency signal from reaching the vehicle's TPMS receiver module antenna

D. The new tire's inflation pressure is slightly different from the original tire's pressure despite both reading the same on the gauge, because the new tire's sidewall stiffness creates a different internal volume

96. A vehicle's steering makes a clunking noise when turning the steering wheel from center to either side at low speed. The noise occurs once when turning left and once when turning right. The power steering fluid is full and the system has no leaks. What is the most likely source?

A. The steering rack's inner tie rod sockets have developed play that allows the tie rod to shift within the rack housing when the steering direction changes, producing a single clunk in each direction

B. The steering column intermediate shaft universal joint is dry and notchy, producing a single clunk as the joint's trunnion bearings transition from one rotational position to another during steering direction changes

C. The power steering pump's internal pressure relief valve is opening momentarily during the initial steering input, creating a hydraulic thump that is transmitted through the fluid to the rack as a steering clunk

D. The steering rack mounting bushings have worn, allowing the rack housing to shift laterally within its mounts when the steering force direction changes, producing the single clunk in each turning direction

97. A vehicle's ABS warning light illuminates while driving and the scan tool reveals a DTC for "System Voltage Low." The battery and charging system test correctly. What could cause the ABS module to detect low voltage?

A. The ABS module draws high current during self-test cycles, and a marginal connection in the module's dedicated power supply circuit drops the voltage below the module's minimum threshold during these brief events

B. The ABS pump motor draws high current when it activates for its periodic self-test, and a weak battery that tests "Good" at rest cannot maintain voltage under the pump motor's brief high-current demand

C. The alternator's output voltage is correct at the battery but a high-resistance connection in the charging wire between the alternator and the fuse box reduces the voltage at the ABS module's fuse below minimum

D. The ABS module's power supply fuse, relay, or wiring connection has excessive resistance that drops the voltage below the module's minimum operating threshold during the module's self-test or normal operation

98. A vehicle has a tire that consistently loses pressure — approximately 5 psi per week. No puncture can be found using a soap and water solution around the tread and sidewall. What other potential leak sources should be checked?

A. The tire valve stem for a slow leak at the base where the stem seats against the wheel rim, or a faulty valve core that does not seal completely and allows a slow air escape at the valve opening

B. The wheel rim for a crack, porosity in the casting, or corrosion at the bead seating area that creates a leak path between the tire bead and the wheel rim surface that soap solution may not reveal easily

C. Both the valve stem and the wheel rim — valve stem base leaks, faulty valve cores, cracked rims, corroded bead seats, and porous wheel castings are all potential slow-leak sources not visible on the tire itself

D. The tire's inner liner for a manufacturing defect that allows air to permeate through the rubber at a rate faster than normal, creating a slow pressure loss that originates from the tire material rather than a puncture

99. A vehicle's front wheel bearing has been replaced. After the replacement, the vehicle pulls to the side with the new bearing during braking. What might have gone wrong during the installation?

A. The new bearing's integrated ABS tone ring has a different tooth count than the original, causing the ABS to apply uneven braking force during each stop based on the incorrect wheel speed data it receives

B. The hub flange surface was not cleaned before mounting the brake rotor, and trapped corrosion or debris between the hub and rotor has created excessive rotor runout that produces a brake pull to that side

C. The new bearing's integrated hub flange has a slightly different offset than the original, changing the wheel's scrub radius and altering the braking geometry on that side compared to the opposite side

D. The axle nut was torqued above specification during the installation, preloading the bearing excessively and creating rolling resistance on that side that manifests as a pull during braking when the bearing is loaded

100. A vehicle's front end makes a rattling noise at low speed over rough pavement. During inspection, the technician discovers that the front stabilizer bar bushings are severely worn — the rubber has deteriorated and the bar is loose in the bushing clamps. What other symptom would worn stabilizer bar bushings produce?

A. The vehicle's front wheel alignment would be affected, specifically the toe setting, since the stabilizer bar's position influences the steering geometry through the end link connection to the control arm

B. The vehicle would exhibit increased body roll during cornering, since the worn bushings allow the stabilizer bar to move freely in its mounts rather than resisting the body roll force as designed

C. The vehicle's braking performance would be reduced, since the stabilizer bar provides additional structural support to the front subframe that affects the caliper mounting rigidity during brake application

D. The vehicle's ride height would change on one side, since a severely worn bushing allows the stabilizer bar to drop on that side, pulling the control arm downward through the end link and lowering the corner

101. A vehicle has an SRS warning light on and a DTC for "Passenger Frontal Airbag — Circuit Short to Battery." What is the most likely cause?

A. The airbag module's connector has been exposed to water intrusion that created a conductive path between the firing circuit pins and the vehicle's 12V power supply in the connector housing

B. The passenger frontal airbag module has a manufacturing defect that has created an internal short between the initiator's firing circuit and the module's heater element that operates on the 12V vehicle power

C. A wiring fault — chafed insulation, a pinched wire, or a damaged connector — has created a connection between the airbag firing circuit wire and a 12V power source wire in the wiring harness

D. The SRS backup capacitor has overcharged and is feeding excess voltage back into the firing circuit that the ACM detects as a short to battery voltage, triggering the code and the warning light illumination

102. A vehicle's sunroof drain tube has become disconnected inside the A-pillar. During rain, water flows down the inside of the A-pillar and collects in the kick panel area. What component located in the kick panel area could be damaged by this water intrusion?

A. The electronic parking brake module, which on some vehicles is mounted in the left kick panel area and could have its electronic circuit board damaged by water contact from the disconnected drain tube

B. The hood release cable pivot bracket, which on some vehicles is mounted in the kick panel area and could corrode from water exposure, making the hood release progressively harder to operate over time

C. The BCM or a fuse box, which on many vehicles is located in the kick panel area and could be damaged by water exposure, causing multiple electrical faults and module communication failures throughout the vehicle

D. The OBD II diagnostic link connector, which is typically mounted near the kick panel area and could have its pins corroded by water exposure, causing scan tool communication errors during diagnostic sessions

103. A vehicle's power liftgate opens and closes but makes a grinding noise during operation that was not present before. The liftgate operates at the correct speed and the anti-pinch feature works. What is the most likely cause?

A. The liftgate struts (gas springs) have lost pressure and the liftgate motor is bearing the full weight of the liftgate without strut assistance, creating grinding from the overloaded motor gears during operation

B. The liftgate motor or its drive gear mechanism has developed worn teeth that produce the grinding noise during operation but have not yet deteriorated to the point of preventing the liftgate from completing its travel

C. The liftgate hinge pins have worn and allow the liftgate to shift laterally during opening and closing, and the hinge metal-to-metal contact creates the grinding noise that accompanies the liftgate's movement

D. The liftgate weather seal has become dislodged and is dragging against the body panel during the liftgate's travel, creating a rubber-on-metal grinding sound that coincides with the motorized opening and closing

104. A vehicle's heated steering wheel does not produce heat. The heated steering wheel button on the dashboard illuminates when pressed. What should be checked first?

A. The clockspring, since the heated steering wheel element receives its power through the clockspring ribbon cable, and a damaged conductor in the clockspring would prevent power from reaching the heating element

B. The heated steering wheel element's resistance using the scan tool's bi-directional control function to verify the BCM is commanding the heater circuit on and the element is drawing the expected current

C. The BCM for a configuration error that has the heated steering wheel feature disabled in the as-built data, since the button illumination may be hardwired while the actual heater output is BCM-controlled

D. The steering wheel heater element for an open circuit by measuring the resistance at the clockspring connector, since a broken heating element would prevent current flow despite the switch being activated

105. A vehicle's rear quarter panel has a dent that the customer wants repaired without repainting. What technique is commonly used for paintless dent repair (PDR)?

A. The dent is filled with a body filler compound that is shaped to match the surrounding panel contour, then clear-coated to seal the repair without requiring color matching or repainting the entire panel

B. The dent is pushed out from behind the panel using specialized tools that access the back side through existing openings, gradually restoring the original shape without disturbing the factory paint finish

C. The dent is heated with a heat gun and then rapidly cooled with dry ice, causing the metal to contract and pull itself back to its original shape through the thermal stress differential in the panel material

D. The dent is drilled and a slide hammer is attached to pull the metal outward from the front side, then the drill hole is filled with a metal plug and touched up with matching paint from the vehicle manufacturer

106. A vehicle's interior rear view mirror has fallen off the windshield. The metal mounting button is still bonded to the glass. What is the correct repair?

A. Reattach the mirror to the existing button using the mirror's spring clip or set screw mounting mechanism, since the button is still bonded to the glass and the mirror simply needs to be clipped back onto it

B. Clean the glass surface, remove the old button, apply new windshield mirror adhesive to a replacement button, bond it to the glass in the correct location, allow the adhesive to cure, then attach the mirror to the new button

C. Apply clear silicone sealant to the existing button and press the mirror firmly against it, holding it in place for five minutes until the sealant begins to set, then allow 24 hours for full cure before driving

D. Reattach the mirror to the existing button using a two-part epoxy adhesive applied between the mirror's mounting base and the button surface, clamping the assembly with tape until the epoxy reaches full strength

107. A hybrid vehicle has a DTC indicating that the HV battery's cooling fan is drawing excessive current. The fan is running but sounds louder than normal. What is the most likely cause?

A. The HV battery cooling duct has become partially blocked by debris or a collapsed duct section, causing the fan motor to work harder to move air through the restricted passage and draw more current

B. The fan motor has a worn internal bearing that creates mechanical friction the motor must overcome, increasing current draw while producing the louder-than-normal noise from the bearing roughness

C. The HV battery pack has developed an internal hot spot that is raising the pack temperature, causing the BMS to command the fan to maximum speed continuously, which increases the current draw above normal

D. The fan motor's internal winding has a partial short that reduces the motor's efficiency, causing it to draw more current for the same airflow output while producing a louder electromagnetic hum from the shorted turns

108. A plug-in hybrid vehicle charges normally from a household 120V outlet (Level 1) but cannot charge from the owner's home Level 2 EVSE. The EVSE was professionally installed six months ago and has been working correctly until now. What should be checked first?

A. The EVSE itself — verify power is reaching the EVSE, the EVSE's pilot signal is correct, and the EVSE's internal relay, GFCI, and control board are functioning correctly before investigating the vehicle

B. The vehicle's onboard charger for a fault in its Level 2 input circuit that prevents it from accepting the 240V input from the EVSE while its Level 1 circuit continues to function on the 120V household outlet

C. The vehicle's charge port connector for damage at the Level 2 pins that are not used during Level 1 charging, since physical damage to these specific pins would prevent Level 2 communication only

D. The home's electrical panel for a tripped circuit breaker on the dedicated 240V circuit that feeds the EVSE, since a tripped breaker would prevent the EVSE from receiving power while other outlets remain functional

109. A battery electric vehicle's scan tool data shows that cell group 5 has a voltage of 3.2V while all other cell groups read between 3.7V and 3.9V. What does this voltage discrepancy indicate?

A. Cell group 5 is in the normal range for a cell that has recently been discharged by the BMS balancing circuit, and the voltage will equalize with the other groups within the next charging cycle

B. Cell group 5 has a higher internal resistance than the other groups from advanced degradation, and it is discharging faster under load, dropping its voltage below the rest of the pack during operation

C. Cell group 5 has a significantly degraded or failing cell that cannot maintain voltage under load and is pulling down the entire pack's performance, requiring investigation and likely cell group replacement

D. Cell group 5's voltage sensor has a calibration fault that is reporting a lower voltage than actual, and the cell group is physically at the same voltage as the others but appears low on the scan tool display

110. A hybrid vehicle's engine runs continuously and the electric motor does not assist during acceleration. The HV battery SOC reads 15%. The MIL is not illuminated. What is the most likely explanation?

A. The hybrid control module has detected a fault in the electric motor's inverter and has disabled the motor to prevent damage, relying on the engine alone for propulsion until the inverter fault is repaired

B. The BMS has determined that the HV battery SOC is too low for the electric motor to assist, and the engine is running continuously to recharge the battery to a minimum usable level before motor assist resumes

C. The regenerative braking system has failed, preventing the battery from recovering energy during deceleration, and the depleted battery cannot support motor assist until the regen system is repaired

D. The HV battery has reached the end of its useful life and can no longer hold a charge above 15%, permanently preventing the electric motor from assisting and forcing the engine to run continuously for all propulsion

111. What is the purpose of the orange high-voltage interlock loop (HVIL) connector found on HV components?

A. The HVIL connector provides a low-voltage signal circuit that detects whether HV connectors are fully seated — opening the HVIL loop signals the BMS to open the contactors and de-energize the HV circuit as a safety measure

B. The HVIL connector provides a dedicated ground path for the HV system that is separate from the vehicle's chassis ground, preventing any HV current from flowing through the vehicle's body during normal operation

C. The HVIL connector contains a fusible element that opens if HV current exceeds the maximum safe level, providing overcurrent protection similar to a fuse but specifically designed for the HV circuit voltages

D. The HVIL connector provides a reference voltage signal that the BMS uses to verify the HV battery's insulation resistance is above the minimum threshold before allowing the contactors to close during startup

112. A battery electric vehicle displays "Turtle Mode" and limits speed to 15 km/h. The battery SOC shows 3%. What does turtle mode indicate?

A. The vehicle has detected a drivetrain mechanical fault that limits speed to prevent damage to the motor, gearbox, or differential while the driver navigates to a service facility for repair

B. The HV battery has reached its minimum usable SOC and the BMS is severely limiting the available power to prevent the battery from being discharged below the threshold that causes permanent cell damage

C. The vehicle's thermal management system has overheated and the BMS is limiting power output to reduce heat generation until the cooling system can bring the battery temperature back within the operating range

D. The vehicle has detected a ground fault in the HV system that limits speed as a safety measure, since the fault could potentially create a shock hazard if the vehicle operated at full power during normal driving

113. A hybrid vehicle's 12V auxiliary battery keeps dying overnight. The DC-DC converter output has been tested and produces 14.2V with the hybrid system in Ready mode. What should be investigated?

A. The HV battery for a cell imbalance that causes the BMS to keep the DC-DC converter running at reduced output during key-off, which drains the 12V battery rather than maintaining it at full charge

B. The vehicle's parasitic draw, since the hybrid system's multiple control modules may not be entering sleep mode correctly after key-off, drawing excessive current from the 12V battery beyond its capacity

C. The DC-DC converter for an intermittent fault that produces correct output during testing but fails during the extended key-off period, leaving the 12V battery without a charging source during overnight parking

D. The 12V battery itself for a replacement need, since hybrid vehicle 12V batteries experience more charge-discharge cycles from the start-stop operation and may have a shorter service life than conventional vehicle batteries

114. A customer asks what happens if a battery electric vehicle runs out of charge completely while driving. What is the accurate answer?

A. The vehicle shuts down all systems immediately when the battery reaches 0% SOC, leaving the driver with no power steering, no power brakes, and no hazard lights on the road until a tow truck arrives

B. The vehicle gradually reduces power output as the SOC approaches minimum, providing multiple warnings and entering progressive speed limitations before finally ceasing to provide any propulsive power

C. The BMS disconnects the HV battery to prevent cell damage, but the 12V system continues to power the steering, brakes, lights, and hazard flashers for a limited time to allow the driver to safely stop

D. The vehicle enters a regenerative coasting mode that uses the drive motor as a generator powered by the vehicle's momentum to maintain minimum battery charge indefinitely as long as the vehicle continues rolling

115. A plug-in hybrid vehicle's engine starts immediately at key-on instead of entering EV mode, even though the battery is at 85% SOC and the engine was not running when the vehicle was last shut off. What should be investigated?

A. The ambient temperature, since extreme heat or cold causes the hybrid control module to start the engine for battery thermal protection or cabin heating regardless of the battery's charge level

B. The accelerator pedal position sensor for a fault that causes the hybrid control module to interpret a resting pedal as a moderate throttle demand that exceeds the electric motor's maximum output capability

C. The vehicle's operating mode selection, since some plug-in hybrids have a selectable mode (such as "Hold" or "Charge") that keeps the engine running to preserve or build battery charge for later EV use

D. The 12V auxiliary battery voltage, since a low 12V battery can prevent the hybrid control module from accurately reading the HV battery SOC sensor, defaulting to engine-on operation as a safety measure

116. A battery electric vehicle's regenerative braking produces a warning message: "Regen Limited — Battery Full." The driver is descending a long mountain grade. What is the safety concern?

A. The HV battery may overheat from the excess energy being forced into an already full battery, potentially causing thermal runaway if the regenerative braking system continues to charge the full battery pack

B. With regenerative braking limited, the driver must rely primarily on the friction brakes for deceleration on the steep grade, which can overheat the brake pads, fade the braking force, and boil the brake fluid

C. The vehicle will accelerate uncontrollably on the grade because the absence of regenerative braking removes all deceleration capability, leaving the driver with no way to control the vehicle's speed during descent

D. The limited regenerative braking will cause the drive motor to overheat because the motor continues to generate back-EMF but the electrical energy has no battery to flow into, building heat in the motor windings

117. A series hybrid vehicle uses its internal combustion engine exclusively to drive a generator. The generator produces electricity that powers the electric drive motor. Under what operating condition does the ICE typically start in a series hybrid?

A. When the HV battery SOC drops below a calibrated threshold or when the driver's power demand exceeds what the battery alone can deliver, the ICE starts to generate electricity on demand

B. When the vehicle speed exceeds 60 km/h, because the electric motor's efficiency drops below the ICE's efficiency at highway speed and the system switches to engine-direct-drive through a clutch

C. When the driver selects a specific "Engine Mode" using a dashboard button, since the series hybrid's ICE never starts automatically and relies entirely on the driver to command engine operation

D. When the ambient temperature exceeds 30°C, because the electric motor generates excessive heat at high temperatures and the ICE provides a cooler alternative power source for propulsion

118. A battery electric vehicle displays "Charging Fault — Ground Fault Detected" when plugged into a Level 2 home EVSE. The vehicle charges normally at public Level 2 stations. What is the most likely cause?

A. The vehicle's onboard charger has an intermittent insulation fault that only manifests when the charging voltage matches the specific output characteristics of the home EVSE equipment

B. The public Level 2 stations have a higher ground fault tolerance threshold than the home EVSE, allowing the vehicle to charge despite a minor vehicle-side ground fault that the home unit detects

C. The home EVSE or its installation has a wiring fault — such as a missing or deteriorated equipment ground, a neutral-to-ground bond issue, or GFCI sensitivity — that triggers the ground fault detection

D. The vehicle's charge port has accumulated road salt and moisture that creates a leakage path detectable only by the more sensitive home EVSE but not by the public stations with weatherproof connectors

119. A hybrid vehicle technician must replace the water pump on the engine. The vehicle has a separate electric water pump for the HV battery cooling circuit and a belt-driven water pump for the engine cooling circuit. Why is it critical to identify which pump requires replacement?

A. Both pumps use the same coolant type and pressure rating, so the only concern is the physical mounting location and bolt pattern that differs between the engine-driven and electric pump assemblies

B. The two pumps serve completely separate cooling circuits with potentially different coolant types, operating pressures, and service procedures — replacing the wrong pump leaves the actual fault unrepaired

C. The electric water pump for the battery circuit is integrated into the battery pack housing and can only be accessed by removing the entire battery pack from the vehicle for bench service

D. The belt-driven engine water pump on a hybrid vehicle is a high-voltage component that requires full HV de-energization before service, unlike the battery circuit pump which operates on 12 volts

120. A plug-in hybrid vehicle's electric driving range has dropped from the rated 50 km to 28 km. The battery SOH reads 82% on the scan tool. The customer drives primarily on the highway at 120 km/h in EV mode. What factor, beyond battery degradation, is most likely contributing to the significant range shortfall?

A. The vehicle's regenerative braking system has been disabled by a software update, eliminating the energy recovery that normally extends the EV range by 15-20% during city driving conditions

B. The 12V auxiliary battery is drawing excessive current from the HV pack through the DC-DC converter, consuming propulsion energy and reducing the available range for the electric drive motor

C. The vehicle's cabin air filter is severely restricted, causing the HVAC blower motor to draw significantly more current than normal, consuming HV battery energy that reduces the electric driving range

D. Highway driving at 120 km/h consumes significantly more energy per kilometer than the rated range test conditions, and aerodynamic drag increases exponentially with speed, dramatically reducing real-world EV range

121. A battery electric vehicle has a "Service High Voltage Charging System" warning. The vehicle drives normally but will not accept a charge from any source. The scan tool shows a DTC for the onboard charger's internal temperature sensor. What is the most likely scenario?

A. The onboard charger's cooling circuit has a blockage that prevents the charger from maintaining safe operating temperatures, and the charger disables itself to prevent thermal damage during charging

B. The onboard charger's temperature sensor has failed, and the charger cannot verify its internal temperature is within safe limits, so it refuses to operate as a protective measure against potential overheating

C. The DTC is informational only and the charging fault is caused by a separate issue in the charge port wiring that prevents the initial communication handshake between the vehicle and any external EVSE

D. The onboard charger module has suffered a complete internal failure of its power conversion circuitry, and the temperature sensor DTC is a secondary code triggered by the primary hardware failure

122. During a routine inspection of a hybrid vehicle, the technician notices that the engine oil is significantly darker and more degraded than expected for the current oil change interval mileage. The vehicle has 40,000 km on the odometer with 8,000 km since the last oil change. What hybrid-specific factor could explain the accelerated oil degradation?

A. The hybrid vehicle's frequent engine start-stop cycling means the engine spends more time in the cold-start enrichment phase, and the excess fuel in the oil dilutes and degrades it faster than in a conventional vehicle that runs continuously once started

B. The hybrid vehicle's electric motor generates electromagnetic fields that accelerate the oxidation of the engine oil through induced molecular breakdown when the motor operates near the engine block

C. The hybrid vehicle's regenerative braking system creates reverse crankshaft loading that generates different wear patterns in the bearings, producing more metallic contamination in the oil than normal

D. The hybrid vehicle's exhaust system runs cooler than a conventional vehicle because the engine operates intermittently, preventing the catalytic converter from reaching the temperature needed to burn off oil vapors

123. A customer asks whether it is safe to work on a battery electric vehicle's 12V electrical system — such as replacing a headlamp bulb or a 12V fuse — without performing the full HV de-energization procedure. What is the correct answer?

A. No — any electrical work on a BEV requires full HV de-energization because the 12V and HV systems share common ground paths that could create a shock hazard even during 12V component service

B. No — the 12V system on a BEV operates at a higher voltage than conventional vehicles (24V or 48V) and requires HV-rated gloves and tools for any service work on fuses, bulbs, or 12V accessories

C. Yes — but only if the vehicle is not plugged in and the ignition is off, because the DC-DC converter could energize the 12V circuit with HV-derived power during charging or Ready mode operation

D. Yes — the 12V system is electrically isolated from the HV system, and standard 12V components like headlamp bulbs, fuses, and accessories can be serviced using normal procedures without HV de-energization

124. A battery electric vehicle's brake pedal feel changes noticeably when the regenerative braking system transitions from regenerative braking to friction braking during a stop. The pedal becomes slightly firmer in the last portion of the stop. What causes this transition?

A. The electric brake booster adjusts its assist ratio when the regenerative braking system reaches its minimum effective speed, and the booster increases its output to maintain consistent deceleration as regen fades

B. At low vehicle speed, the drive motor cannot maintain effective regenerative braking torque, and the brake system must blend in friction braking to continue decelerating the vehicle to a complete stop

C. The ABS system activates during the final portion of every stop to prevent the front wheels from locking during the transition between regenerative and friction braking, creating the firmer pedal feel

D. The brake master cylinder has a two-stage piston design specific to BEVs that provides lighter pedal effort during regenerative braking and firmer effort during friction braking for driver feedback purposes

125. A hybrid vehicle's HV battery pack is being replaced under warranty. After installation, the hybrid system enters Ready mode but the "Check Hybrid System" warning illuminates immediately. What post-installation procedure was most likely missed?

A. The replacement battery's shipping plugs were not removed from the coolant circuit connections, preventing the cooling system from circulating through the new pack and triggering a thermal protection fault

B. The HV battery vent hose was not reconnected, and the BMS detected abnormal internal pressure readings from the unsealed pack that triggered the warning as a hydrogen gas accumulation safety precaution

C. The replacement battery pack's firmware version is incompatible with the vehicle's existing hybrid control module software and requires a dealer-level software update to establish communication and compatibility

D. The replacement battery pack's registration or initialization procedure was not performed, and the BMS cannot correctly manage the new pack's cell characteristics without the calibration data from the initialization

## Practice Exam 8: Answer Key and Explanations

1. C — Brake fluid (DOT 3, 4, 5.1) is a glycol-based chemical that irritates skin and can cause serious eye damage if it contacts the eye surface. Even though the technician was wearing safety glasses, fluid may have splashed around the glasses' edges onto the facial skin or eyelids. The affected areas must be flushed with clean water, and the eyes must be carefully inspected for any fluid contact despite the glasses' protection.

2. B — High-pressure water forced into electrical connectors, module housings, and sensor connections displaces the protective grease and seals, allowing moisture to reach the terminal pins. This moisture causes corrosion, intermittent short circuits, and ground faults that may not produce symptoms for days or weeks — long after the pressure washing is forgotten as a potential cause.

3. D — A cracked fuel rail actively weeping gasoline onto a hot engine is an immediate fire emergency. The fuel can ignite from contact with the hot exhaust manifold, catalytic converter, or any spark source. The vehicle must not be started or moved further into the shop — the area must be evacuated, ignition sources eliminated, and the space ventilated before the leak is addressed.

4. A — Electric cooling fans are controlled by the ECM or a dedicated fan module and can activate at any time without warning — when coolant temperature rises, when the A/C compressor engages, or

during an after-run cooling cycle even with the ignition off. The fan blades spin at high speed and can cause severe lacerations or finger amputations. Hands must never be placed near the fan blades on any running or recently running vehicle.

5. B — Driving the front wheels onto ramps provides the initial ground clearance needed to slide the floor jack underneath the vehicle's designated lift point. Once the jack raises the vehicle further, jack stands are placed at the manufacturer's support points. This two-step approach safely raises a low-clearance vehicle without improvised blocking or unsafe modifications to the jack.

6. D — A cracked extension cord with exposed inner insulation creates an electrical hazard. If the inner insulation is also compromised (from the same mechanical damage, heat, or chemical exposure that damaged the outer jacket), the live conductors can contact grounded metal surfaces or each other, creating a shock hazard to anyone who touches the cord or a fire hazard from short-circuit arcing.

7. A — After a brake pad replacement, the caliper pistons are fully retracted. The first time the brake pedal is pressed, the pistons must travel the full distance to contact the new pads. Until the pistons advance and establish contact, the brake pedal will go to the floor with minimal braking force. Pumping the pedal several times before moving the vehicle advances the pistons and establishes a firm pedal.

8. C — A lead-acid battery contains corrosive sulfuric acid electrolyte and produces explosive hydrogen gas. The battery must be kept upright during transport to prevent electrolyte spillage. A battery carrier tool or the battery's built-in handle provides a secure grip, and the battery should be held away from the body to prevent acid contact with clothing or skin.

9. D — A flood-damaged vehicle may have standing water in contact with live electrical circuits beneath the carpet, including 12V wiring, module connectors, heated seat wiring, and potentially HV components on hybrid/electric vehicles. Entering the vehicle without assessing the electrical hazard risks contact with energized circuits through the standing water, creating a potential shock hazard.

10. A — The freeze frame captured the misfire at 45°C coolant temperature — well below the normal operating temperature of 90°C+. This tells the technician the misfire occurred during the engine warmup phase, not at full operating temperature. Temperature-sensitive faults (such as an ignition coil with cold-cracked insulation, a cold-sticking VVT solenoid, or a fuel injector that dribbles until warm) should be investigated.

11. B — The coil has been eliminated (misfire didn't follow it to cylinder 2) and the injector has been eliminated (misfire didn't follow it to cylinder 1). The remaining possibilities are: the spark plug (still on cylinder 4 and not yet swapped), the wiring or connector specific to cylinder 4's position, a mechanical fault on cylinder 4, or an ECM driver fault for that position.

12. D — Oil pressure that flickers briefly at hot idle but recovers immediately with even a slight RPM increase indicates the pressure is barely below the warning threshold at the lowest pump output condition. Hot, thin oil combined with worn bearing clearances allows enough oil leak-down at idle RPM to momentarily drop below the sensor's threshold. Even a small RPM increase raises pump output enough to restore pressure.

13. A — The CKP sensor is the ECM's primary timing reference — without it, the ECM cannot determine crankshaft position, engine RPM, or cylinder firing order, preventing fuel injection and ignition from being commanded. The sensor itself, its air gap to the reluctor ring, the reluctor ring condition, the connector, and the wiring must all be checked before investigating other no-start causes.

14. C — Negative fuel trims (−15% LTFT) confirm the ECM is removing fuel to compensate for an overly rich condition. The MAF reads correctly and no vacuum leaks exist. The rich condition must come from fuel entering the engine outside the ECM's control — leaking injectors that dribble fuel between pulses, fuel pressure above specification that increases each pulse's delivery, or a stuck-open EVAP purge valve adding fuel vapor.

15. B — The RPM drop when the EGR valve is commanded open confirms that exhaust gas is flowing through the valve and entering the intake (diluting the charge and reducing power). However, the volume of gas flowing during the commanded test may be less than what the ECM's EGR monitor expects during actual driving conditions — the monitor may require a higher flow rate at specific speeds and loads to pass.

16. D — In an injector balance rate test, the return fuel quantity represents fuel that bypassed the injector's internal sealing surfaces without being injected into the cylinder. An injector returning three times more fuel than the others has worn internal components (needle seat, guide bore, or control valve) that allow excessive fuel to leak past and return to the tank instead of being delivered to the combustion chamber.

17. C — A brief fuel pressure dip during hard acceleration confirms the fuel pump cannot maintain both adequate pressure and adequate volume during the sudden high-demand transition. The pump's delivery

volume is momentarily insufficient for the combined demand of all injectors at maximum pulse width, causing the pressure to drop until the pump catches up within one second.

18. A — A P0016 correlation code 15,000 km after a chain replacement is more likely caused by a VVT system fault than premature chain stretch. The VVT oil control valve (solenoid) on bank 1 intake cam may be sticking from varnish, debris, or a weak internal spring, holding the camshaft phaser in a position that does not match the ECM's expected correlation between the CKP and CMP signals.

19. D — Black smoke on a diesel engine indicates incomplete combustion — more fuel is being injected than the available air can completely burn. With adequate boost and a clean air filter, the remaining variable is whether the air reaching the cylinders is actually oxygen-rich. A stuck-open EGR valve displaces fresh intake air with inert exhaust gas, reducing the available oxygen for combustion and producing the rich, sooty burn.

20. C — The readings represent ideal combustion and catalyst performance: HC at 45 ppm (very low unburned fuel), CO at 0.2% (very low incomplete combustion product), $CO_2$ at 15.1% (high complete combustion product), and $O_2$ at 0.3% (very low excess oxygen). This combination confirms the engine is combusting its fuel charge almost completely and the catalytic converter is efficiently oxidizing the small remaining HC and CO.

21. C — The water pump weep hole is a drain path located between the pump's internal shaft seal and the shaft bearing. When the seal fails, coolant leaks past the seal and exits through the weep hole to the exterior — by design, to prevent coolant from reaching and contaminating the shaft bearing. A drip from the weep hole specifically confirms the pump's internal shaft seal has failed.

22. A — The engine's combustion quality is confirmed acceptable (equal cylinder contribution, stable fuel trims, no misfire codes), yet HC is elevated at the tailpipe. This pattern indicates the hydrocarbons are being produced in the cylinders at a normal rate but not being cleaned up by the catalytic converter before they exit the tailpipe. The converter's oxidation function has degraded.

23. B — The technician uses tools (stethoscope, wrench) to identify the noise at the exhaust location. The noise is from the exhaust valve area but not a full ticking; it's consistent with a degraded lifter at that specific location that cannot maintain zero lash. The localized noise combined with the stethoscope finding confirms a hydraulic lash adjuster failure at cylinder 3's exhaust position.

24. B — When the ECM detects an open circuit on the ECT sensor input (maximum resistance / no signal), it defaults to displaying −40°C — the value at the extreme low end of the sensor's calibration table that corresponds to infinite resistance. An open circuit in the sensor, its wiring, or its connector produces this characteristic −40°C default reading on the scan tool.

25. C — The SCR catalyst requires both adequate DEF dosing (confirmed) and adequate upstream exhaust conditioning by the DOC to function effectively. A failed DOC allows unburned hydrocarbons to pass through and contaminate the SCR catalyst's active surface, poisoning the vanadium or copper-zeolite coating and preventing it from performing the selective catalytic reduction of NOx.

26. A — A P0442 small EVAP leak that cannot be visualized by smoke testing is extremely small — the hole may be less than 0.5 mm in diameter. A nitrogen pressure decay test pressurizes the sealed system with dry nitrogen and monitors the pressure with a high-precision gauge over an extended period. A gradual pressure drop confirms a leak exists, and the decay rate indicates the leak size.

27. B — Stalling specifically during sharp left turns suggests a connection or component on the left (driver's) side of the engine bay that loses contact when the engine shifts on its mounts during the left turn. A loose or corroded electrical connector, a ground strap with a broken strand, or a sensor connection that pulls apart when the engine leans rightward during a left turn can momentarily interrupt a critical circuit.

28. D — Disconnecting the upstream $O_2$ sensor forces the ECM into open-loop with a fixed fuel map, which eliminates the positive fuel trim correction. The fact that the lean condition disappears when the sensor's input is removed means the ECM was adding fuel based on the sensor's lean signal. The most likely cause is the sensor itself reporting false lean data from internal contamination or electrical drift, and disconnecting it removes the erroneous input.

29. A — Calculated engine load at WOT represents the actual volumetric efficiency relative to the engine's theoretical maximum. A value of 78% instead of the expected 85-95% means the engine is not filling its cylinders as effectively as it should. This reduced air ingestion could be caused by a restricted air filter, restricted exhaust, low compression, incorrect cam timing, or any condition that reduces the engine's breathing.

30. C — The intake manifold runner control flaps stuck in the wide-open (high-RPM) position reduce the air velocity through the intake runners at cold idle speed. Lower air velocity produces poor fuel atomization and inconsistent cylinder-to-cylinder mixture distribution, causing random misfires across multiple cylinders. As the engine warms and the ECM transitions to closed-loop control with optimized fuel delivery, the improved fuel management compensates for the reduced atomization.

31. D — The low-pressure supply pump delivers adequate fuel to the high-pressure pump inlet (confirmed by testing). The high-pressure pump must then compress this fuel to the rail's cranking pressure specification. If the pump's internal pistons, check valves, or seals are worn, the pump cannot generate the required compression ratio at the low rotational speed of cranking, producing only 40% of the specified rail pressure.

32. B — A cluster that randomly sweeps its gauges (the power-on self-test sequence) during normal driving — with no DTCs stored anywhere — indicates the cluster is experiencing brief power interruptions that trigger its restart routine. An intermittent connection at the cluster's main connector (corroded pin, loose terminal, or damaged wire) momentarily drops power, and the cluster re-initializes with the gauge sweep when power returns.

33. C — The camera image appears on the display (confirming the camera communicates with the head unit) but is nearly black. Since the system worked until recently, the camera's internal image sensor has likely failed — it can still power on and transmit a signal, but the sensor no longer produces a usable image from the available light. If cleaning the lens doesn't resolve it, the camera requires replacement.

34. A — After ECM replacement and programming, the A/C not engaging with no DTCs suggests the new ECM's configuration data does not include the A/C compressor option. The as-built data that tells the ECM which features the vehicle has may not have been correctly transferred to the replacement module. Updating the as-built configuration to include the A/C system option enables the ECM's compressor relay output.

35. A — Multiple plausibility or range-error codes across different systems simultaneously point to a common factor affecting all sensors. A charging system producing voltage outside the specification (too high from a failed regulator or too low from a failing alternator) changes the reference voltage that all sensors use, causing their output signals to shift outside their expected ranges and trigger plausibility codes in every module that receives those signals.

36. B — After ECM reprogramming, the TCM detects that the new software in the ECM does not match the TCM's expected communication parameters or data format. The TCM enters recovery mode as a protective measure — operating in a limited capacity with default shift strategies until its software is also updated to the matching version that is compatible with the new ECM calibration.

37. D — CAN-L at a constant 0V (instead of its normal 2.5V bias) indicates the CAN-L wire has a short to ground. The 2.5V bias that normally holds both CAN-H and CAN-L at their resting state is being pulled to 0V by the ground fault. This eliminates the differential signal on CAN-L, degrading bus

communication. The short must be located in the wiring harness — a chafed wire, a grounded connector pin, or a module with an internally shorted CAN-L driver.

38. C — A remote start system that successfully starts the engine but shuts it off after exactly three seconds is responding to a safety interlock. The most common interlock is the hood latch switch — many remote start systems require the hood to be closed for fire safety. A misadjusted hood switch that reports "open" triggers the safety shutdown after the programmed verification delay.

39. D — The ACC maintains set speed (proving the speed control function works) but does not slow for vehicles ahead (proving the distance detection function is not working). The forward radar sensor's ability to detect and track vehicles ahead is compromised — by contamination on the sensor surface, misalignment from a bumper impact, or a physical obstruction that blocks the radar beam while still allowing the system's basic speed-control function to operate.

40. A — Battery disconnection erases many customer-programmed settings stored in volatile memory: radio station presets, clock settings, seat memory positions, mirror positions, climate control preferences, and trip computer data. Documenting these settings before disconnecting the battery allows the technician to restore them after reconnection, providing a better customer experience and avoiding complaints.

41. C — The ambient temperature sensor is typically a thermistor mounted behind the front bumper or grille where it measures the outside air temperature. A faulty sensor (open circuit, short circuit, or contaminated thermistor element) produces a resistance value that the BCM translates to an incorrect temperature reading. A −10°C reading on a 22°C day indicates the sensor's resistance is far from the correct value for the actual ambient temperature.

42. A — A pending DTC means the monitoring system has detected a fault condition, but the condition has not yet repeated on enough consecutive drive cycles (typically two) to confirm the code and illuminate the MIL. Pending codes are valuable diagnostic information — they tell the technician which monitor detected a problem, even though the ECM has not yet committed the code to confirmed status.

43. C — A completely dark instrument cluster (no gauges, no lights, no display) that also cannot communicate on the CAN bus indicates the cluster has no power at all. Without power, the cluster's microprocessor cannot operate, its displays cannot illuminate, and its CAN transceiver cannot participate on the bus. The most likely cause is a total power supply or ground failure at the cluster's harness connector.

44. A — At idle in neutral with the clutch engaged, the engine's torsional combustion pulses are transmitted through the clutch disc to the transmission's input shaft and countershaft gears. The gear backlash allows the teeth to rattle as the torsional pulses alternately accelerate and decelerate the gears. Depressing the clutch disconnects the engine from the gears (stopping the rattle), and selecting a gear loads the mesh (eliminating the backlash).

45. C — An isolated harsh 1-2 shift with all other shifts smooth points to the 1-2 accumulator — the hydraulic cushion specific to that shift transition. A leaking accumulator piston seal or broken accumulator spring allows the second-gear clutch apply pressure to rise abruptly instead of gradually, slamming the clutch engagement rather than cushioning it progressively.

46. A — Shifting from 4H to 4L requires meshing a different gear set inside the transfer case. This engagement requires speed matching between the output gear sets, which the synchronizer (or sliding gear mechanism) provides. A worn synchronizer cannot match the speeds during the engagement attempt, causing the gear teeth to clash and produce the grinding noise. The 2H-to-4H shift does not involve this gear set.

47. D — A rhythmic vibration proportional to vehicle speed (not engine RPM) on a FWD vehicle, persisting after tire balancing, points to the half-shafts. The half-shafts rotate at wheel speed and a bent shaft, damaged CV joint, or missing balance weight produces a once-per-revolution vibration that increases linearly with vehicle speed regardless of engine RPM or gear selection.

48. B — A 1-2 slip at cold temperatures that disappears when warm indicates a seal that cannot maintain hydraulic pressure when cold but seals adequately when warm. The clutch piston seal in the 1-2 circuit is hardened from age and heat cycling. At cold temperatures, the stiff seal cannot conform to the bore surface, allowing fluid to bypass. As the fluid warms the seal, it softens and regains its flexibility.

49. C — A rhythmic clunk during slow, tight turns in an open differential comes from the spider gears and their interaction with the side gears. During turns, the spider gears must rotate on their cross-shaft to accommodate the speed difference between the left and right wheels. A chipped or broken tooth on the ring gear produces a single clunk at a specific point in each revolution of the gear, most audible at slow parking lot speeds.

50. A — When the TCC is locked, the input speed and output speed should be identical (zero slip). A 50 RPM difference means the TCC clutch surface is not achieving full lockup — it is slipping. The cause may be worn TCC friction material, insufficient apply pressure from a faulty solenoid or valve, contaminated ATF that has lost its friction properties, or a mechanical fault inside the converter.

51. B — The clutch touch point represents the physical position where the clutch disc first contacts the pressure plate and begins transmitting torque. As the friction material wears thinner, the actuator must travel further before the disc contacts the plate — the touch point migrates away from its original learned position. Significant migration confirms the friction material has worn substantially.

52. D — Vibration during acceleration that disappears at cruise and coast, felt through the steering wheel on a FWD vehicle, is characteristic of a worn inner CV joint (tripod joint). The inner joint must accommodate both plunge and angle under the torque loading of acceleration. A worn tripod roller or housing produces vibration that ceases immediately when the acceleration torque is removed.

53. B — Progressive increase in clutch pedal effort over months, with the engagement point remaining correct, indicates increasing friction in the hydraulic release mechanism. The clutch master cylinder's bore corrodes from moisture absorption in the brake fluid, creating friction between the piston seal and the rough bore wall that progressively increases the force required to push the piston through its stroke.

54. A — If the differential drain plug's sealing washer was damaged and not replaced, the plug may leak slowly after the service. Over 5,000 km, the fluid level drops below the minimum, and the ring-and-pinion gear mesh begins running without adequate lubrication. The resulting metal-to-metal contact at highway speed produces a vibration that was not present when the differential had adequate fluid.

55. B — The transmission shifts correctly (confirming the internal hydraulics and electronics are functioning), but the cluster displays the wrong gear. Since the actual shift is correct, the TCM's shift control is accurate. The display error is in the communication between the TCM and the instrument cluster — the TCM is broadcasting an incorrect gear position on the CAN bus due to a software lookup table error.

56. D — The U-joints were recently replaced (eliminating them as the cause). A single clunk during the coast-to-drive transition indicates rotational play — free movement that takes up when the torque direction reverses. Excessive ring-and-pinion backlash in the differential is the most common remaining source, allowing the ring gear to separate from the pinion during coast and then re-engage with a clunk when drive torque is applied.

57. A — Downshifting from 3rd to 2nd at speeds above 40 km/h requires the 2nd-gear synchronizer to match a large speed differential between the slowing output shaft and the faster-spinning 2nd gear. A worn synchronizer cannot generate enough friction to overcome this large speed differential at higher vehicle speeds. At lower speeds, the speed differential is smaller and the worn synchronizer can still match speeds adequately.

58. A — The kickdown (passing) downshift requires the accelerator pedal to reach a specific position — typically past a detent point or at a specific rate of application — that the TCM recognizes as a passing demand. If the driver presses firmly but does not reach the kickdown threshold (stops just short of the detent or applies the pedal too slowly), the TCM does not receive the correct input to command the downshift.

59. A — Clicking equally loud in both left and right turns eliminates the normal single-side CV joint pattern (where the outside joint is loaded more during the turn toward the opposite side). Both outer CV joints being equally damaged is the most likely explanation — both boots tore at approximately the same time, both joints have been exposed to contamination for a similar period, and both have reached the same level of internal wear.

60. B — Slightly soft shifts in a recently rebuilt transmission where every shift is affected (not just one specific gear) suggest a system-wide issue rather than a specific clutch fault. A reused, unflushed torque converter introduces contaminated old fluid into the fresh rebuild. The contaminated fluid's degraded friction properties reduce the clutch pack engagement quality across all shifts.

61. C — The BCM commands show a steady headlamp output (the software is commanding the lamps on continuously), but the physical light output flickers. This disconnect between the steady software command and the flickering physical output indicates the BCM's internal solid-state output driver is failing intermittently — the hardware cannot maintain the steady output that the software commands.

62. D — The ECM uses barometric pressure to calculate air density — lower barometric pressure means thinner air (less oxygen per unit volume). With the barometric sensor reading 85 kPa instead of the actual 101 kPa, the ECM believes it is operating at approximately 1,500 meters elevation and reduces fuel delivery and adjusts ignition timing for the perceived thinner air, causing a lean condition and reduced performance at sea level.

63. B — The safest temporary solution for a window stuck in the down position is to access the glass from inside the door, manually push or guide it to the closed position, and secure it with tape or a wedge that holds it at the top of its travel. This seals the opening against weather while maintaining the door's interior integrity and avoiding damage to the glass or door components.

64. B — A voltage drop from 14.4V to 13.1V under heavy accessory load at idle is within the normal operating range for an automotive charging system. The alternator's output decreases at idle speed (lower RPM), and the combined load of headlamps, defroster, blower, and heated seats draws significant

current. As long as the voltage remains above approximately 12.8-13.0V, the battery continues to receive a net positive charge.

65. A — The A/C system cools normally (proving the system pressures, compressor, and refrigerant charge are correct). The low-speed fan setting is the only function that doesn't work — the fans operate correctly at high speed when the A/C or high-temperature condition commands them. The dedicated low-speed component (resistor, relay, or speed controller module) that provides the reduced-speed drive has failed.

66. D — Over time, the compressor clutch friction surface wears, widening the air gap between the drive plate and the pulley. When the gap exceeds the specification (typically 0.4-0.8 mm), the electromagnetic field from the coil cannot exert sufficient force across the increased distance to pull the plate firmly against the pulley. The plate engages weakly and slips under the compressor's load rather than locking solidly.

67. A — High-speed fans at key-on with a correct 25°C ECT reading and A/C off eliminates the ECM temperature command and A/C command as causes. The fan relay has failed with welded contacts, providing continuous battery power to the fan motors. Welded relay contacts occur from arcing during high-current switching events and create a permanent closed circuit regardless of any control signal.

68. B — The concentrated reservoir fluid has adequate freeze protection, but the washer fluid remaining in the exposed lines and nozzles is from a previous fill of more diluted fluid. These exposed components are not heated and reach ambient temperature between uses. The diluted old fluid in the lines and nozzles freezes in extreme cold while the properly concentrated reservoir fluid remains liquid.

69. C — At 0°C evaporator temperature, water from the cabin air begins freezing on the evaporator fins. If the compressor continues operating without cycling off, ice progressively builds on the fin surfaces, blocking airflow through the evaporator. The blower continues running but the iced-over evaporator physically prevents air from passing through, reducing vent output to near zero despite maximum blower operation.

70. D — With the adjustment screws unchanged, the headlamp housing remains in its factory-set position. The beam pattern change must be internal — the reflector bowl, projector lens, or light-guiding optics inside the housing have shifted from their factory position due to thermal cycling over time. This internal component movement redirects the light pattern without any external housing movement.

71. A — The brake light switch has 12V at its input terminal (confirming the fuse and power supply are functional). Pressing the pedal should close the switch and pass voltage to the output terminal. No voltage at the output with the pedal pressed confirms the switch is not closing its contacts — it has failed in the open position and must be replaced or adjusted.

72. B — UV dye confirmed at the compressor shaft seal area identifies the specific leak location. On most modern A/C compressors, the shaft seal is not a separately serviceable component — it is integrated into the compressor housing and cannot be replaced without disassembling the compressor, which is not practical in the field. The complete compressor assembly must be replaced.

73. A — Cold-start heavy steering that resolves within five minutes and produces no DTCs suggests a component that is affected by cold temperature but returns to normal as it warms. The EPS motor's internal brushes, which make spring-loaded contact with the commutator, contract in cold temperatures. The reduced spring pressure allows intermittent contact that reduces motor torque, and the brushes warm and expand within minutes.

74. C — The system maintains 22°C correctly but cannot achieve 18°C — the blend door is not moving far enough toward the full-cold position to provide the additional cooling needed below 22°C. A mechanical restriction (debris, broken door pivot, misaligned duct), an actuator that has reached its end-of-travel before the full-cold position, or a calibration error limits the blend door's travel short of maximum cooling.

75. D — Self-activating wipers with the switch off point to a signal triggering the wiper circuit without the driver's input. On vehicles with rain sensors, contamination or a fault in the rain sensor can intermittently detect moisture that doesn't exist. On vehicles without rain sensors, the BCM's wiper output circuit may have an intermittent signal glitch from a wiring fault or module anomaly.

76. B — Temperature and fan speed are correct on both sides (eliminating the HVAC module, blower, and temperature control). The difference is airflow volume — the driver's side receives less air despite the same blower speed. A restriction, disconnected joint, or collapsed section in the driver's side ductwork reduces the volume reaching those vents while the unobstructed passenger side receives full airflow.

77. D — A battery testing "Good" at room temperature demonstrates adequate plate structure at 20°C. At −25°C, both the battery's output capacity decreases (chemical reaction slows) and the engine's cranking resistance increases (cold oil viscosity and tighter tolerances). The combination of reduced battery output and increased engine demand at −25°C can exceed a battery's capability even though it passes testing at room temperature.

78. A — The SRS DTC appeared after body work on the passenger door — the area where the side impact sensor is located. The body shop either physically damaged the sensor during the door repair, failed to reconnect the sensor's wiring after removing the interior door trim, or disturbed the connector enough to create high resistance in the circuit. The timing of the code with the body work is the critical diagnostic clue.

79. B — The motor runs (confirmed by sound) but the seat doesn't move forward. All other directions work (eliminating the power supply, ground, and switch). The forward/backward drive mechanism — the motor gear, drive cable, or track screw specific to that axis of movement — has stripped, broken, or disconnected, allowing the motor to spin without translating its rotation into linear seat movement.

80. A — The left mirror repeater works (proving the flasher, multifunction switch, and main circuit are functional for both sides). The right rear turn signal works (proving the right-side circuit is active). The fault is isolated to the right mirror repeater's branch circuit — the LED, its wiring within the mirror, or the connector between the vehicle harness and the mirror assembly.

81. C — The fans work with the A/C on (proving the fan motors, wiring, and one relay path are functional). The fans don't activate when the ECM should command them based on coolant temperature. The ECM reads the temperature correctly (confirmed by scan tool). The ECM's fan control output for the temperature-activated circuit has failed — it cannot provide the ground signal to energize the fan relay.

82. D — Backup lights not illuminating in reverse while all other lights work correctly points to the backup light circuit specifically. The entire circuit must be checked systematically: the reverse light switch or transmission range sensor's reverse position signal, the fuse protecting the backup light circuit, any relay in the circuit, the wiring to the bulbs, and the bulbs themselves.

83. B — System pressures look normal and the compressor engages correctly, yet the vent temperature is 12°C instead of the specified 3-7°C. The most common cause of warm vent temperatures despite normal system pressures is a blend door that is partially open to the heater core, allowing warm air to mix with the cold evaporator air and raising the vent temperature above what the A/C system alone can achieve.

84. A — Swapping the front tires left-to-right caused the pull to switch from right to left. The pull follows the tire that was originally on the right. This confirms the tire has an internal construction defect (ply steer or radial pull) that creates a directional bias independent of alignment settings, tire pressure, or suspension condition.

85. B — Sensor resistance is within specification (eliminating the coil winding), the tone ring is visually intact, and the air gap is correct. The remaining possibility is the signal quality — the AC waveform the sensor produces during wheel rotation. An oscilloscope connected to the sensor output during rotation reveals amplitude dropouts, erratic voltage spikes, or waveform irregularities that resistance testing alone cannot detect.

86. D — Resurfacing restored the rotor to flat, zero-DTV condition — but the vibration returned within 5,000 km. The root cause is not in the rotors themselves but in what is deforming them. Hub assembly lateral runout forces even a perfectly machined rotor to wobble. The brake pads contact the wobbling rotor's high spot with each revolution, progressively wearing a thickness variation into the rotor that reproduces the vibration.

87. B — A steady (continuously illuminated) ESC light indicates the system has been disabled due to a fault. A flashing ESC light indicates active system intervention during driving. The steering angle sensor fault prevents the ESC module from comparing the driver's steering input to the vehicle's actual path, so the module cannot determine whether intervention is needed and disables the system entirely.

88. B — Tire pressure directly affects ride height — underinflated tires compress more under the vehicle's weight, lowering the ride height, while overinflated tires raise it. Since camber, caster, and toe all change with ride height (due to suspension geometry), incorrect tire pressure produces incorrect alignment readings. The alignment must be performed at the manufacturer's specified pressures to ensure accurate measurements.

89. C — Seized caliper slide pins prevent the floating caliper from moving laterally to equalize pad pressure. When the piston pushes the inner pad against the rotor, the caliper body should slide toward the rotor to pull the outer pad inward equally. With seized pins, only the piston-side (inner) pad contacts the rotor fully, wearing rapidly while the outer pad barely makes contact.

90. A — With correct fluid level and clean fluid, the whining noise is most likely from the pump's internal mechanical components. Worn vanes, gears, or housing surfaces create internal clearances that allow fluid to bypass the pumping elements. The turbulent flow through these worn clearances produces the characteristic speed-dependent whine that increases linearly with pump RPM.

91. B — Vague, loose steering at highway speed with correct alignment and pressures indicates cumulative mechanical looseness in the steering and suspension linkage. Individual components (tie rod ends, ball joints, control arm bushings, rack mount bushings, wheel bearings) may each have play within

their individual wear specifications, but the total accumulated play creates the imprecise feel at highway speed.

92. D — A brake pedal that feels firm initially but becomes spongy with subsequent applications suggests a component that maintains its integrity for one application but loses it under repeated loading. A brake hose with internal deterioration expands under pressure like a balloon — the first application fills the expanded volume, and subsequent applications must re-fill the expansion before building effective pressure at the caliper.

93. B — Before performing a tire puncture repair, the technician must verify: the puncture is within the repairable center tread zone (not in the shoulder or sidewall), the puncture diameter does not exceed the maximum repairable size (typically 6 mm / 1/4"), and the tire interior shows no hidden damage (separation, deterioration, or previous repairs that would compromise the new repair's integrity).

94. B — Drums seized to hubs are freed by: first applying penetrating oil at the hub contact surface, then using the drum's threaded adjuster access holes to back off the brake shoe adjustment (shoes expanded tight against the drum are a common reason the drum won't release). Some drums also have threaded bolt holes where bolts can be progressively threaded in to push the drum off the hub evenly without hammering.

95. D — The TPMS sensor in the wheel with the new tire was likely damaged during the tire mounting process. The tire machine's bead breaker or mounting arm can contact and break the sensor stem, crack the housing, or damage the internal electronics. This damage prevents the sensor from transmitting its pressure data, and the TPMS module illuminates the warning because it cannot read the damaged sensor despite the relearn.

96. A — A single clunk when the steering direction changes (once turning left, once turning right) indicates play in a steering linkage component that shifts position with each direction change. Worn inner tie rod sockets allow the tie rod to move within the rack housing before engaging the steering rack's movement, producing a single clunk as the play is taken up in each new direction.

97. D — The ABS module's power supply circuit — its dedicated fuse, relay (if equipped), and wiring connection — may have excessive resistance that is not apparent during normal vehicle operation but drops the voltage below the module's minimum threshold during the high-current self-test when the ABS pump motor briefly activates. The battery and alternator test correctly because the fault is in the ABS-specific circuit.

98. C — Both the valve stem (base seal and valve core) and the wheel rim (cracks, porosity, and corroded bead seats) are potential slow-leak sources that soap solution applied only to the tread and sidewall would not detect. A comprehensive slow-leak diagnosis must include submerging the entire wheel-and-tire assembly in water or applying soap solution to the valve stem base, valve core, and the bead-to-rim interface on both sides.

99. B — After a wheel bearing replacement, a brake pull to the replaced side during braking points to a rotor mounting issue. If the hub flange surface was not cleaned of corrosion and debris before the rotor was mounted, the trapped material spaces the rotor away from the hub at that point, creating lateral runout. The runout causes uneven pad-to-rotor contact that produces a brake pull toward that side.

100. B — The stabilizer bar resists body roll during cornering by transferring the compression force from one side of the suspension to the other through the bar's torsional resistance. Worn bushings allow the bar to move freely within its mounts, delaying and reducing the torsional force transfer. The result is increased body roll during cornering in addition to the rattle noise over bumps.

101. C — A "short to battery" DTC in the airbag firing circuit means the circuit is contacting a 12V power source somewhere in the wiring. The most common cause is a chafed wire in the harness where the airbag circuit wire's insulation has worn through and is contacting a 12V supply wire — or a damaged connector where pins are bridging between the firing circuit and a power circuit.

102. D — A disconnected sunroof drain tube dumping water into the A-pillar and kick panel area threatens any electronic component mounted in that area. On many vehicles, the BCM or a fuse/relay box is located in the driver's side kick panel. Water reaching these components can corrode circuit board traces, short relay contacts, and damage module housings — causing widespread electrical faults.

103. B — The liftgate operates at normal speed with functioning anti-pinch (proving the motor has adequate power and the control module is functioning). The grinding noise indicates mechanical wear in the drive mechanism — the motor's gear, the worm drive, or the rack-and-pinion mechanism has developed worn or chipped teeth that produce the grinding sound during operation without yet preventing function.

104. A — The heated steering wheel element receives power through the clockspring ribbon cable (the same component that carries the airbag and horn circuits). A damaged conductor within the clockspring for the heater circuit would prevent power from reaching the heating element even though the button illuminates (which may be powered through a different clockspring conductor or a separate circuit).

105. C — Paintless dent repair (PDR) uses specialized access tools (rods, hooks, and leverage bars) inserted behind the panel through existing openings (door jambs, trim removal areas, window openings) to progressively push the dented metal back to its original contour from behind. The factory paint finish is not disturbed because no filling, sanding, priming, or repainting is required.

106. A — The metal mounting button is still securely bonded to the windshield glass. The mirror detached from the button — either the spring clip released, the set screw loosened, or the mirror's mounting slot separated from the button. The repair is simply reattaching the mirror to the existing button using its original mounting mechanism, which does not require any adhesive application to the glass.

107. B — The HV battery cooling fan draws excessive current (higher than normal) and sounds louder (mechanical noise). The most common cause is a worn fan motor bearing that creates friction resistance the motor must overcome, increasing current draw while producing the louder-than-normal noise characteristic of a rough or dry bearing. The bearing wear may also cause vibration audible as motor noise.

108. A — The vehicle charges from Level 1 (120V) but not from the home Level 2 EVSE that previously worked. Before investigating the vehicle's Level 2 circuit, verify the EVSE itself is functioning — check that the dedicated 240V circuit breaker hasn't tripped, that the EVSE receives power, and that its internal relay, GFCI, and control board are operational. The EVSE is the simplest and most accessible check.

109. C — A single cell group at 3.2V while all others are between 3.7V and 3.9V represents a significant voltage disparity (0.5V to 0.7V difference) that exceeds normal balancing variation. The low cell group has degraded cells with reduced capacity or increased internal resistance that cannot maintain voltage under load. This cell group is limiting the entire pack's performance and likely needs replacement.

110. B — The HV battery SOC at 15% is below the minimum threshold for electric motor assist on most hybrid systems. The hybrid control module runs the engine continuously to recharge the battery back to a usable level. Once the SOC rises above the minimum threshold (typically 20-25%), the system resumes normal hybrid operation with electric motor assist during appropriate driving conditions.

111. A — The HVIL (High Voltage Interlock Loop) is a low-voltage safety circuit that runs through all HV connectors. When any HV connector is disconnected (removing the HVIL loop's continuity), the BMS detects the open circuit and immediately commands the main contactors to open, de-energizing the HV circuit. This prevents anyone from contacting live HV terminals during service.

112. B — "Turtle mode" (named for the turtle icon displayed) activates when the HV battery SOC reaches its absolute minimum usable level. The BMS severely limits the available power output to prevent the battery from being discharged below the threshold where permanent cell damage (irreversible capacity loss or copper dissolution) would occur. The limited power allows the driver to slowly reach a safe location or charging station.

113. B — The DC-DC converter produces correct output when tested (14.2V in Ready mode), eliminating the converter as the continuous charging source problem. The 12V battery dying overnight despite correct daytime charging points to excessive parasitic draw from the vehicle's numerous control modules not entering sleep mode properly, draining the 12V battery faster than it can sustain overnight.

114. B — BEVs do not simply shut down all systems at 0% SOC. Instead, the BMS begins limiting power output well before reaching the minimum, providing the driver with progressive warnings, reduced speed limits (turtle mode), and a final safe-stop procedure. The vehicle gradually reduces its power availability to give the driver maximum opportunity to reach a charging station or safe stopping point.

115. A — With 85% SOC and the engine starting unexpectedly, environmental temperature is the most likely trigger. In extreme cold, the hybrid control module starts the engine to provide cabin heating (since there's no waste heat from an ICE in EV mode) and to warm the HV battery to its optimal operating temperature. In extreme heat, the engine may run to power the A/C compressor at maximum capacity.

116. B — When regenerative braking is limited because the battery is full, the driver must rely primarily on the friction brakes for deceleration on the long mountain descent. Extended friction braking on a steep, sustained grade can overheat the brake pads (causing fade), boil the brake fluid (causing vapor lock and pedal loss), and warp the rotors. The driver should use lower gear settings and intermittent braking to manage heat.

117. A — In a series hybrid, the ICE has no mechanical connection to the wheels — it drives only a generator. The ICE starts when the HV battery can no longer meet the energy demand alone: either the SOC has dropped below the calibrated minimum threshold (requiring the generator to replenish the battery), or the driver's instantaneous power demand exceeds the battery's maximum output (requiring the generator to supplement the battery's electrical output in real time).

118. C — The vehicle charges normally at public stations but faults at home, isolating the problem to the home EVSE or its electrical installation. Common home installation faults include a missing or degraded

equipment grounding conductor, an incorrect neutral-to-ground bond at the subpanel, or a GFCI device with a sensitivity mismatch. The home EVSE detects the wiring fault as a ground fault and refuses to deliver current to protect the user.

119. B — Hybrid vehicles commonly have two completely separate cooling circuits: the engine cooling circuit (belt-driven pump, conventional coolant, 90°C+ operating temperature) and the HV battery cooling circuit (electric pump, potentially different coolant specification, 20–35°C operating range). Replacing the wrong pump leaves the actual failed circuit unrepaired and wastes parts and labor on a system that was functioning correctly.

120. D — The manufacturer's rated EV range is determined under standardized test conditions that include moderate speeds, gentle acceleration, and mixed driving. Highway driving at 120 km/h dramatically increases aerodynamic drag — drag force increases with the square of speed, and the power required increases with the cube of speed. At 120 km/h, a BEV can consume 40–60% more energy per kilometer than at 80 km/h, accounting for much of the range shortfall beyond the 18% SOH degradation.

121. C — The onboard charger has an internal temperature sensor that the charger monitors as a safety input. If the sensor fails (open circuit, short circuit, or erratic reading), the charger cannot verify its internal temperature is within safe operating limits. Rather than operating blind with no thermal protection, the charger disables itself entirely as a protective measure. The vehicle drives normally because the drive system does not use the onboard charger.

122. A — Hybrid vehicles cycle their engines on and off frequently during normal driving. Each engine restart involves a cold-start enrichment period where the ECM commands extra fuel. This excess fuel washes past the piston rings into the oil (fuel dilution), degrading the oil's viscosity and additive package faster than in a conventional vehicle where the engine runs continuously and the enrichment occurs only once per trip.

123. D — The 12V auxiliary electrical system on a BEV is electrically isolated from the HV system by design. The DC-DC converter that connects them provides galvanic isolation — there is no direct electrical path between the HV circuit and the 12V circuit. Standard 12V components (headlamp bulbs, fuses, 12V accessories, wiper blades) can be serviced using normal procedures without HV de-energization, just as on a conventional vehicle.

124. B — Regenerative braking is effective at higher speeds where the motor can generate meaningful back-EMF, but its effectiveness diminishes as the vehicle slows and the motor approaches zero RPM. Below a calibrated speed threshold (typically 5–15 km/h), the regenerative system can no longer provide

useful deceleration force. The brake system must seamlessly blend in friction braking to maintain the driver's commanded deceleration rate through the final portion of the stop.

125. D — A replacement HV battery pack requires a registration or initialization procedure that programs the BMS with the new pack's specific cell data — capacity baseline, internal resistance values, manufacturing date, and initial SOC calibration. Without this initialization, the BMS cannot accurately manage the new pack's charging limits, discharge limits, and cell balancing parameters, triggering the warning because the system detects a mismatch between expected and actual battery behavior.