PRACTICE EXAM 2: RED SEAL AUTOMOTIVE SERVICE TECHNICIAN SIMULATION (125 QUESTIONS)

1. A technician accidentally splashes battery acid onto the skin of their forearm. What is the correct immediate first aid response?

A. Apply petroleum jelly to the affected area to neutralize the acid and prevent further chemical reaction

B. Sprinkle baking soda powder directly onto the wet acid on the skin to neutralize it before rinsing with water

C. Cover the area with a dry sterile bandage and proceed to the hospital for treatment without rinsing the wound

D. Flush the affected area immediately with large volumes of clean water for a minimum of fifteen minutes

2. A fire starts in a pan of waste solvent on a parts cleaning bench. The solvent is petroleum-based. Which class of fire does this represent, and which extinguisher type is appropriate?

A. Class A fire involving ordinary combustibles, which is best extinguished using a pressurized water extinguisher

B. Class B fire involving flammable liquids, which is best extinguished using a CO_2 or dry chemical extinguisher

C. Class C fire involving energized electrical equipment, which requires a non-conductive extinguishing agent only

D. Class D fire involving combustible metals, which requires a specialized dry powder agent designed for metal fires

3. What information does Section 8 of a Safety Data Sheet provide?

A. The physical and chemical properties of the product including boiling point, flash point, and vapor pressure

B. The fire-fighting measures including suitable extinguishing media and protective equipment for responders

C. The exposure controls and personal protection requirements including PPE, ventilation, and exposure limits

D. The ecological information including aquatic toxicity, persistence in the environment, and bioaccumulation data

4. A hydraulic floor jack is used to raise the front of a vehicle. Once the vehicle is at the desired height, what must be done before the technician performs any work underneath?

A. Jack stands must be placed under designated support points and the vehicle lowered onto the stands before any work begins

B. The floor jack handle must be locked in the raised position using the jack's built-in locking pin to prevent descent

C. A second technician must hold the jack handle at all times while the first technician works under the vehicle as safety backup

D. Wheel chocks must be placed on the rear wheels and the floor jack left in position as the sole support for the vehicle

5. When operating a bench grinder, a technician notices a hairline crack on the grinding wheel. What is the correct action?

A. Apply industrial adhesive to the crack and allow it to cure for twenty-four hours before returning the wheel to service

B. Reduce the grinder RPM to the lowest setting and continue using the wheel while monitoring the crack for growth

C. Mark the cracked area with a permanent marker and avoid using that section of the grinding wheel during future operations

D. Remove the cracked wheel from service immediately and replace it with a new wheel rated for the grinder's maximum RPM

6. Which WHMIS 2015 pictogram features a symbol depicting corrosion of both a surface and skin, and indicates the product is corrosive?

A. The skull and crossbones pictogram within a red-bordered diamond, indicating acute toxicity or fatal exposure risk

B. The corrosion pictogram within a red-bordered diamond, showing damage to both a surface and a hand from chemical contact

C. The exclamation mark pictogram within a red-bordered diamond, indicating irritation or less severe health effects

D. The health hazard pictogram within a red-bordered diamond, showing a silhouette with a starburst on the chest

7. A torque wrench with a micrometer-adjustable handle must be stored properly after use. What is the correct storage practice for a click-type torque wrench?

A. Set the wrench to its lowest scale value to relieve tension on the internal calibration spring during storage

B. Set the wrench to midpoint of its range to maintain even stress distribution across the internal spring mechanism

C. Lock the wrench at the last torque value used so it is ready for the next application without requiring readjustment

D. Store the wrench with the handle fully extended to the maximum scale value to keep the spring in a stretched condition

8. Waste engine coolant (ethylene glycol) has been drained from a vehicle during a cooling system service. What is the correct disposal procedure?

A. Collect the coolant in an approved container separate from other waste fluids and dispose of it through the shop's licensed recycling program

B. Pour the used coolant down the shop floor drain since ethylene glycol is water-soluble and will be diluted in the sewer system

C. Mix the used coolant with the used engine oil collection tank since both fluids are processed together by waste haulers

D. Allow the coolant to evaporate in an open container outside the shop since the glycol will break down in sunlight naturally

9. A technician must use compressed air to dry a cleaned engine component. Safety glasses are worn. What additional precaution must be observed?

A. The component must be placed inside a sealed blast cabinet before compressed air is applied to prevent debris projection

B. A second technician must hold a shop towel over the component as a debris shield while the first technician applies the air

C. The nozzle pressure must be regulated to a maximum of 30 psi to prevent debris from being driven into skin or eyes

D. The compressed air line must be fitted with an inline water separator to prevent moisture contamination of the clean surface

10. During a cylinder leak-down test, a technician introduces 80 psi of regulated air into cylinder 2 at TDC compression stroke. The gauge shows 40% leak-down, and air is heard escaping from the tailpipe. What does this indicate?

A. The piston rings on cylinder 2 are excessively worn and allowing compressed air to escape past them into the crankcase

B. The head gasket has failed between cylinder 2 and the adjacent coolant passage, allowing air to enter the cooling system

C. The intake valve on cylinder 2 is not sealing, allowing compressed air to escape backward through the intake port and manifold

D. The exhaust valve on cylinder 2 is not sealing, allowing compressed air to escape through the exhaust port and out the tailpipe

11. A customer complains that the engine uses oil between changes but no external leaks are visible. Blue-gray smoke is observed from the tailpipe during hard acceleration after periods of coasting or deceleration. What is the most likely cause?

A. A leaking front crankshaft seal that allows oil to spray onto the exhaust manifold where it burns and produces visible smoke

B. Worn valve stem seals that allow oil to seep past the valve guides into the combustion chambers during high intake vacuum periods

C. A failed PCV valve stuck in the open position that draws excessive crankcase oil mist into the intake manifold at all operating conditions

D. An overfilled crankcase that allows the crankshaft counterweights to contact the oil surface and whip oil into the cylinder bores

12. A crankshaft is being inspected during an engine overhaul. The technician measures each rod journal with an outside micrometer at two positions 90 degrees apart and at two locations along the journal length. What two conditions is this procedure checking for?

A. Journal out-of-round and journal taper, which indicate whether the journal can accept new bearings or must be reground

B. Journal surface hardness and journal bearing crush, which determine the correct bearing insert selection for reassembly

C. Journal runout and journal concentricity, which indicate whether the crankshaft has been bent during previous engine operation

D. Journal oil clearance and journal end play, which must be set to specification before the connecting rods are torqued into place

13. What is the purpose of a harmonic balancer (crankshaft vibration damper) mounted on the front of the crankshaft?

A. It drives the accessory belt system by providing a pulley surface for the serpentine belt at the front of the engine assembly

B. It provides the mounting surface for the crankshaft position sensor reluctor ring used by the engine management system for timing

C. It absorbs torsional vibrations in the crankshaft caused by the uneven firing impulses of the cylinders to prevent crankshaft fatigue failure

D. It maintains constant crankshaft rotational speed during the intervals between firing events by storing inertial rotational energy

14. An engine equipped with a timing chain makes a rattling noise from the front of the engine that is most noticeable at cold startup and during sudden acceleration. The noise has gradually worsened over time. What is the most likely cause?

A. A worn water pump bearing that produces a rattle as the impeller contacts the pump housing at the front of the engine block

B. A loose accessory drive belt tensioner that allows the belt to slap against the timing cover during RPM changes and cold conditions

C. A cracked exhaust manifold that leaks exhaust gas at the front cylinder, producing a rattle that resonates against the timing cover

D. A stretched timing chain and worn chain tensioner or guides that allow the chain to slap against the timing cover during operation

15. A port fuel injection system has a fuel pressure specification of 350 kPa with the engine running at idle. The measured pressure is 350 kPa at idle but drops to 280 kPa during a wide-open throttle snap test. What does this indicate?

A. The fuel pressure regulator is stuck at a fixed pressure and not compensating for the reduced vacuum at wide-open throttle

B. The fuel pump is unable to maintain adequate flow at high demand, indicating a weak pump or a restricted fuel filter

C. The fuel injectors are leaking internally and consuming fuel faster than the pump can supply during the high-demand WOT condition

D. The fuel return line is partially restricted, causing backpressure that artificially supports the idle reading but collapses under demand

16. A technician is performing a relative compression test using the scan tool's crankshaft acceleration data during cranking. Cylinder 4 shows significantly less crankshaft deceleration during its compression stroke compared to the other three cylinders. What does this indicate?

A. Cylinder 4 has higher compression than the other cylinders because carbon deposits have reduced its combustion chamber volume

B. Cylinder 4 has a misfire caused by a faulty ignition coil that is not producing adequate spark voltage during cranking operation

C. Cylinder 4 has low compression, meaning it offers less resistance to crankshaft rotation during its compression stroke than normal

D. Cylinder 4 has a stuck-open fuel injector that is hydrolocking the cylinder with excess fuel and increasing cranking resistance

17. A turbocharged gasoline engine experiences detonation (knock) under heavy load. The knock sensor is confirmed functional, and ignition timing has been retarded to maximum by the ECM. What other condition could be contributing to the persistent knock?

A. A malfunctioning intercooler or charge air cooler that is not adequately cooling the compressed intake air before it enters the engine

B. A restricted exhaust system downstream of the turbocharger that is creating excessive backpressure and reducing turbo efficiency

C. A failed turbocharger wastegate stuck in the open position that is limiting boost pressure below the target calibration setting

D. A contaminated mass airflow sensor that is causing the ECM to command a richer-than-stoichiometric mixture at high engine load

18. Two adjacent cylinders on an inline four-cylinder engine both show low and approximately equal compression readings. A wet compression test does not improve either cylinder's readings. What is the most likely cause?

A. Both cylinders have simultaneously experienced piston ring failure from a common lubrication problem affecting both cylinder bores

B. Both cylinders have exhaust valve damage from a single detonation event that occurred when the engine was operated on low-octane fuel

C. Both cylinders have intake valve carbon buildup from the GDI system that has reduced valve sealing across both adjacent intake ports

D. The head gasket has failed between the two adjacent cylinders, allowing compression to leak from each cylinder into the other

19. The evaporative emission system on a vehicle has a confirmed large leak DTC (P0455). The fuel cap has been verified as sealing correctly. What is the most effective diagnostic tool for locating the leak?

A. An exhaust gas analyzer positioned at the fuel tank filler neck to detect hydrocarbon vapors escaping from the tank interior

B. A smoke machine that pressurizes the sealed EVAP system with visible non-toxic smoke that exits visibly at the leak point

C. An electronic refrigerant leak detector that can be repurposed to detect fuel vapor molecules escaping from EVAP system components

D. A cooling system pressure tester adapted with EVAP system fittings to pressurize the system with compressed air for a bubble test

20. A vehicle with a coil-on-plug ignition system has a consistent misfire on cylinder 3. The technician swaps the coil from cylinder 3 with the coil from cylinder 1. After clearing codes and test-driving, the misfire is now on cylinder 1. What does this confirm?

A. The ignition coil that was originally on cylinder 3 is faulty, since the misfire followed the coil to its new location on cylinder 1

B. The spark plug on cylinder 1 was already marginal and the combination of the swapped coil and weak plug caused the new misfire

C. The wiring harness connector on cylinder 1 has an intermittent fault that coincidentally manifested after the coil was swapped into it

D. The ECM driver circuit for cylinder 1 has a fault that is under-powering whichever coil is installed in that position on the engine

21. What is the primary function of the oxygen sensor located downstream of the catalytic converter (post-catalyst O_2 sensor)?

A. To provide the ECM with a real-time air-fuel ratio signal for closed-loop fuel trim correction during all engine operating conditions

B. To detect engine misfires by monitoring the oxygen content of the exhaust gas exiting the converter during normal combustion events

C. To monitor catalytic converter efficiency by comparing its relatively stable signal to the actively switching upstream sensor signal

D. To measure the exhaust gas temperature at the converter outlet to protect the converter from overheating during high-load operation

22. An engine with gasoline direct injection has a DTC for high-pressure fuel pump performance below threshold. Fuel rail pressure reads 4,000 kPa at idle instead of the specified 10,000 kPa. The low-pressure fuel supply from the tank measures correctly at 400 kPa. What is the most likely cause?

A. A failing low-pressure electric fuel pump in the tank that cannot deliver adequate volume to the high-pressure pump inlet port

B. A leaking fuel pressure regulator on the fuel rail that is venting high-pressure fuel back to the return line prematurely

C. A restricted fuel filter between the tank and the engine that limits the fuel volume reaching the high-pressure pump inlet

D. A worn camshaft-driven high-pressure fuel pump that cannot generate adequate rail pressure despite receiving normal supply pressure

23. A vehicle has a rough idle and the scan tool shows misfire counts on cylinders 1 and 4. Cylinders 2 and 3 have zero misfire counts. All ignition coils and spark plugs have been confirmed functional through swapping. What should be investigated next?

A. The mass airflow sensor for contamination that would cause uneven fuel distribution to cylinders at opposite ends of the intake manifold

B. The compression on cylinders 1 and 4 to determine if a mechanical condition is preventing complete combustion on those cylinders

C. The crankshaft position sensor reluctor ring for missing or damaged teeth that could generate false misfire signals on specific cylinders

D. The fuel injector wiring harness for a common ground fault that affects only the injectors on the outermost cylinders of the engine

24. What happens to engine performance and emissions if the positive crankcase ventilation (PCV) valve is stuck in the fully open position?

A. The engine develops a lean condition at idle from excessive crankcase vapors acting as an unmetered vacuum leak into the intake manifold

B. The engine develops excessive crankcase pressure that pushes oil past the seals and gaskets, causing external oil leaks everywhere

C. The engine develops an extremely rich mixture because the open PCV draws fuel vapors from the EVAP canister into the crankcase

D. The engine loses all crankcase ventilation because the open valve allows intake vacuum to collapse the crankcase ventilation hose

25. A diesel engine equipped with a common rail injection system has a hard start condition. The engine cranks at normal speed but requires extended cranking before it fires. Once running, it operates normally. What should be checked first?

A. The glow plug system for proper pre-heat operation, since a warm engine starts normally but a cold engine needs functional glow plugs

B. The crankshaft position sensor signal quality during cranking, since an erratic signal would prevent the ECM from commanding injection

C. The fuel system for air intrusion, since air in the high-pressure lines prevents the injectors from delivering a combustible fuel charge

D. The starter motor current draw during cranking, since high current indicates increased mechanical resistance in the engine assembly

26. A vehicle has a check engine light with a DTC for the EGR system — insufficient flow detected. The EGR valve has been replaced but the code returns. What should be investigated next?

A. The catalytic converter efficiency, since a degraded converter often mimics EGR flow fault symptoms in the ECM monitoring algorithm

B. The EGR passages between the exhaust manifold and the intake manifold for carbon buildup that restricts exhaust gas flow

C. The engine oil level and condition, since contaminated oil can coat the EGR position sensor and prevent accurate valve position feedback

D. The fuel injection timing calibration, since incorrect timing can alter the exhaust pulse timing and prevent gas from flowing through the EGR

27. A four-cylinder engine has a P0302 (Cylinder 2 Misfire Detected) code. The freeze frame data shows the misfire occurred at 750 RPM, 28% engine load, and 92°C coolant temperature. The misfire is present at idle but disappears above 2,000 RPM. What type of fault does this pattern suggest?

A. A fuel delivery fault that starves cylinder 2 under the high fuel demand conditions of elevated RPM and heavy engine loading

B. An ignition fault that cannot produce adequate spark voltage to fire under the high cylinder pressures of heavy-load operation

C. A mechanical fault such as a leaking intake valve or head gasket that causes compression loss most noticeable at low RPM idle

D. A vacuum leak near cylinder 2's intake runner that introduces unmetered air most significantly at idle where manifold vacuum is highest

28. What is the function of the intake air temperature (IAT) sensor in the engine management system?

A. It measures the temperature of the incoming air so the ECM can calculate air density and correct fuel delivery for temperature variations

B. It measures the temperature of the exhaust gas recirculation flow to verify the EGR system is operating at the correct temperature

C. It measures the temperature of the coolant at the thermostat housing so the ECM can adjust cold-start enrichment and idle speed

D. It measures the temperature of the fuel in the rail to correct fuel injector pulse width for variations in fuel density with temperature

29. An engine has a persistent P0171 code (System Too Lean, Bank 1). Long-term fuel trim is +22% at idle and +8% at 2,500 RPM. Short-term fuel trim fluctuates between +3% and −2% at cruise. The MAF sensor reads 2.1 g/s at idle on a 2.0L engine. What is the most likely cause?

A. A failed upstream oxygen sensor on bank 1 that is falsely reporting a lean condition and forcing the ECM to add excess fuel

B. A restricted fuel filter that limits fuel delivery under the high-demand conditions of elevated RPM but delivers adequately at idle

C. A vacuum leak that introduces unmetered air primarily at idle, combined with a contaminated MAF sensor underreporting actual airflow

D. A weak fuel pump that cannot maintain rail pressure at idle, causing the injectors to deliver less fuel than the ECM pulse width commands

30. A diesel engine's diesel particulate filter (DPF) warning light is illuminated and the vehicle is in reduced power mode. The scan tool shows the DPF soot loading is at 95%. The vehicle is primarily driven on short urban trips. What is the most likely reason the DPF has become critically loaded?

A. The diesel oxidation catalyst upstream of the DPF has failed, preventing the chemical breakdown of soot into carbon dioxide and water

B. The driving pattern never allows the exhaust to reach the temperature required for either passive or active DPF regeneration to complete

C. The exhaust gas temperature sensors have failed, causing the ECM to believe exhaust temperature is too high and block regeneration

D. The DEF injection system is over-dosing urea solution, which is contaminating the DPF substrate and physically blocking the soot channels

31. A technician replaces an engine coolant temperature sensor. After installation, the engine starts and runs but idles significantly high and the fuel trim shows a strongly negative correction. What is the most likely issue with the replacement sensor?

A. The replacement sensor has a higher resistance than the original at the same temperature, causing the ECM to read a cooler signal

B. The replacement sensor's electrical connector is partially seated, creating a high-resistance connection that mimics a cold engine signal

C. The replacement sensor is the correct part number but was manufactured with a calibration offset that reads warmer than actual temperature

D. The replacement sensor is reporting a falsely high temperature, causing the ECM to lean the mixture and reduce cold-enrichment, creating a high idle from lean misfire correction

32. A vehicle has no scan tool communication. DLC pin 16 reads 12.5 volts, pins 4 and 5 ground reads 0.05 ohms to chassis. Termination resistance between pins 6 and 14 reads 0 ohms. What does the 0-ohm reading indicate?

A. A short circuit between CAN-H and CAN-L that prevents any differential signal from being generated on the bus

B. Both terminating resistors have failed simultaneously, removing all resistance from the bus and allowing unrestricted signal flow

C. The OBD II DLC has an internal fault that is creating a false reading between pins 6 and 14 due to corroded internal pin contacts

D. The bus is operating normally at low impedance, indicating that all modules are actively communicating and loading the bus correctly

33. A technician is attempting to program a replacement body control module. During the programming process, the scan tool displays a "Programming Failed — Voltage Low" error message. What most likely caused this failure?

A. The vehicle's battery is too weak to maintain adequate voltage during the programming process, causing the data transfer to corrupt

B. The replacement BCM is defective from the factory and cannot accept programming regardless of the vehicle's battery condition

C. A battery charger or power supply maintainer was not connected to sustain voltage above the minimum threshold during programming

D. The scan tool's own internal battery is depleted and cannot generate enough signal voltage to communicate with the module properly

34. On a vehicle with separate high-speed and medium-speed CAN buses connected through a gateway module, the scan tool communicates normally with all powertrain modules but cannot communicate with any body modules. What is the most likely cause?

A. The scan tool software is outdated and does not support the body module communication protocol used by this vehicle platform

B. The gateway module has a fault that is preventing it from translating data between the high-speed powertrain bus and the medium-speed body bus

C. All body modules have simultaneously failed due to a common power supply fuse that feeds all body system modules on the vehicle

D. The OBD II DLC is connected only to the high-speed bus and has no physical connection to the medium-speed body bus on this vehicle

35. What information does a U0401 DTC (Invalid Data Received from ECM/PCM) stored in the transmission control module indicate?

A. The ECM has completely lost power and is no longer broadcasting any data messages on the CAN bus for other modules to receive

B. The CAN bus backbone between the ECM and TCM has a physical break that is preventing any data from reaching the TCM from the ECM

C. The TCM has an internal processing fault that is causing it to misinterpret valid data messages that the ECM is transmitting correctly

D. The TCM is receiving data from the ECM but the data values are outside the expected range, indicating corrupted or incorrect ECM data

36. A vehicle has a parasitic battery drain. The technician discovers that the CAN bus remains active (modules not entering sleep mode) for hours after the ignition is turned off. An aftermarket GPS tracking device is plugged into the OBD II DLC. What is the most likely cause of the drain?

A. The aftermarket device is keeping the CAN bus active by continuously sending messages that prevent the modules from entering sleep mode

B. The vehicle's battery has a weak cell that cannot sustain the minimal current draw of the modules in their normal sleep mode condition

C. The BCM has an internal fault that prevents it from commanding the other modules to enter sleep mode after the ignition is turned off

D. The instrument cluster is remaining in its active display mode due to a faulty ignition switch that does not fully signal the off state

37. A technician disconnects modules one at a time on a vehicle where the scan tool cannot communicate with any module. After disconnecting the left rear door module, communication with all remaining modules is restored. What does this indicate?

A. The left rear door module's CAN bus wiring has an open circuit that was preventing the scan tool from reaching the rest of the network

B. The left rear door module has a failed internal CAN transceiver that was shorting the bus and preventing all modules from communicating

C. The left rear door module was drawing excessive current from the power supply, causing a voltage drop that prevented all module operation

D. The left rear door module stored a DTC that was blocking the gateway module from allowing scan tool access to the rest of the network

38. On a CAN bus network operating normally, what is the nominal voltage on both CAN-H and CAN-L when the bus is idle (not transmitting data)?

A. CAN-H rests at 5.0 volts and CAN-L rests at 0 volts, creating a constant 5.0-volt differential signal during idle periods between messages

B. CAN-H rests at 3.5 volts and CAN-L rests at 1.5 volts, maintaining a constant 2.0-volt differential even when no data is being transmitted

C. Both CAN-H and CAN-L rest at 0 volts, and voltage is only present on the lines when a module is actively transmitting a data message

D. Both CAN-H and CAN-L rest at approximately 2.5 volts, producing a 0-volt differential that represents the recessive (idle) bus state

39. A technician performs a TPMS relearn procedure after a tire rotation. The procedure requires using a TPMS activation tool at each wheel in a specific sequence. What is the purpose of this procedure?

A. It reprograms each TPMS sensor with a new identification code that corresponds to its new wheel position on the vehicle

B. It tests the battery voltage in each TPMS sensor and transmits a report to the TPMS module for replacement scheduling

C. It triggers each sensor to transmit its unique ID to the TPMS module so the module knows which sensor is at which wheel position

D. It calibrates each TPMS sensor's internal pressure transducer to the ambient barometric pressure for accurate pressure reporting

40. A vehicle requires a crankshaft position variation relearn procedure. Under what circumstances is this procedure typically required?

A. After replacing the crankshaft position sensor, the crankshaft, or the PCM, so the module can re-learn the specific mechanical characteristics for accurate misfire detection

B. After every engine oil change, so the module can compensate for the slight change in crankshaft rotational friction caused by fresh oil

C. After replacing the spark plugs, so the module can re-learn the ignition energy requirements of the new plug gap for each cylinder

D. After performing a wheel alignment, so the module can compensate for the change in rolling resistance that affects crankshaft load detection

41. A scan tool connected to a vehicle displays "Bus Active — No Response" when attempting to read DTCs from the airbag control module, but all other modules respond normally. What is the most likely cause?

A. The scan tool software does not support the specific airbag module protocol used by this vehicle manufacturer and model year

B. The airbag control module has lost its CAN bus connection due to a damaged spur wire, corroded connector, or internal module failure

C. The airbag module is in a locked deployment mode following a crash event and will not respond to scan tool requests until it is replaced

D. The CAN bus termination resistance is incorrect, causing signal degradation that selectively affects the airbag module communication only

42. What communication protocol is most commonly used for sub-networks connecting simple, low-speed devices such as seat motors, mirror adjustments, and window switches to their master module?

A. High-speed CAN operating at 500 kbps, which provides the fastest possible communication for all vehicle sub-systems

B. FlexRay operating at up to 10 Mbps, which provides the deterministic timing required for safety-critical seat position control

C. Automotive Ethernet operating at 100 Mbps, which provides the bandwidth needed for the high data volume of seat memory systems

D. Local Interconnect Network (LIN) operating at up to 20 kbps, which provides simple, low-cost single-wire communication for non-critical accessories

43. After replacing a transmission control module on a vehicle with an electronically controlled automatic transmission, the transmission shifts harshly into every gear. No DTCs are stored. What is the most likely cause?

A. The replacement TCM is defective from the factory and has an internal calibration fault affecting all shift solenoid output drivers

B. The transmission's internal solenoid pack has coincidentally failed during the module replacement and is stuck in maximum pressure mode

C. The new TCM has lost the adaptive shift learning data from the previous module and needs several hundred kilometers of driving to relearn

D. The vehicle speed sensor has lost its calibration reference due to the module swap and is sending incorrect speed data to the new TCM

44. A rear-wheel-drive vehicle produces a vibration that increases with vehicle speed, is felt through the floor, and occurs in all gears including neutral while rolling. Raising the vehicle and running the engine in gear with the rear wheels spinning does not reproduce the vibration. What is the most likely cause?

A. A worn transmission output shaft bearing that produces vibration only under the load conditions of the vehicle's weight on the drivetrain

B. An engine misfire that produces a vibration at crankshaft frequency which the driver perceives through the vehicle floor and seat

C. A worn pinion bearing in the rear differential that produces speed-dependent noise only when the driveline is under the load of vehicle weight

D. An unbalanced rear tire and wheel assembly, since the vibration is speed-related and cannot be reproduced with the wheels off the ground

45. A clutch disc is being installed on a manual transmission vehicle. What must be verified before bolting the pressure plate to the flywheel?

A. The clutch disc must be centered on the flywheel using an alignment tool so the transmission input shaft can pass through the disc hub during reassembly

B. The pressure plate diaphragm spring fingers must be adjusted to a uniform height using a dial indicator before the plate is bolted down

C. The flywheel ring gear must be inspected for damage and coated with anti-seize compound to prevent corrosion between the ring gear and starter

D. The release bearing must be pre-loaded against the diaphragm spring fingers to verify correct engagement depth before the bell housing is attached

46. A front-wheel-drive vehicle makes a rhythmic humming noise from the left front that increases with vehicle speed. The noise gets louder during right turns and quieter during left turns. What is the most likely cause?

A. A worn left front tire with irregular tread wear that produces increasing noise as rotational speed increases with vehicle speed

B. A worn left front wheel bearing that is loaded more heavily during right turns as weight transfers to the left side of the vehicle

C. A damaged left front CV joint that produces a constant hum rather than the typical clicking associated with CV joint wear in turns

D. A worn left front brake caliper slide pin that allows the pad to drag against the rotor and produce a speed-dependent friction noise

47. An automatic transmission has normal fluid level and condition but slips only during the 2-3 upshift. All other shifts are firm and timely. What does this pattern indicate?

A. The torque converter clutch is slipping because the TCC apply solenoid is not generating sufficient hydraulic pressure during the 2-3 event

B. The transmission oil pump is producing marginal pressure that is sufficient for most clutch applications but not the specific 2-3 shift clutch

C. The specific clutch pack or band that applies for the 2-3 shift has worn friction material or a leaking apply piston seal

D. The transmission fluid is contaminated with coolant from a breached internal transmission cooler that is affecting all friction surfaces

48. What is the correct first step when diagnosing a customer complaint of a "clunk" from the driveline when shifting from park to drive on a rear-wheel-drive vehicle?

A. Check for excessive play in the driveline by rotating the drive shaft by hand and measuring total free movement in degrees or millimeters

B. Replace the transmission mount, which is the most common cause of driveline clunks on rear-wheel-drive vehicles during gear engagement

C. Remove the drive shaft and inspect the universal joints for wear by checking for any perceptible play in the bearing caps and trunnion

D. Perform a transmission fluid analysis to check for metallic particles that indicate internal transmission damage causing the engagement clunk

49. A continuously variable transmission (CVT) equipped vehicle hesitates and shudders during moderate acceleration from a stop. What should be checked first?

A. The CVT belt or chain for wear marks or glazing that reduces the friction coefficient between the belt and the variable pulley surfaces

B. The engine mounts for deterioration, since excessive engine movement can be transmitted through the drivetrain as a shudder sensation

C. The torque converter (on CVTs equipped with one) for lockup clutch contamination that creates grabbing and releasing during initial acceleration

D. The CVT fluid level and condition, since incorrect fluid level or degraded fluid directly affects the belt-to-pulley clamping force and slip behavior

50. A manual transmission pops out of fifth gear during deceleration on the highway. The condition does not occur in any other gear. What is the most likely cause?

A. The synchronizer blocking ring on fifth gear is worn and cannot maintain speed matching during the deceleration load reversal transition

B. Worn fifth-gear shift detent springs or grooves that cannot hold the sliding sleeve in the engaged position against the deceleration forces

C. A bent fifth-gear shift fork that is not fully engaging the sliding sleeve with the gear, allowing it to disengage under load reversal

D. Low transmission fluid that fails to adequately lubricate the fifth-gear set, causing thermal expansion that forces the gears out of mesh

51. During a test drive, a four-wheel-drive pickup truck exhibits tight steering and a hopping sensation during low-speed turns on dry pavement. The 4WD indicator light is illuminated. What is the cause?

A. The part-time 4WD system is engaged on dry pavement, causing drivetrain bind because no center differential allows front-to-rear speed differences

B. The front wheel bearings are severely worn on both sides, causing the wheels to track erratically during turns and producing the hopping sensation

C. The power steering pump is failing and cannot produce adequate pressure for the additional steering effort required by the 4WD engagement forces

D. The front differential has a failed spider gear that is locking the left and right front wheels together and preventing speed differentiation in turns

52. What does a torque converter's stator one-way clutch do when the turbine speed approaches impeller speed during highway cruising?

A. It locks the stator in a fixed position to maintain torque multiplication efficiency at high vehicle speeds for continued acceleration capability

B. It engages a friction clutch to connect the stator directly to the torque converter housing and eliminate all fluid coupling slippage

C. It disengages the stator from the turbine shaft so the stator cannot interfere with the hydraulic coupling at higher rotational speeds

D. It allows the stator to freewheel so it does not redirect fluid against the impeller's rotation, which would create a braking effect at speed

53. A rear differential produces a howling noise during acceleration that disappears during coasting. What does this pattern indicate?

A. Worn differential pinion bearings that are loaded during acceleration and unloaded during coasting as thrust forces change direction

B. Excessive ring and pinion backlash that allows the gears to rattle during the transition between acceleration and deceleration loads

C. The ring and pinion gear contact pattern on the drive side is incorrect, indicating improper gear mesh that produces noise under drive load

D. A worn limited-slip clutch pack that chatters during the torque loading of acceleration and releases smoothly during coast deceleration

54. After replacing a half-shaft on a front-wheel-drive vehicle, the technician notices a vibration at highway speed that was not present before the repair. What is the most likely cause?

A. The replacement half-shaft has a different spline count than the original and is not meshing correctly with the transmission output gear

B. The replacement half-shaft was not correctly seated in the transmission or the hub, or has a manufacturing balance issue

C. The replacement half-shaft's CV boots are too tight and are restricting joint articulation, creating a binding vibration at higher speeds

D. The wheel alignment was disturbed by the half-shaft replacement and the toe setting is now incorrect on the serviced side of the vehicle

55. A dual-mass flywheel equipped vehicle has a rattling noise at idle that disappears when the clutch pedal is slightly depressed. The noise has been gradually worsening over several months. What is the most likely cause?

A. The dual-mass flywheel's internal spring and damper mechanism is worn, allowing the secondary mass to rattle against the primary mass at idle

B. The release bearing has developed a rough spot that causes it to vibrate against the pressure plate fingers at the resting idle position

C. The pilot bearing in the crankshaft has worn and allows the transmission input shaft to vibrate at idle RPM frequencies when fully engaged

D. The clutch disc's torsional damper springs are broken, causing the disc hub to rattle against the pressure plate hub at idle engine speed

56. A vehicle's automatic transmission has a fluid cooler integrated into the radiator. The customer reports that the transmission fluid has turned a milky pink color. What has occurred?

A. The transmission fluid has been severely overheated, causing chemical breakdown that changes the fluid's color from red to milky pink

B. The wrong type of ATF was installed during the last service and has chemically reacted with the existing fluid to create the discoloration

C. An internal leak in the radiator's transmission cooler has allowed engine coolant to mix with the ATF, contaminating both fluids

D. Normal ATF aging has progressed to the stage where the friction modifier additives separate from the base oil creating a pink emulsion

57. A transfer case on a four-wheel-drive truck makes a grinding noise during engagement of 4WD from 2WD while the vehicle is moving at 20 km/h. What is the most likely cause?

A. The front differential is overfilled with gear oil, creating hydraulic resistance that the transfer case cannot overcome during engagement

B. The front axle disconnect mechanism or shift synchronizer is worn and cannot smoothly match the front axle speed during on-the-move engagement

C. The transfer case fluid has degraded and is no longer providing adequate lubrication for the chain drive during the engagement transition

D. The rear drive shaft universal joints are worn and creating a speed differential that prevents the transfer case from engaging smoothly

58. An AWD-equipped vehicle requires all four tires to be within a specific circumference tolerance. What component is most at risk of damage if mismatched tires are installed?

A. The front wheel bearings, which will experience uneven loading from the speed differential caused by different tire circumferences

B. The brake system proportioning, which will be disrupted by the different rotational speeds causing uneven brake force distribution

C. The steering rack, which will experience asymmetric forces from the different grip levels produced by tires with different tread depths

D. The center coupling, transfer case, or center differential, which must continuously compensate for the speed difference between axles

59. A manual transmission equipped vehicle stalls when the driver attempts to release the clutch from a stop, even with moderate engine RPM. The clutch pedal feels normal. What is the most likely cause?

A. The clutch disc is installed backwards with the friction material facing the wrong direction, preventing progressive engagement

B. The pressure plate diaphragm spring has lost tension and cannot generate sufficient clamping force to transmit engine torque

C. The flywheel friction surface is severely glazed or contaminated with oil, preventing the clutch disc from gripping during engagement

D. The pilot bearing has seized, which prevents the crankshaft and input shaft from rotating at different speeds during clutch engagement

60. What is the purpose of the accumulator piston in an automatic transmission hydraulic circuit?

A. It stores excess transmission fluid under pressure and releases it during high-demand shifting events to prevent pressure loss in the circuit

B. It regulates the line pressure output of the transmission oil pump by absorbing pressure spikes that could damage the valve body gaskets

C. It cushions the application of clutch packs and bands during shifts by absorbing initial hydraulic pressure and releasing it gradually

D. It provides a reservoir of pressurized fluid that keeps the torque converter filled during extended periods of vehicle coasting in neutral

61. A circuit has a total resistance of 6 ohms and is connected to a 12-volt source. Using Watt's Law, what is the total power consumed by this circuit?

A. 72 watts, calculated by first finding the current ($I = 12V \div 6\Omega = 2A$), then multiplying $P = V \times I$ ($12V \times 2A = 24W$)

B. 24 watts, calculated by first finding the current ($I = 12V \div 6\Omega = 2A$), then multiplying $P = V \times I$ ($12V \times 2A = 24W$)

C. 2 watts, calculated by dividing the voltage by the resistance and using that as the power value directly without further calculation

D. 48 watts, calculated by squaring the voltage and dividing by the resistance using the formula $P = V^2 \div R$ ($144 \div 6 = 24W$)

62. A technician performs a voltage drop test across the negative battery cable connection from the battery negative post to the cable clamp while the starter is cranking. The meter reads 0.8 volts. What does this indicate?

A. The negative cable connection is within acceptable limits since up to 1.0 volts of drop is normal across high-current battery connections

B. The voltage drop is within the normal range for a starter circuit ground connection and does not require any corrective action or cleaning

C. The negative cable itself has high internal resistance from corrosion within the copper strands and must be replaced with a new cable

D. Excessive resistance exists at the negative cable-to-post connection, likely from corrosion, and the connection must be cleaned and tightened

63. A vehicle equipped with daytime running lamps (DRLs) has one DRL that is significantly dimmer than the other. Both DRL bulbs are the same age and type. The supply voltage at the bright DRL connector reads 12.1 volts, while the supply voltage at the dim DRL connector reads 10.3 volts. What is the most likely cause of the dim lamp?

A. A high-resistance connection in the supply wiring to the dim DRL is dropping voltage before it reaches the lamp, reducing its brightness

B. The dim DRL bulb has developed higher internal filament resistance from age and is drawing less current than the bright side

C. The DRL control module is intentionally reducing voltage to one side to compensate for an imbalanced alternator output between circuits

D. The bright side DRL is actually receiving excessive voltage from a faulty DRL relay that is causing it to glow brighter than specification

64. In a parallel circuit with three loads connected to a 12-volt source, what happens to the remaining loads if one load develops an open circuit?

A. All loads stop functioning because the open circuit interrupts the single current path that feeds all three loads in the parallel arrangement

B. The remaining loads draw increased current to compensate for the lost load, causing the fuse to blow from the overcurrent condition

C. The remaining loads continue to operate normally because each has its own independent current path from the source to ground

D. The remaining loads operate at reduced brightness or speed because the open circuit reduces the total voltage available in the circuit

65. A vehicle's starter motor draws 350 amps during cranking. The voltage at the battery drops to 9.2 volts during cranking, but only 7.8 volts arrives at the starter solenoid B terminal. Where is the problem?

A. The starter motor itself has high internal resistance and is consuming excessive voltage across its internal windings during cranking

B. The battery is too weak to sustain adequate voltage under the 350-amp cranking load and should be replaced with a higher-CCA unit

C. The starter solenoid's internal contact disc is burned and is not passing full voltage from the B terminal to the motor terminal inside

D. The positive battery cable or its connections have excessive resistance, dropping 1.4 volts between the battery and the solenoid B terminal

66. A technician is testing a battery with an electronic conductance tester. The tester reports "GOOD BATTERY — RECHARGE." What does this result mean?

A. The battery's internal plates and cell structure are healthy, but the battery's state of charge is low and it needs to be fully recharged before use

B. The battery has a weak cell that will temporarily test as good after recharging but will fail again under load within a short operating period

C. The tester cannot determine the battery's true condition until it is fully charged, and the test should be disregarded until after charging

D. The battery has passed its useful service life and should be replaced, but it can be temporarily recharged for short-term emergency use

67. A vehicle has an intermittent no-start condition. When the problem occurs, the engine does not crank at all — no click, no sound. Moving the gear selector from park to neutral and back to park sometimes allows the vehicle to start normally. What is the most likely cause?

A. The starter motor has an intermittent open in its armature winding that prevents it from drawing current when the fault condition is present

B. The ignition switch has worn contacts that intermittently fail to send the start signal to the starter relay when the key is turned to start

C. The neutral safety switch (transmission range sensor) has an intermittent fault in the park position that opens the starter control circuit

D. The battery terminals are loose and intermittently lose contact under the vibration generated by the gear selector mechanism movement

68. What is the correct procedure for testing an alternator's diode condition using a DVOM?

A. Measure the AC voltage output at the alternator B+ terminal with the engine running; a reading above 0.5V AC indicates a failed diode

B. Disconnect the alternator and measure each individual diode's forward and reverse resistance using the DVOM's diode test function

C. Measure the DC voltage output at the alternator B+ terminal and compare it to the battery voltage; a difference of more than 2V indicates failure

D. Connect the DVOM between the alternator case and the B+ terminal in AC mode; excessive AC ripple indicates one or more failed rectifier diodes

69. A fuse rated at 20 amps protects a circuit that contains an electric cooling fan motor. The fuse blows repeatedly after replacement. What is the correct diagnostic approach?

A. Measure the current draw of the cooling fan motor circuit to determine if the motor is drawing excessive current due to a short or mechanical seizure

B. Install a 30-amp fuse to provide additional headroom for the fan motor's inrush current spike that occurs during initial startup each cycle

C. Bypass the fuse with a jumper wire to determine if the fan motor operates correctly when provided with an unrestricted power supply

D. Replace the cooling fan relay, which is the most common cause of repeated fuse failures in electric cooling fan circuits on most vehicle platforms

70. A vehicle's left rear turn signal flashes at a noticeably faster rate than normal (hyperflash). All other exterior lights work correctly. What is the most likely cause?

A. The turn signal relay (flasher module) is failing and producing an inconsistent flash rate that varies by circuit depending on the internal contact wear

B. A burned-out left rear turn signal bulb that reduces the circuit's total current draw, causing the flasher module to cycle at a faster rate

C. A short to ground in the left rear turn signal wiring that increases total circuit current and causes the flasher to overwork at higher frequency

D. A faulty multifunction (combination) switch in the steering column that is sending a double-pulse signal to the left rear turn signal circuit

71. An engine overheats at idle but the temperature returns to normal during highway driving. The electric cooling fans do not activate. What is the most likely cause?

A. A restricted radiator that cannot dissipate sufficient heat at any airflow speed but is partially compensated by the increased airflow at highway speed

B. A failed thermostat stuck in the closed position that prevents all coolant circulation to the radiator regardless of vehicle speed or fan operation

C. An incorrect coolant mixture with a water-to-antifreeze ratio that exceeds the manufacturer's specification and reduces thermal transfer efficiency

D. A fault in the cooling fan circuit — the fan relay, fan motor, wiring, or the coolant temperature signal to the fan control module — preventing fan activation

72. A technician is diagnosing an intermittent electrical fault. The complaint only occurs when driving over bumps. What diagnostic technique is most effective for locating this type of fault?

A. Performing a complete system scan with the scan tool to capture any DTCs that may be stored from previous intermittent fault occurrences

B. Performing a thorough static resistance test of every connector and wire in the affected circuit with the DVOM while the vehicle is stationary

C. Wiggle-testing connectors and wiring while monitoring the affected circuit with a DVOM or scan tool to provoke the intermittent condition

D. Replacing the most likely component based on the symptom description since intermittent faults cannot be reliably diagnosed in the shop

73. A vehicle's A/C system produces warm air from the vents. The compressor clutch engages when commanded by the scan tool, and the system has no stored DTCs. Manifold gauge readings show both the low side and high side pressures are extremely high. What is the most likely cause?

A. The system is severely undercharged, causing both pressures to drop below the normal operating range and reducing cooling capacity

B. The compressor has failed internally and is not compressing refrigerant, resulting in equalized low and high pressures across the system

C. The A/C system has been overcharged with refrigerant, or the condenser is severely restricted or has no airflow, preventing heat rejection

D. The expansion device is completely blocked, preventing any refrigerant from flowing from the high side to the low side of the system

74. An A/C system performance test shows a vent temperature of 5°C on a 32°C day. The compressor cycles on and off approximately every 20 seconds. What is the most likely cause of the short cycling?

A. The evaporator is freezing over due to excessive refrigerant charge, causing the compressor to cycle off on low pressure as ice blocks airflow

B. The system is slightly undercharged, causing the low-side pressure to drop to the compressor cutoff threshold sooner than normal

C. The condenser fan is running at high speed continuously, overcooling the condenser and causing abnormally rapid high-side pressure cycling

D. The A/C clutch relay has an intermittent fault that momentarily drops out and re-energizes the clutch coil on a regular short interval

75. What is the correct procedure for evacuating an A/C system before recharging?

A. Connect a vacuum pump, pull the system to at least 29.92 inches of mercury, and hold the vacuum for the manufacturer-specified time to remove air and moisture

B. Purge the system with dry nitrogen until all residual refrigerant is expelled, then seal the system and charge with the specified refrigerant weight

C. Open both the high-side and low-side service ports simultaneously and allow atmospheric pressure to push residual refrigerant and moisture out naturally

D. Connect the recovery machine and run it until the system pressure reaches zero, then immediately charge the system with fresh refrigerant

76. A heater core is suspected of leaking based on a sweet smell in the cabin and fogging on the inside of the windshield. The technician notices that the passenger-side floor carpet is damp. Before replacing the heater core, what should be verified?

A. The A/C evaporator drain tube is not clogged, since a blocked drain can cause water to overflow into the HVAC case and onto the floor

B. The windshield washer fluid reservoir is not leaking onto the HVAC intake area and being drawn into the cabin through the fresh air duct

C. The source of the moisture is indeed coolant by testing the fluid on the carpet for the presence of antifreeze using a refractometer or test strip

D. The engine oil cooler is not leaking, since some vehicles route the oil cooler lines through the HVAC case near the heater core assembly

77. A vehicle's automatic climate control system maintains the correct temperature on the passenger side but blows maximum heat on the driver's side regardless of the temperature setting. What is the most likely cause?

A. The driver's side blend door actuator has failed in the full-heat position and is not responding to commands from the HVAC module

B. The heater core is partially plugged on the passenger side, routing all coolant flow through the driver's side half of the core

C. The HVAC control module has an internal fault that is sending incorrect temperature commands to the driver's side blend door circuit

D. The in-car temperature sensor for the driver's zone has failed and is reading falsely cold, causing the system to command maximum heat

78. After replacing the blower motor on a vehicle, the technician discovers that the blower runs at one constant speed and does not respond to the speed control adjustments. The original complaint was no blower operation at any speed. What is the most likely cause?

A. The replacement blower motor is the wrong part number and has a different voltage rating that prevents speed control from functioning

B. The blower motor speed control module (transistorized controller) has also failed, and it was the cause of the original no-blower complaint

C. The blower motor wiring harness has a reversed polarity connection that causes the motor to run at maximum speed regardless of input signal

D. The HVAC control panel has a fault in the blower speed adjustment circuit that prevents it from sending variable commands to the motor

79. A refrigerant identifier test on a vehicle brought in for A/C service shows that the system contains a mixture of R-134a and R-1234yf. What is the correct course of action?

A. Service the system normally using R-134a equipment since R-134a is the dominant refrigerant and the small amount of R-1234yf is compatible

B. Add additional R-1234yf to bring the system to the correct charge weight, since the two refrigerants are partially compatible in mixed ratios

C. Evacuate the system using R-134a equipment and recharge with pure R-134a since R-134a is backward-compatible with R-1234yf systems

D. Recover the contaminated refrigerant into a dedicated contaminated-refrigerant recovery tank; do not mix it with either pure R-134a or R-1234yf stock

80. An A/C system has been opened for a compressor replacement. The old compressor failed mechanically with internal debris. What components must be addressed in addition to the new compressor to prevent repeat failure?

A. Only the receiver-drier needs to be replaced since its desiccant is the only component affected when the system is opened to atmosphere

B. Only the expansion device needs to be replaced since it is the most likely point where debris from the failed compressor would lodge

C. The condenser must be flushed or replaced, the expansion device replaced, and the receiver-drier or accumulator replaced to remove all debris and moisture

D. The evaporator must be removed and flushed, since it is the component furthest from the compressor and debris would accumulate there first

81. A vehicle's headlamps both switch to high beam normally when the driver activates the high beam switch, but neither lamp returns to low beam when the switch is released. What is the most likely cause?

A. The headlamp multifunction switch (dimmer switch) has a fault in the low-beam contact position that prevents the circuit from returning to low beam

B. Both low-beam headlamp bulbs have burned out simultaneously, which is why high beam works but low beam does not illuminate on either side

C. The BCM has a software fault that is not commanding the headlamp relay to switch from the high-beam circuit back to the low-beam circuit

D. The headlamp relay is stuck in the high-beam position and is not releasing when the multifunction switch returns to the low-beam contact

82. An ADAS-equipped vehicle has a forward collision warning system that suddenly begins giving false alerts — warning of objects that are not present — after the front bumper cover was removed and reinstalled for a repair. What is the most likely cause?

A. The front bumper cover was reinstalled with a slight misalignment that has shifted the radar sensor behind it out of its calibrated position

B. The paint applied to the repaired bumper cover is metallic and is interfering with the radar sensor's ability to transmit through the bumper

C. The radar sensor's aim was disrupted during the bumper removal and requires recalibration to restore its correct detection field alignment

D. The forward collision warning module has a software fault that was triggered by the momentary disconnection of the bumper sensor wiring

83. A vehicle with electronic power steering has intermittent loss of steering assist. The EPS warning light illuminates briefly, then turns off and assist returns. No DTCs are stored permanently. What diagnostic approach is most appropriate?

A. Replace the electric power steering motor assembly since intermittent loss of assist indicates internal motor winding insulation breakdown

B. Replace the power steering control module since intermittent warning lights with no stored DTCs indicate an internal module processing fault

C. Perform a visual inspection of the EPS wiring, connectors, and ground connections for signs of intermittent contact from corrosion or looseness

D. Check the EPS system for a software update from the manufacturer, since intermittent faults with no stored codes are typically software-related issues

84. A vehicle pulls to the left during braking only. The pull does not occur during normal driving. What is the most likely cause?

A. The left front tire has lower inflation pressure than the right front, causing the vehicle to track toward the lower-pressure side during braking

B. A sticking right front brake caliper that does not apply fully, reducing the braking force on the right side and causing the vehicle to pull left

C. A left front wheel alignment issue with excessive negative camber that becomes apparent under the weight transfer conditions of braking

D. A worn left front wheel bearing that allows the rotor to shift position under braking load and alters the effective braking force on that corner

85. A vehicle with a rack-and-pinion steering system has excessive play in the steering wheel before the front wheels respond. The play is approximately 50 mm of free movement at the steering wheel rim. What should be inspected first?

A. The power steering pump for worn internal vanes that reduce hydraulic assist pressure and delay the steering gear's response to input

B. The steering column universal joints for excessive wear that absorbs input movement before it reaches the steering gear pinion shaft

C. The inner and outer tie rod ends for wear and play, and the rack mounting bushings for deterioration that allows the rack to shift position

D. The front wheel bearings for excessive play that allows the wheels to shift position before responding to the steering gear's lateral input

86. During an alignment, the technician finds that the left front camber is −2.5° and the right front camber is −0.5°. The vehicle pulls to the right during driving. What alignment correction is needed?

A. Adjust the left front camber toward zero (less negative) to reduce the side-to-side camber difference that is causing the rightward pull

B. Adjust the right front camber more negative to match the left side at −2.5° and equalize the camber across both front wheels

C. Adjust both front caster angles to compensate for the camber imbalance that cannot be corrected on this vehicle's suspension design

D. Adjust the rear toe to offset the front camber imbalance, which will straighten the vehicle's tracking despite the front alignment difference

87. A vehicle equipped with four-wheel disc brakes has a pulsation in the brake pedal during moderate braking. The pulsation is not felt through the steering wheel and appears to originate from the rear of the vehicle. What is the most likely cause?

A. Warped front brake rotors that are transmitting the pulsation through the hydraulic system to the brake pedal but not through the steering

B. Rear brake rotor thickness variation that pushes the rear caliper pistons in and out with each wheel revolution during brake application

C. A faulty ABS hydraulic control unit that is momentarily pulsing the rear brake circuits during braking even though ABS activation is not needed

D. Worn rear brake pads that have uneven friction material thickness creating inconsistent contact with the rotor surface during each revolution

88. A MacPherson strut is being replaced on the front of a vehicle. During disassembly, the technician must compress the coil spring to remove it from the strut assembly. What safety precaution is critical during this procedure?

A. The strut must be clamped vertically in a bench vise to prevent it from falling over while the spring compressor is attached and loaded

B. The spring compressor bolts must be lubricated with penetrating oil before installation to ensure smooth and even compression of the spring

C. The coil spring must be compressed using only hand tools and never with air-powered impact tools to prevent sudden over-compression

D. A quality spring compressor must be used correctly, with the clamps properly seated on the coils, because a spring under compression stores lethal energy

89. A vehicle's parking brake does not hold the vehicle on a moderate incline. The rear disc brake pads and rotors are within specification. What should be inspected?

A. The parking brake cable adjustment and the parking brake shoe mechanism (on rear disc brakes with drum-in-hat parking brakes) for wear or maladjustment

B. The master cylinder for internal bypass that is allowing the rear brake hydraulic pressure to bleed off when the parking brake is applied

C. The rear brake calipers for seized slide pins that prevent the parking brake cable from fully applying the caliper piston to clamp the pads

D. The brake fluid for moisture contamination that reduces the hydraulic clamping force when the parking brake pedal or lever is applied

90. A tire shows cupping wear — a pattern of alternating high and low spots around the tread circumference, creating a scalloped appearance. What is the most likely cause?

A. Excessive positive camber on the affected wheel that concentrates the vehicle's weight on the outer portion of the tread contact patch

B. Incorrect tire inflation pressure that causes the center or edges of the tread to bear disproportionate load during straight-line driving

C. Worn shock absorbers or struts on the affected corner that allow the tire to bounce and lose contact with the road surface repeatedly

D. An out-of-balance tire and wheel assembly that vibrates at certain speeds and scuffs the tread unevenly against the road surface

91. A vehicle's brake warning light on the instrument cluster illuminates. The ABS light is not on and the brakes feel normal. What should be checked first?

A. The windshield washer fluid level, since some vehicles share a warning indicator between the brake fluid and washer fluid systems

B. The ABS hydraulic control unit for stored DTCs, since the brake warning light can be triggered by ABS faults even if the ABS light is off

C. The brake pad wear sensors for continuity, since worn pads that trigger the sensor will illuminate the brake warning light on equipped vehicles

D. The brake fluid level in the master cylinder reservoir, since a low level is the most common cause of the brake warning light illumination

92. During a wheel bearing inspection on a vehicle with sealed hub unit bearings, the technician grasps the tire at 12 and 6 o'clock and rocks it. A slight but perceptible amount of play is felt. What does this indicate?

A. The play is within the normal acceptable range for sealed hub unit bearings and does not require any corrective action or replacement

B. The hub unit bearing has failed and should be replaced, since sealed hub units should have zero perceptible play when properly functioning

C. The play is caused by normal suspension bushing compliance and does not indicate bearing wear unless accompanied by noise during rotation

D. The play indicates that the axle nut is loose and needs to be retorqued to the manufacturer's specification to eliminate the movement

93. What is the primary difference between a MacPherson strut and a standard shock absorber in terms of suspension function?

A. A strut is a structural suspension component that serves as the upper steering pivot and spring seat, while a shock absorber provides damping only

B. A strut uses hydraulic fluid for damping while a shock absorber uses compressed gas, making them functionally different in damping method

C. A strut is designed for front suspension applications only, while shock absorbers are designed exclusively for rear suspension installations

D. A strut has a longer stroke and higher damping force than a shock absorber, but both serve identical structural functions in the suspension

94. A vehicle has a vibration in the steering wheel that occurs between 80 and 100 km/h and disappears above and below that speed range. The vibration is not affected by braking. What is the most likely cause?

A. A worn tie rod end that has excessive play and allows the steering to vibrate at a resonant frequency within the specific speed range

B. A bent front brake rotor that contacts the pad intermittently at the specific wheel speed corresponding to the vibration speed range

C. A front wheel bearing that is in the early stages of failure and produces vibration at a specific rotational frequency within that speed range

D. An unbalanced front tire and wheel assembly that produces a vibration at the rotational speed corresponding to that vehicle speed range

95. A technician is bleeding the brake system after replacing the left front brake caliper. What is the correct bleeding sequence for a vehicle with a diagonal split brake system?

A. Start with the wheel closest to the master cylinder and work outward to ensure fluid flows in the correct direction through all lines

B. Start with the wheel furthest from the master cylinder (right rear), then left front, left rear, and finally right front for proper air removal

C. Bleed only the left front caliper that was replaced, since the rest of the system was not opened and does not require bleeding

D. Start with both rear wheels simultaneously using a dual-bleeder setup, then bleed both front wheels simultaneously for balanced fluid flow

96. A customer reports that the vehicle's steering feels noticeably heavier than normal when parking at low speed, but feels normal at highway speed. The vehicle has hydraulic power steering. What is the most likely cause?

A. The front wheel alignment has excessive positive caster that increases steering effort at all speeds equally but is only noticed at low speed

B. The front tires are overinflated, which increases the tire's contact patch firmness and makes low-speed steering feel heavier than normal

C. The steering gear has developed internal wear that increases mechanical friction and reduces the gear's efficiency at all turning speeds

D. The power steering pump is producing reduced flow at idle RPM due to worn internal vanes, but adequate flow at higher engine speeds

97. A tire sidewall marking includes the code "2519" as the last four digits of the DOT number. What does this indicate?

A. The tire was manufactured in the 25th week of 2019, which is the manufacturing date code required on all tires sold in North America

B. The tire has a maximum load rating of 2,519 pounds when inflated to the maximum pressure indicated elsewhere on the sidewall

C. The tire's tread compound formula is batch number 2519, which identifies the specific rubber compound used in that production run

D. The tire meets safety standard 2519, which is the federal motor vehicle safety standard number assigned to this specific tire classification

98. A vehicle's electronic stability control (ESC) system activates aggressively during normal cornering at moderate speeds on dry pavement. What is the most likely cause?

A. The ESC control module has a software fault that has lowered its intervention threshold, causing it to activate during normal driving conditions

B. The front and rear tires are mismatched in size or tread depth, causing the wheel speed sensors to report differences the ESC interprets as instability

C. The ESC system is functioning correctly and the driver is cornering at speeds that exceed the vehicle's actual stability limits for the current conditions

D. The yaw rate sensor or steering angle sensor is out of calibration, causing the ESC module to misinterpret normal driving as a loss-of-control condition

99. A front-wheel-drive vehicle has the front wheels off the ground on a lift. When each front wheel is spun by hand, the left wheel spins freely but the right wheel has noticeable resistance and a slight grinding feeling. What is the most likely cause?

A. The right front CV joint has seized internally and is preventing the half-shaft from rotating freely when the wheel is spun off the ground

B. The right front brake caliper is not fully retracting, causing the brake pads to drag against the rotor and create the resistance and grinding

C. The right front wheel bearing is failing and producing internal friction and roughness that is detectable when the wheel is rotated by hand

D. The right front tire has a broken internal belt that creates a flat spot and resistance to rotation that can be felt when the wheel is spun by hand

100. A vehicle's power steering fluid is foamy and the power steering pump makes a loud groaning noise that worsens during turns. What is the most likely cause?

A. The power steering fluid is contaminated with water from a leaking cooler line that causes the fluid to foam when heated during operation

B. Air is being drawn into the power steering system through a cracked or loose inlet hose, a low fluid level, or a faulty pump seal

C. The power steering pump's internal relief valve is stuck closed, causing excessive pressure that cavitates the fluid and creates the foam

D. The wrong type of power steering fluid was installed, and it is chemically incompatible with the system's seals and is producing gas bubbles

101. A technician discovers that a vehicle's rear brake rotors are heavily rusted on the inner and outer surfaces despite having adequate pad thickness remaining. The vehicle is a hybrid. Why is this condition common on hybrid vehicles?

A. Hybrid vehicles use brake rotors made from a different alloy that is more susceptible to surface corrosion than conventional vehicle rotors

B. Hybrid vehicles have less effective splash guards that expose the rotors to more road water and salt than conventional vehicle designs

C. Hybrid vehicles use electronically controlled proportioning that reduces rear brake pressure, causing the rear pads to contact the rotors less

D. The hybrid vehicle's regenerative braking handles most deceleration electrically, so the friction brakes are used less and rotors develop surface rust from disuse

102. What is the DOT brake fluid specification that uses silicone rather than glycol as its base fluid?

A. DOT 3, which uses a silicone-based formula designed for standard passenger vehicle brake systems and drum brake applications

B. DOT 4, which uses a silicone-based formula designed for European vehicles with higher temperature brake system requirements

C. DOT 5.1, which uses a silicone-based formula designed as a direct upgrade replacement for DOT 3 and DOT 4 glycol fluids

D. DOT 5, which uses a silicone base and is NOT compatible with DOT 3, DOT 4, or DOT 5.1 glycol-based brake fluids

103. A vehicle has a steering wheel shimmy (vibration) that occurs only during braking at highway speed. The shimmy is not present during normal driving. What is the most likely cause?

A. An unbalanced front tire and wheel assembly that produces vibration at highway speed which is amplified by the braking force application

B. Worn front suspension components including ball joints and tie rod ends that allow the suspension to vibrate under the dynamic loading of braking

C. Front brake rotor thickness variation or excessive runout that causes uneven braking force at each wheel as the rotor rotates past the brake pads

D. A faulty ABS hydraulic control unit that modulates front brake pressure during normal stops, creating pulsation transmitted through the steering rack

104. An outer tie rod end has been replaced on a vehicle. What alignment parameter is directly affected by this replacement and must be checked?

A. Camber, because the tie rod end position determines the vertical tilt angle of the wheel relative to the road surface at each front wheel

B. Toe, because the tie rod end's threaded position on the adjusting sleeve directly controls the front wheel's inward or outward pointing angle

C. Caster, because the tie rod end position affects the fore-and-aft tilt of the steering axis when the steering wheel is turned from center position

D. Thrust angle, because replacing a front tie rod end changes the geometric relationship between the front and rear axle centerlines on the vehicle

105. A vehicle has excessive free play in the steering before the front wheels respond. The outer tie rod ends and steering rack are confirmed tight with no detectable play. What component should be checked next?

A. The power steering pump for adequate flow output, since reduced hydraulic pressure can create a delayed response that mimics mechanical play

B. The front wheel bearings for excessive radial play that allows the wheels to shift before responding to steering input from the rack and tie rods

C. The steering column intermediate shaft universal joints for worn or seized joints that absorb or delay the driver's input before it reaches the rack

D. The front strut mounts and bearings for wear that allows the entire strut assembly to shift before transmitting the steering force to the knuckle

106. A vehicle with TPMS shows the left rear tire pressure at 28 psi on the dash display, but a calibrated handheld tire pressure gauge reads 35 psi on the same tire. What is the most likely explanation?

A. The TPMS sensor in the left rear wheel has a low internal battery or a calibration fault and is reporting an inaccurate pressure reading to the module

B. The handheld tire gauge is inaccurate and should be compared against a known reference gauge to verify which instrument is providing the correct reading

C. The TPMS module has not been relearned since the last tire service and is displaying the pressure reading from a sensor that is now at a different position

D. Temperature differences between the tire's internal air and the ambient air are causing a discrepancy between the direct-reading gauge and the sensor reading

107. A technician needs to remove the headliner on a vehicle equipped with side curtain airbags to access wiring above the headliner. What must be done before removing the headliner?

A. The curtain airbags must be deployed using the scan tool's SRS activation function so they are safe to work around during the headliner removal

B. The headliner must be cut around the curtain airbag modules rather than removing the headliner completely to avoid disturbing the airbag mounting

C. The instrument cluster must be removed first to access the headliner mounting screws that are hidden behind the gauge cluster bezel trim panel

D. The SRS system must be fully disarmed by disconnecting the battery and waiting the specified capacitor discharge time before removing the headliner

108. An SRS warning light illuminates intermittently and seems to correlate with turning the steering wheel to full lock in either direction. What is the most likely cause?

A. The front impact sensors in the bumper are being triggered by the physical stress of the steering components at full lock position

B. The clockspring ribbon cable is nearing the end of its travel range or is damaged, creating an intermittent open circuit at extreme steering angles

C. The steering angle sensor is sending a conflicting signal to the SRS module at full lock that triggers a false SRS fault detection

D. The driver's knee airbag module is being compressed by the steering column at full lock and sending a deployment warning to the ACM

109. What type of automotive glass is designed to shatter into small, relatively harmless granules rather than sharp shards when broken?

A. Tempered glass, which is heat-treated to create internal stresses that cause it to break into small granular pieces upon impact or fracture

B. Laminated glass, which consists of two layers of glass bonded to an inner plastic layer that holds the fragments together when broken

C. Polycarbonate glass, which is a plastic-based transparent material that flexes on impact rather than shattering into any type of fragments

D. Annealed glass, which is standard float glass that has been slowly cooled to relieve internal stresses and prevent sharp-edged fracture patterns

110. A vehicle has a water leak into the trunk area. There is no sunroof and no rear window damage is visible. The trunk seal appears intact. What should be checked?

A. The tail lamp housing gaskets and mounting seals, which are a common entry point for water into the trunk when the gaskets deteriorate or shift

B. The rear bumper cover mounting holes, which can allow water to enter if the cover was removed and reinstalled without replacing the sealing grommets

C. The spare tire well drain plug, which may have been left open or fallen out and is allowing road spray to enter the trunk from underneath the vehicle

D. The fuel filler neck seal, which can deteriorate and allow water to enter the trunk area through the gap between the fuel filler housing and the body

111. A power window on the rear passenger door does not operate from either the rear door switch or the driver's master switch. All other windows operate normally. The window lock button on the master switch is not engaged. What should be checked first?

A. The driver's master switch panel for a faulty individual output circuit that controls only the rear passenger window motor function

B. The BCM for a fault code related to the rear passenger window circuit that would indicate a module-level control fault for that window

C. The power window relay in the fuse box that is dedicated to the rear passenger window circuit on vehicles with individual window relays

D. The fuse, wiring, and connector for the rear passenger window circuit, since a blown fuse or disconnected connector would disable the window completely from all switches

112. After a collision, the front passenger airbag deployed and the seatbelt pretensioner fired. What components must be replaced before returning the vehicle to service?

A. Only the airbag module needs to be replaced; the seatbelt pretensioner can be inspected and reused if it shows no visible damage from deployment

B. The deployed airbag module, the fired seatbelt pretensioner and retractor assembly, and any other deployed SRS components must all be replaced

C. The entire SRS system including all airbag modules, all seatbelt assemblies, all crash sensors, and the ACM must be replaced as a complete set

D. Only the deployed components need to be replaced, but the ACM must also be replaced regardless since it cannot be cleared after a deployment event

113. A vehicle with keyless entry and push-button start will not start. The dashboard displays "Key Not Detected." The key fob battery was recently replaced. What is the most likely cause?

A. The replacement key fob battery is installed correctly but is the wrong voltage or type, producing a signal too weak for the vehicle's receiver to detect

B. The vehicle's immobilizer antenna has failed and cannot receive the transponder signal regardless of the key fob's battery condition or proximity

C. The push-button start module has a software fault that was triggered by the momentary loss of key fob signal during the battery replacement

D. The vehicle's 12-volt battery has discharged below the minimum threshold for the keyless entry receiver module to power on and scan for the key

114. A customer complains that the power liftgate on their SUV opens only partway and then stops, reverses direction, and closes. The liftgate encounters no visible physical obstruction. What is the most likely cause?

A. The liftgate latch mechanism is partially seized, creating resistance that the motor interprets as an obstruction through its anti-pinch current monitoring

B. The liftgate struts (gas springs) that assist the opening have weakened, causing the liftgate motor to work harder and trigger the overload protection

C. The power liftgate motor has worn brushes that reduce its torque output, causing it to stall and reverse when the liftgate reaches its heaviest opening angle

D. The liftgate anti-pinch sensor has a fault that is incorrectly detecting an obstruction and commanding the motor to reverse before reaching full open position

115. What is the most common cause of a musty or mildew odor from the HVAC vents when the A/C system is first turned on?

A. A clogged cabin air filter that has accumulated moisture and organic material, providing a breeding ground for mold and mildew growth

B. A refrigerant leak at the evaporator that produces a chemical odor often mistaken for mildew or mold by customers unfamiliar with refrigerant

C. Mold and mildew growth on the evaporator core surface, caused by moisture from condensation that remains on the core after the A/C is turned off

D. A deteriorating foam seal inside the HVAC case that is breaking down from the repeated temperature cycles and producing an organic odor

116. A vehicle's exterior door handle mechanism operates the latch correctly, but the door will not open because the door is jammed shut. The lock cylinder turns freely and the power lock actuator clicks. A close inspection reveals the door is slightly misaligned with the body. What is the most likely cause?

A. The door striker on the body pillar is misadjusted or has shifted position, preventing the latch from fully releasing when the handle is operated

B. The door lock actuator has a faulty linkage rod that blocks the latch release mechanism even though the actuator itself clicks during operation

C. The door hinge pins have worn, allowing the door to sag and misalign with the striker, preventing the latch from clearing the striker during opening

D. The door skin has a dent at the latch area that is applying external pressure to the latch mechanism and preventing the latch from releasing fully

117. In a parallel hybrid drivetrain, how are the internal combustion engine and electric motor connected to the drive wheels?

A. Only the electric motor is mechanically connected to the drive wheels; the ICE drives a generator that supplies electricity to the motor only

B. Both the ICE and the electric motor are mechanically connected to the drive wheels, and either or both can provide propulsion simultaneously

C. The ICE and electric motor alternate connection to the drive wheels through a transfer clutch that engages one power source at a time only

D. The electric motor drives the front wheels and the ICE drives the rear wheels independently through separate drivetrains with no mechanical link

118. A hybrid vehicle's HV battery service disconnect has been removed. After waiting the specified capacitor discharge time, the technician measures voltage at the HV terminals and reads 2.5 volts. Is it safe to proceed with HV service?

A. No — 2.5 volts exceeds the safety threshold, and the system must be investigated further before any HV components are touched

B. No — the measurement indicates the DVOM is not properly calibrated, and the technician must use a different meter before proceeding

C. Yes — 2.5 volts is below the generally accepted 30-volt safe threshold and indicates the system has adequately de-energized for service

D. Yes — any voltage reading detected after the service disconnect is removed indicates a metering error, since the circuit should read exactly zero

119. What type of electric motor is most commonly used as the traction motor in modern hybrid and battery electric vehicles?

A. A brushed DC series-wound motor that provides high starting torque and simple speed control through armature voltage adjustment

B. A universal motor that operates on both AC and DC power, providing flexibility in the varying voltage conditions of a hybrid drivetrain

C. A stepper motor that provides precise rotational position control through digital pulse counting from the hybrid vehicle control module

D. A permanent magnet synchronous motor that offers the highest power density and efficiency for automotive traction drive applications

120. A battery electric vehicle's 12-volt auxiliary battery is being replaced. What precaution is specific to BEV auxiliary battery replacement that does not apply to conventional vehicles?

A. The HV system must be de-energized before the 12V battery is disconnected, because removing 12V power can cause the HV contactors to default open

B. The 12V battery must be replaced with an identical AGM type because BEVs use the 12V system for regenerative braking motor control signals

C. The replacement battery must be pre-charged to exactly 12.6V using an external charger before installation, or the BEV systems will not initialize

D. The HV battery pack must be fully charged before the 12V battery is disconnected, or the HV battery may enter a protective shutdown mode

121. A plug-in hybrid vehicle cannot charge from an external Level 2 charging station. The vehicle drives normally in hybrid mode. What should be checked first?

A. The HV battery pack for internal cell failure, since a failed cell would prevent the BMS from accepting any external charging current input

B. The vehicle's DC-DC converter output, since a failed converter would prevent the 12V system from powering the charge port communication circuits

C. The charge port, locking mechanism, and pilot signal circuit for physical damage or electrical faults that prevent the vehicle from communicating with the EVSE

D. The engine coolant temperature sensor, since an incorrect reading may cause the hybrid control module to block charging to protect the battery from overheating

122. What happens to a battery electric vehicle's driving range when the cabin heater is used extensively in cold weather?

A. Range decreases significantly because the cabin heater draws energy directly from the HV battery, and cold temperatures further reduce battery capacity

B. Range is unaffected because the cabin heater operates from the 12V auxiliary system, which is independently charged by the DC-DC converter

C. Range increases slightly because the waste heat generated by the cabin heater warms the HV battery, improving its efficiency and capacity

D. Range is unaffected because BEVs use waste heat from the electric motor and inverter to heat the cabin, requiring no additional battery energy

123. During a routine service on a hybrid vehicle, the technician notices that an orange HV cable under the vehicle has a section where the outer insulation is abraded and the inner conductor shielding is visible but not breached. What is the correct action?

A. Apply electrical tape around the abraded section as a temporary repair and note the condition on the work order for future monitoring

B. The cable can remain in service since the inner conductor shielding is intact and the outer insulation abrasion does not compromise electrical safety

C. Coat the abraded area with liquid electrical insulation compound and install a cable loom protector to prevent further abrasion from road debris

D. The cable must be replaced because the compromised outer insulation reduces the safety margin and exposes the HV circuit to potential moisture intrusion and further damage

124. A hybrid vehicle's regenerative braking system captures less energy than expected, and the scan tool shows the HV battery temperature at −8°C. What is the explanation?

A. The regenerative braking motor has a temperature sensor fault that is falsely reporting cold conditions and causing the system to limit energy recovery

B. The BMS limits regenerative braking current when the battery is cold because charging a cold lithium-ion battery at high current can damage the cells

C. The cold temperature has increased the battery's internal capacity, so it requires less energy to reach its target state of charge during regeneration

D. The inverter's power electronics have reduced efficiency at low temperatures, converting less of the kinetic braking energy into usable electrical energy

125. What is the primary function of the HV battery's contactors?

A. They regulate the voltage output of the battery by switching cells in and out of the series string to adjust total pack voltage to match motor demand

B. They provide overcurrent protection by opening automatically when current exceeds the safe threshold, functioning as high-voltage circuit breakers

C. They are high-current relays that connect and disconnect the HV battery from the vehicle's HV electrical circuit under the command of the BMS

D. They balance the charge between individual cells by routing current from higher-charged cells to lower-charged cells within the battery pack

Practice Exam 2: Answer Key and Explanations

1. D — Battery acid (sulfuric acid) is a corrosive chemical that causes progressive tissue damage as long as it remains in contact with the skin. The correct immediate response is to flush the affected area with large volumes of clean water for a minimum of fifteen minutes to dilute and remove the acid. Applying baking soda or other neutralizers before flushing delays the critical first step of removing the acid from the skin.

2. B — Petroleum-based solvents are flammable liquids, which classifies this as a Class B fire. Class B fires are extinguished using CO_2 or dry chemical (BC or ABC rated) extinguishers that smother the fire without spreading the burning liquid. Water extinguishers must never be used on flammable liquid fires because the water can spread the burning liquid across a wider area.

3. C — Section 8 of the Safety Data Sheet is specifically designated for Exposure Controls and Personal Protection. It specifies the required PPE (gloves, eye protection, respirator type), engineering controls (ventilation requirements), and occupational exposure limits for safe handling of the product. This is the section technicians consult to determine what protection they need before working with a specific chemical.

4. A — A hydraulic floor jack is a lifting device only — it must never be used as the sole support for a vehicle while work is performed underneath. Once the vehicle is raised to the desired height, jack stands must be placed under the manufacturer's designated support points and the vehicle lowered onto the stands. Only then is the vehicle supported by a redundant mechanical device that will not fail if hydraulic pressure is lost.

5. D — A cracked grinding wheel can disintegrate at operating speed, turning fragments into high-velocity projectiles capable of causing severe injury or death. Any grinding wheel with a crack, chip, or visible damage must be removed from service immediately and replaced with a new wheel rated for the grinder's maximum RPM. Operating a cracked wheel at any speed is unacceptable.

6. B — The corrosion pictogram within a red-bordered diamond depicts damage to both a metallic surface and human skin from chemical contact. It indicates the product is corrosive to metals, skin, or eyes. This pictogram is found on products such as battery acid, strong rust removers, and concentrated wheel cleaners used in automotive service.

7. A — Click-type torque wrenches use an internal calibration spring that provides the "click" at the set torque value. Storing the wrench at any setting other than the lowest scale value keeps the spring under constant tension, which can cause the spring to take a permanent set over time and lose calibration accuracy. Reducing the setting to the lowest value relieves the spring tension during storage.

8. A — Ethylene glycol antifreeze is toxic to humans and animals and harmful to aquatic environments. Used coolant must be collected in an approved container separate from other waste fluids (never mixed with waste oil or other chemicals) and disposed of through the shop's licensed recycling or hazardous waste program. Pouring coolant down drains or onto the ground is an environmental violation.

9. C — When using compressed air for cleaning or drying purposes in a Canadian automotive shop, the nozzle pressure must be regulated to a maximum of 30 psi. Higher pressures can drive debris, metal particles, or fluid droplets into the skin, eyes, or ears with sufficient force to cause penetrating injuries or permanent damage. This limit applies regardless of what PPE is being worn.

10. D — During a leak-down test, air escaping from the tailpipe traces directly to the exhaust valve. With the piston at TDC on the compression stroke and both valves closed, the only path from the combustion chamber to the tailpipe is through a leaking exhaust valve. Air at the intake manifold would indicate an intake valve leak, and air at the oil fill cap would indicate ring blow-by.

11. B — Blue-gray smoke during hard acceleration after coasting or deceleration is characteristic of worn valve stem seals. During coasting, high intake manifold vacuum draws oil past the worn seals, where it pools on top of the closed intake valves. When the throttle is opened and the valves open, the accumulated oil is drawn into the cylinders and burned, producing the visible smoke puff.

12. A — Measuring each rod journal at two perpendicular positions detects out-of-round (the difference between the two measurements at the same location), while measuring at two locations along the journal length detects taper (the difference between the two ends). Both conditions indicate journal wear that determines whether the crankshaft can accept new bearings as-is or must be reground to an undersize dimension.

13. C — The harmonic balancer absorbs torsional (twisting) vibrations in the crankshaft that are inherent to the pulsating nature of combustion events. Each power stroke applies a sudden rotational force, and the sections of crankshaft between cylinders twist and spring back cyclically. Without the damper absorbing these vibrations, the crankshaft can develop fatigue cracks and ultimately fracture.

14. D — A timing chain stretches progressively as the pin-and-roller joints wear over tens of thousands of kilometers. As the chain elongates, the tensioner and guides compensate, but eventually the slack exceeds their take-up range. The excess chain slaps against the timing cover and guides, producing a rattling noise most noticeable at cold startup (when oil pressure is lowest and the tensioner is least effective) and during sudden RPM changes.

15. B — Fuel pressure that meets specification at idle but drops under high-demand conditions (wide-open throttle) indicates the pump cannot maintain both adequate pressure and adequate volume simultaneously. At idle, fuel demand is low and the pump maintains pressure easily. At WOT, injector demand increases dramatically, and a weak pump or restricted filter cannot deliver enough volume to maintain the specified pressure.

16. C — The relative compression test measures how much the crankshaft decelerates as each cylinder undergoes its compression stroke. A cylinder with normal compression resists crankshaft rotation, causing measurable deceleration. A cylinder with low compression offers less resistance, allowing the crankshaft to maintain more speed through that stroke — showing less deceleration on the scan tool's data graph.

17. A — Detonation occurs when combustion temperatures and pressures exceed the fuel's autoignition threshold. A malfunctioning intercooler that fails to cool the compressed intake air allows charge temperatures to remain excessively high, promoting detonation even with the ignition timing fully

retarded. The intercooler is the primary thermal management component for preventing knock in turbocharged engines.

18. D — Two adjacent cylinders that both show low, approximately equal compression that does not improve with a wet test (ruling out rings) strongly indicates a head gasket failure between those two cylinders. The gasket breach allows compression from each cylinder to leak into the other during their respective compression strokes, reducing both readings equally without involving the rings, valves, or coolant passages.

19. B — A smoke machine pressurizes the sealed EVAP system with visible, non-toxic smoke that traces the entire vapor path — tank, lines, canister, purge valve, and all connections. Any leak point allows smoke to escape visibly, pinpointing the exact location. Smoke testing is the most effective method for finding EVAP leaks, particularly the small leaks (0.5 mm diameter) that trigger P0442 small-leak codes.

20. A — The coil swap test is the definitive diagnostic for COP ignition coil faults. By moving the suspect coil to a different cylinder, the technician isolates the coil from its original location. When the misfire follows the coil to its new cylinder, the coil is confirmed as the faulty component. If the misfire stayed on cylinder 3, the fault would be in the plug, wiring, or mechanical condition of that cylinder.

21. C — The downstream (post-catalyst) oxygen sensor monitors catalytic converter efficiency by detecting how well the converter stores and releases oxygen. A healthy converter dampens the exhaust gas oscillations, producing a relatively stable downstream sensor signal. When the converter degrades, it loses this oxygen storage capacity, and the downstream signal begins to mirror the upstream sensor's rapid switching — triggering a P0420 code.

22. D — The low-pressure supply is confirmed adequate at 400 kPa, eliminating the supply pump and filter as causes. The GDI high-pressure pump receives this supply and must boost it to the specified 10,000+ kPa rail pressure. A pump producing only 4,000 kPa despite adequate supply has worn internal components (plungers, check valves, or seals) that cannot generate the required compression ratio.

23. B — With ignition coils and spark plugs eliminated through swapping, and misfires isolated to two specific cylinders, a mechanical condition becomes the primary suspect. Compression testing on cylinders 1 and 4 will reveal whether a valve, ring, or gasket issue is preventing complete combustion. Two non-adjacent cylinders misfiring simultaneously can indicate individual mechanical faults or, on some engines, a shared intake manifold runner issue.

24. A — A PCV valve stuck fully open creates an excessive vacuum leak at idle by allowing too much crankcase vapor to be drawn into the intake manifold. At idle, this unmetered air lean out the mixture, causing rough running and potential lean DTCs. At higher RPM, the PCV flow becomes a smaller percentage of total airflow and the effect diminishes. The lean condition at idle is the primary diagnostic clue.

25. C — A diesel engine that cranks at normal speed but requires extended cranking to fire, then runs normally once started, suggests the fuel system is losing its prime — air is entering the high-pressure lines or the fuel is draining back to the tank during key-off periods. Air in the common rail system prevents the injectors from delivering a combustible fuel charge until the pump purges the air and builds pressure.

26. B — Replacing the EGR valve addresses only the valve itself. If the exhaust gas passages between the exhaust manifold and the intake manifold (which the gas must flow through to reach the valve) are clogged with carbon deposits, the new valve cannot pass gas regardless of its own condition. Carbon buildup in the EGR passages is a common root cause that survives valve replacement.

27. D — A misfire present at idle but absent above 2,000 RPM points to a condition that is significant at low airflow but overwhelmed at higher airflow. A vacuum leak near cylinder 2's intake runner introduces unmetered air that represents a large percentage of that cylinder's charge at idle but becomes negligible at higher throttle openings where total airflow is much greater.

28. A — The intake air temperature sensor measures the temperature of the incoming air so the ECM can calculate air density. Cold air is denser (contains more oxygen per unit volume) than hot air. The ECM adjusts fuel delivery based on the IAT signal to maintain the correct air-fuel ratio regardless of intake air temperature variations from weather, under-hood heat soak, or turbocharger compression heating.

29. C — The fuel trim pattern — strongly positive at idle, normalizing at cruise — is the signature of a vacuum leak (unmetered air entering at idle). The MAF reading of 2.1 g/s on a 2.0L engine is at the low end of the expected range (approximately 1 g/s per 0.5L), suggesting the MAF may also be underreporting. The combination of a vacuum leak and a contaminated MAF underreporting airflow accounts for the +22% idle correction and the +8% residual at cruise.

30. B — Short urban trips produce exhaust temperatures that are too low for passive regeneration (which requires sustained temperatures above 350–400°C) and too brief for active regeneration to complete its 15-to-30-minute cycle. Without either regeneration mode successfully burning off the accumulated soot,

the DPF loading increases progressively until it reaches the critical threshold that triggers reduced power mode.

31. D — The replacement sensor is reading falsely high temperature, which causes the ECM to believe the engine is fully warmed up even during cold start. The ECM removes cold-start enrichment prematurely (creating the negative fuel trim correction — subtracting fuel) and opens the idle air control wider to compensate for the lean idle condition, producing the abnormally high idle speed.

32. A — A 0-ohm reading between CAN-H and CAN-L indicates the two bus wires are shorted together — either by chafing, a crushed harness, or a module with a failed CAN transceiver. With the two wires at the same potential, no differential voltage signal can be generated, and all bus communication is impossible. Normal reading should be approximately 60 ohms from the two 120-ohm terminators in parallel.

33. C — Module programming draws significant current from the vehicle's electrical system and requires sustained voltage above the minimum threshold (typically 12.6V or higher) throughout the entire process. Without a battery charger or power supply maintainer connected, the battery voltage drops during programming, corrupting the data transfer. This is the most common cause of "Programming Failed — Voltage Low" errors.

34. B — When all powertrain modules communicate normally (indicating the high-speed CAN bus is healthy) but no body modules are reachable, the gateway module that bridges the two buses is the most likely point of failure. The gateway's job is to translate data between the HS-CAN powertrain bus and the MS-CAN body bus — if it fails, the body side becomes isolated from the scan tool's communication path.

35. D — A U0401 (Invalid Data Received) is different from a U0100 (Lost Communication). U0401 means the TCM is receiving messages from the ECM, but the data content is outside the expected range — corrupted, incorrect, or inconsistent values. This can be caused by an ECM software fault, incorrect ECM calibration, or a CAN bus signal integrity problem that is corrupting the data without completely blocking communication.

36. A — Aftermarket devices connected to the OBD II DLC can keep the CAN bus active by continuously sending messages or polling modules, preventing the bus from entering the sleep state that reduces current draw to milliamp levels. With the bus active, all connected modules remain powered and responding, drawing hundreds of milliamps continuously and draining the battery within days.

37. B — When disconnecting a specific module restores all bus communication, that module was the source of the bus failure. The most common mechanism is a failed CAN bus transceiver inside the module that internally shorts CAN-H to CAN-L (or one line to ground or power), clamping the differential signal and preventing all other modules from communicating. Removing the shorted module removes the clamp.

38. D — When the CAN bus is idle (no module is transmitting a dominant bit), both CAN-H and CAN-L rest at approximately 2.5 volts — the nominal recessive state. The differential voltage between them is 0 volts. During data transmission, CAN-H rises to approximately 3.5V and CAN-L drops to approximately 1.5V, creating the 2.0V differential that represents a dominant bit.

39. C — The TPMS activation tool sends a low-frequency magnetic or RF signal to each sensor in sequence, triggering the sensor to transmit its unique identification code to the TPMS module. The module records which sensor ID it receives at each wheel position in the prescribed sequence. This allows the module to associate each sensor's pressure data with the correct wheel location for accurate per-wheel monitoring.

40. A — The crankshaft position variation relearn calibrates the ECM's misfire detection algorithm to the specific mechanical characteristics of the crankshaft, reluctor ring, and sensor combination. Each crankshaft has slight manufacturing variations in tooth spacing and each CKP sensor has slight sensitivity differences. After replacing any of these components (or the PCM itself), the module must relearn these characteristics to distinguish actual misfires from normal mechanical variation.

41. B — "Bus Active — No Response" from a single module while all other modules communicate normally indicates the bus backbone is healthy but the specific module has lost its connection. The module's spur wiring may be damaged, its connector may be corroded or disconnected, or the module itself may have an internal fault that prevents it from participating in bus communication.

42. D — LIN (Local Interconnect Network) is a low-cost, single-wire serial protocol operating at up to 20 kbps, designed specifically for connecting simple, non-critical accessories to a master module. Seat motors, mirror adjusters, window switches, rain sensors, and similar low-data-rate devices commonly use LIN sub-networks managed by a CAN-connected master module in the door or seat.

43. C — The previous TCM spent its service life learning the specific characteristics of the transmission's clutch packs, solenoids, and hydraulic circuits — storing adaptive correction values that fine-tune shift quality. A new TCM starts with default base calibration values and has no learned data,

resulting in harsh, uncushioned shifts until the module accumulates enough operating data to learn the optimal apply pressures and timing for each shift.

44. D — The vibration increases with vehicle speed (speed-related), is felt through the floor (not the steering wheel), occurs in all gears and neutral (eliminating engine RPM as a factor), and cannot be reproduced with the wheels off the ground. This last detail is the key: when the rear wheels are spinning freely on a lift, the tires are not in contact with the road and any balance issue is absent. An unbalanced tire produces vibration only when rolling on a surface.

45. A — The clutch disc must be centered on the flywheel using a pilot alignment tool (a plastic or metal tool that simulates the transmission input shaft) before the pressure plate is bolted down. If the disc is not centered, the transmission input shaft cannot pass through the disc hub during reassembly — the transmission will not mate to the engine because the splines are misaligned.

46. B — A humming noise that increases with speed and gets louder during right turns (when weight transfers to the left side) points to the left front wheel bearing. The increased load during right turns amplifies the noise from the worn bearing. Left turns transfer weight to the right, unloading the left bearing and quieting the noise. This directional noise change is the most reliable method for identifying the affected side.

47. C — Slipping that occurs only during one specific shift (2-3) while all other shifts are normal isolates the fault to the specific clutch pack, band, or servo that applies for that shift. Each gear change in an automatic transmission involves a specific combination of clutch and band applications. If only the 2-3 shift slips, the friction element unique to that shift has worn material or a leaking apply circuit.

48. A — Before disassembling any component, check for the most basic and accessible condition first. Grabbing the drive shaft and attempting to rotate it by hand reveals total driveline free play — including U-joint play, ring-and-pinion backlash, and axle shaft spline wear — in seconds. Excessive total play (more than the manufacturer's specification in degrees or millimeters) confirms the clunk source is in the driveline and directs further investigation.

49. D — CVT fluid has unique friction properties specifically formulated for the belt-to-pulley interface. Incorrect fluid level or degraded fluid directly reduces the clamping force that holds the belt against the pulley surfaces, causing belt slip that manifests as a shudder during acceleration. Checking and correcting the fluid level and condition is the simplest, least invasive, and most common resolution for CVT shudder complaints.

50. B — A transmission that pops out of a specific gear during deceleration but holds in all other gears indicates that the shift detent mechanism for that gear cannot maintain the sleeve in the engaged position against the deceleration-induced load reversal. Worn detent springs, worn detent grooves in the shift rail, or a worn shift ball create insufficient holding force. The synchronizer affects shift-in quality, not gear retention.

51. A — The symptoms — tight steering, hopping during turns, and the 4WD indicator illuminated — confirm that the part-time 4WD system is engaged. Part-time 4WD locks the front and rear axles together with no center differential to accommodate the speed difference between axles during turns. On dry pavement, the front wheels must travel farther than the rear during turns, causing drivetrain bind, tire scrubbing, and the characteristic hopping sensation.

52. D — At highway speed, the turbine speed approaches impeller speed, and the fluid exiting the turbine is now flowing in the same direction as the impeller. If the stator remained locked, it would redirect the fluid against the impeller's rotation, creating a braking effect. The one-way clutch allows the stator to freewheel at this point, letting the fluid pass without redirection and allowing the converter to function as a simple fluid coupling.

53. C — A howl that is present during acceleration but disappears during coasting indicates the ring and pinion gear contact pattern on the drive side (the loaded tooth surface during acceleration) is incorrect. The gear mesh is noisy under drive loading but quiet under coast loading because the tooth contact shifts to the coast side, which may have a better pattern. Adjusting the gear mesh (backlash and pinion depth) to correct the drive-side contact pattern resolves the howl.

54. B — A vibration that appears immediately after half-shaft replacement and was not present before is most commonly caused by the new shaft — either it was not fully seated into the transmission differential (leaving play that allows the shaft to oscillate), or the shaft has a manufacturing balance issue, or the inboard joint was not fully engaged into the transmission side gear splines during installation.

55. A — A rattle at idle that disappears when the clutch pedal is slightly depressed is the signature symptom of a worn dual-mass flywheel. The DMF's internal spring-and-damper mechanism wears over time, allowing the secondary mass to rattle against the primary mass at idle RPM frequencies. Slightly depressing the clutch loads the pressure plate against the disc, applying enough pressure to suppress the secondary mass movement and silencing the rattle.

56. C — The transmission cooler is integrated into the radiator, sharing a common heat exchanger. When an internal leak develops in the cooler, engine coolant (which operates at higher pressure than the ATF) enters the transmission fluid circuit, mixing with the ATF. The coolant-ATF mixture turns milky pink and causes rapid deterioration of the transmission's clutch friction materials, seals, and internal components.

57. B — The front axle disconnect mechanism (or the transfer case synchronizer on systems that allow on-the-move shifting) is responsible for smoothly matching the front axle speed to the rear axle speed during 4WD engagement while moving. A worn synchronizer or disconnect mechanism cannot achieve smooth speed matching, resulting in a grinding noise during the engagement transition.

58. D — Mismatched tire circumferences create a constant speed differential between the front and rear axles. The center coupling, transfer case, or center differential must continuously compensate for this difference, generating heat and mechanical stress. Over time, this continuous compensation overheats and wears the coupling components, leading to expensive damage that far exceeds the cost of proper tire matching.

59. A — A clutch disc installed backwards places the torsional damper springs on the wrong side, causing the disc to sit incorrectly between the flywheel and pressure plate. The reversed disc prevents progressive engagement — instead of gradually gripping as the pedal is released, the disc either grabs abruptly or cannot transmit torque at all, causing the engine to stall during launch.

60. C — The accumulator piston in an automatic transmission hydraulic circuit cushions the application of clutch packs and bands during shifts. When hydraulic pressure is first applied to a clutch circuit, the accumulator absorbs the initial pressure spike and releases it gradually, providing a controlled, progressive clutch engagement that the driver perceives as a smooth shift rather than an abrupt slam.

61. B — Using Ohm's Law, first find current: $I = V \div R = 12V \div 6\Omega = 2$ amps. Then apply Watt's Law: $P = V \times I = 12V \times 2A = 24$ watts. Note that option D also arrives at 24W using $P = V^2 \div R$ (which is mathematically equivalent), but it incorrectly states the answer is 48 watts despite showing the correct formula — a distractor designed to test whether you verify the arithmetic.

62. B — A voltage drop of 0.8 volts across a single cable connection during cranking (which draws 200+ amps) is excessive. The maximum acceptable voltage drop across any single connection in the starting circuit is approximately 0.2 to 0.3 volts. An 0.8V drop indicates high resistance at the battery negative post-to-clamp connection, most commonly from corrosion buildup that must be cleaned and the connection retightened.

63. A — A 1.8-volt difference between the supply voltages at two identical lamps (12.1V vs 10.3V) indicates that 1.8 volts is being consumed by unwanted resistance in the supply wiring to the dim lamp. The voltage is being dropped across a corroded connector, damaged wire, or high-resistance splice before reaching the lamp, reducing the voltage available to the bulb and dimming its output.

64. C — In a parallel circuit, each load has its own independent current path from the source to ground. If one load develops an open circuit, only that branch loses current flow — the other branches continue to receive full source voltage and operate normally because their current paths are unaffected. This is why most automotive circuits are wired in parallel — a single failed component does not disable the entire system.

65. D — The battery voltage drops to 9.2V under cranking load (acceptable for a high-current event), but only 7.8V reaches the solenoid — a 1.4V loss between the battery and the solenoid. This 1.4V voltage drop occurs in the positive cable or its connections, indicating excessive resistance from corroded terminals, a damaged cable, or loose connections that must be found and repaired.

66. A — "GOOD BATTERY — RECHARGE" means the conductance test determined that the battery's internal plate structure is healthy and capable of performing to its rated CCA, but the current state of charge is low. The battery needs to be fully recharged before being returned to service. This is an important distinction — a discharged battery is not a bad battery; it simply needs charging.

67. C — The neutral safety switch (or park/neutral position switch on the transmission range sensor) prevents the starter from engaging unless the transmission is in Park or Neutral. An intermittent fault in the Park position contact opens the starter control circuit — the starter receives no signal and produces no sound. Moving the selector to Neutral engages a different contact that may work, allowing the start.

68. D — The most practical in-vehicle test for alternator diode condition is measuring AC ripple voltage at the B+ terminal (or at the battery) with the engine running. A DVOM set to AC voltage or an oscilloscope connected to the alternator output reveals AC ripple that should be less than 0.5V. Excessive AC ripple (above 0.5V) indicates one or more rectifier diodes have failed and are passing AC through to the DC system.

69. A — A repeatedly blowing fuse indicates an overcurrent condition in the protected circuit. The correct approach is to measure the actual current draw to determine if the fan motor is drawing more current than the 20-amp fuse rating — which could be caused by a seized motor, a short in the wiring, or a binding fan blade. Installing a larger fuse bypasses the protection and creates a fire hazard; bypassing with a jumper wire is even more dangerous.

70. B — Turn signal hyperflash (faster-than-normal flashing) occurs when the circuit's total current draw drops below the flasher module's expected threshold. A burned-out bulb removes its current draw from the circuit, and the flasher responds to the reduced load by cycling faster. This is by design — hyperflash serves as a visual indicator to the driver that a bulb has failed. Replacing the burned-out left rear turn signal bulb restores normal flash rate.

71. D — The engine overheats at idle (where the only airflow through the radiator comes from the cooling fans) but normalizes at highway speed (where ram airflow through the radiator provides adequate cooling without fan assistance). This pattern points directly to the cooling fan system — the fans are not activating at idle when they are needed most. The fault may be in the fan relay, fan motor, wiring, fuse, or the coolant temperature signal that triggers fan activation.

72. C — Intermittent faults that appear only during vibration or bumps are caused by connections that make and break contact under physical movement. The most effective diagnostic technique is wiggle-testing — physically manipulating connectors, wiring, and ground connections while monitoring the affected circuit with a DVOM or scan tool. When the wiggle reproduces the symptom, the fault location is identified.

73. C — Both sides reading extremely high indicates the system cannot reject heat from the refrigerant — the condenser side of the system is overwhelmed. This is caused by an overcharge of refrigerant (too much mass in the system raises both pressures), a severely restricted or blocked condenser (debris, failed fan), or air contamination in the system (non-condensable gas raises the high-side pressure). A failed compressor would show equalized or low pressures, not both high.

74. B — A slightly undercharged system has less refrigerant mass to evaporate in the evaporator, causing the low-side pressure to drop to the compressor cutoff threshold faster than normal. The compressor cycles off, pressure rises as the remaining liquid evaporates, the compressor cycles back on, and the pattern repeats in short intervals. The vent temperature of 5°C suggests the system cools effectively when the compressor runs but cannot sustain the cooling continuously.

75. A — Evacuation uses a vacuum pump to remove both air (a non-condensable gas that raises high-side pressure) and moisture (which combines with refrigerant to form corrosive acids) from the system. The pump pulls the system down to at least 29.92 inches of mercury (deep vacuum), where water boils at room temperature and is drawn out as vapor. The vacuum must be held for the manufacturer-specified time (typically 30–60 minutes) to ensure complete moisture removal.

76. C — Before committing to heater core replacement (which typically requires extensive dashboard disassembly), verify that the moisture is actually coolant and not condensation from the A/C evaporator or another water source. Testing the fluid on the carpet with a refractometer (which reads glycol concentration) or an antifreeze test strip confirms the presence of ethylene glycol, definitively identifying the leak as a heater core failure.

77. A — In a dual-zone system, each side has an independent blend door actuator. When one side delivers the correct temperature and the other is stuck at maximum heat regardless of setting, the blend door actuator on the affected side has failed in the full-heat position. The actuator motor has either failed electrically, stripped its internal gears, or lost its calibration, leaving the door unable to respond to commands.

78. B — The original complaint was no blower at any speed, and the new motor runs at one constant speed without responding to speed adjustments. The blower motor speed control module (transistorized power controller) regulates the motor speed by varying the voltage or PWM signal. If the controller had already failed (causing the original no-blower condition on the old motor), the new motor runs at whatever default state the failed controller allows — typically full speed through a bypass circuit or no speed at all.

79. D — Contaminated refrigerant (a mixture of R-134a and R-1234yf) cannot be processed by either type of dedicated recovery equipment without contaminating the equipment and its stored refrigerant. The mixed refrigerant must be recovered into a dedicated contaminated-refrigerant tank and sent for proper disposal or reclamation by a licensed facility. Never mix contaminated refrigerant with pure stock.

80. C — When a compressor fails mechanically, metallic debris circulates through the entire refrigerant circuit. The condenser must be flushed (or replaced if it cannot be flushed — many parallel-flow designs have passages too narrow to flush effectively), the expansion device must be replaced (debris lodges in the metering orifice), and the receiver-drier or accumulator must be replaced (to remove both debris and moisture). Failing to address all three contamination points destroys the replacement compressor.

81. A — If both high beams work but neither low beam illuminates when the switch is released, and both low-beam bulbs are unlikely to have failed simultaneously, the multifunction switch (dimmer switch) has a faulty low-beam contact. The switch successfully closes the high-beam circuit but cannot return to the low-beam contact position due to worn or damaged internal contacts.

82. C — The radar sensor behind the front bumper cover was aimed and calibrated with the bumper in its original installed position. Removing and reinstalling the bumper can shift the sensor's position or angle by millimeters — enough to misalign the radar beam. The sensor requires recalibration after any bumper removal/reinstallation to restore its correct detection field alignment and prevent false alerts or missed detections.

83. C — Intermittent EPS faults with no permanently stored DTCs suggest a connection that works under some conditions but fails under others — the hallmark of an intermittent wiring or connector problem. A visual inspection of the EPS wiring, connectors (particularly at the motor and PSCM), and ground connections for corrosion, looseness, chafing, or moisture intrusion is the appropriate diagnostic approach before replacing expensive components.

84. B — A vehicle that pulls to one side only during braking indicates unequal braking force between the left and right front wheels. A sticking right front caliper that does not fully apply reduces braking force on the right side, causing the vehicle to pull toward the left (the side with stronger braking). The pull does not occur during normal driving because the brakes are not applied.

85. C — Fifty millimeters of steering wheel free play before the wheels respond indicates mechanical looseness somewhere in the steering linkage chain. The inner and outer tie rod ends and the rack mounting bushings are the most common wear points that produce measurable play. Worn tie rod ball joints allow the tie rod to move within the socket before transmitting force to the knuckle.

86. A — The vehicle pulls toward the side with more positive camber. Left camber is −2.5° (more negative) and right camber is −0.5° (less negative / more positive). The 2.0° difference creates a rightward pull. Adjusting the left front camber toward zero (less negative, more positive) reduces the side-to-side difference and eliminates the pull.

87. B — A brake pedal pulsation that is not felt through the steering wheel and appears to originate from the rear indicates rear rotor thickness variation. Front rotor DTV produces pulsation felt through both the pedal and the steering wheel (because the front rotors are connected to the steering knuckles). Rear rotor DTV produces pulsation felt through the pedal only, since the rear brakes have no connection to the steering.

88. D — A coil spring under compression stores enormous potential energy — enough to cause serious injury or death if the spring escapes the compressor during disassembly. A quality spring compressor with properly seated clamps and adequate compression capacity is essential. Improvised or undersized

compressors, and clamps that are not fully seated on the coils, create a risk of catastrophic spring release.

89. A — Many vehicles with rear disc brakes use a separate drum-in-hat parking brake mechanism — a small set of brake shoes inside the hat section of the rear rotor that applies via the parking brake cable. If the cable adjustment is incorrect or the parking brake shoes are worn, the mechanism cannot generate enough friction to hold the vehicle. The hydraulic disc brake pads are not involved in parking brake operation on this design.

90. C — Cupping (scalloped) wear — alternating high and low spots around the tread circumference — is caused by the tire bouncing against the road surface rather than maintaining consistent contact. Worn shock absorbers or struts allow the wheel to oscillate after encountering road irregularities, and each bounce scuffs the tread unevenly. Replacing the worn dampers stops the cupping progression; the affected tire should also be replaced.

91. D — The brake warning light (separate from the ABS light) is most commonly triggered by a low brake fluid level in the master cylinder reservoir. A float sensor in the reservoir illuminates the light when the fluid drops below the minimum level. Low fluid can indicate worn brake pads (the calipers have extended further, displacing more fluid into the calipers), a brake fluid leak, or simply low fluid from normal consumption.

92. B — Sealed hub unit bearings are precision assemblies designed to operate with zero perceptible play. Any play detectable by hand at the 12 and 6 o'clock positions indicates the bearing has failed — the internal races, balls, or rollers have worn to the point of measurable looseness. The hub unit should be replaced. Serviceable tapered roller bearings may have a specified amount of end play, but sealed units should have none.

93. A — A MacPherson strut is a structural suspension component — it serves as the upper steering pivot, the upper suspension mounting point, and the coil spring seat. Removing a strut causes the suspension to collapse because it is a load-bearing member. A standard shock absorber provides damping only and is not a structural member — the suspension retains its geometry if the shock is removed.

94. D — A vibration that occurs in a specific speed range and is felt through the steering wheel but is not affected by braking (ruling out brake rotor DTV) is most commonly caused by a tire and wheel balance issue. The unbalanced mass creates a centrifugal force that reaches resonance with the steering

system at the specific rotational speed corresponding to 80–100 km/h, producing the shimmy that disappears above and below that speed window.

95. B — The standard bleeding sequence for a diagonal split system begins at the wheel furthest from the master cylinder (typically right rear) and progresses to the left front, then left rear, then right front. This sequence ensures that air is pushed progressively outward from the master cylinder through the longest lines first, preventing trapped air from being pushed deeper into the system.

96. D — Hydraulic power steering uses a belt-driven pump that produces flow proportional to engine RPM. At idle, pump speed and therefore flow output are at their minimum. A pump with worn internal vanes produces even less flow at idle, resulting in insufficient hydraulic assist for the high-friction, low-speed steering effort of parking maneuvers. At highway speed, the higher engine RPM increases pump output to a level that provides adequate assist.

97. A — The last four digits of the DOT code on a tire sidewall indicate the manufacturing date. The first two digits represent the week of the year (01–52), and the last two digits represent the year. "2519" means the tire was manufactured during the 25th week of 2019. This date is critical for identifying aged tires that may need replacement due to rubber degradation regardless of remaining tread depth.

98. D — ESC compares the driver's intended path (from the steering angle sensor and vehicle speed) with the actual vehicle path (from the yaw rate sensor). If either sensor is out of calibration, the ESC module perceives a discrepancy between intended and actual path during normal driving, triggering corrective intervention when none is needed. Recalibrating the sensors resolves the false activation.

99. C — A wheel that has noticeable resistance and a grinding feeling when spun by hand off the ground, with the brake not dragging, indicates a failing wheel bearing. The internal bearing surfaces have developed roughness from wear, corrosion, or damage that creates friction and a tactile grinding sensation during rotation. A healthy bearing allows the wheel to spin freely and smoothly with no detectable resistance.

100. B — Foamy power steering fluid combined with a groaning pump noise indicates air contamination in the hydraulic system. Air enters through a low fluid level (the pump draws air along with fluid), a cracked or loose inlet hose, or a failed pump shaft seal. The air mixes with the fluid, creating foam that cannot maintain hydraulic pressure, and the air cavitation inside the pump produces the groaning noise.

101. D — Hybrid vehicles use regenerative braking for the majority of their deceleration, converting kinetic energy to electrical energy through the motor/generator rather than through friction brakes. This means the brake pads contact the rotors far less frequently than on conventional vehicles. The reduced friction contact allows surface moisture to sit on the rotor without being scrubbed off, leading to visible rust buildup that would be absent on a frequently used rotor.

102. D — DOT 5 brake fluid uses a silicone base rather than the glycol base used by DOT 3, DOT 4, and DOT 5.1. DOT 5 is NOT compatible with any glycol-based fluid — mixing them causes seal damage, fluid separation, and potential brake failure. DOT 5.1, despite its similar numbering, is glycol-based and IS compatible with DOT 3 and DOT 4. The numbering system is a common source of confusion.

103. C — A steering wheel shimmy that occurs only during braking is caused by uneven braking force at the front wheels, transmitted through the steering linkage to the steering wheel. Front brake rotor thickness variation or excessive runout creates uneven pad-to-rotor contact with each revolution, producing a cyclic variation in braking force that the driver feels as shimmy through the steering wheel.

104. B — The outer tie rod end threads into the adjusting sleeve, and the sleeve's threaded position on the inner tie rod determines the total toe angle for that wheel. Replacing the tie rod end and threading it to a different depth than the original changes the effective length of the tie rod assembly, directly altering the toe setting. Toe must always be checked and adjusted after tie rod replacement.

105. C — With the tie rod ends and rack confirmed good, the next link in the steering chain between the driver's hands and the rack is the intermediate shaft and its universal joints. Worn or dry universal joints in the intermediate shaft absorb rotational input before it reaches the rack pinion, creating a dead zone of free play at the steering wheel. This is often overlooked because the joints are partially hidden behind the firewall.

106. A — When the TPMS display and a calibrated handheld gauge disagree, and the system was recently serviced, the most likely explanation is a sensor fault. A TPMS sensor with a low battery produces weak or inaccurate transmissions, or a sensor with an internal calibration drift reports incorrect pressure values. The handheld gauge provides a direct physical measurement that is generally more trustworthy than a potentially failing electronic sensor.

107. D — Side curtain airbag modules and their mounting hardware are located directly behind the headliner and pillar trim. Removing the headliner involves working in close proximity to these pyrotechnic devices. The SRS system must be fully disarmed — ignition off, negative battery cable

disconnected, and the manufacturer-specified capacitor discharge time observed — before the headliner or any pillar trim covering an airbag is removed.

108. B — The clockspring is a coiled ribbon cable with a finite number of turns. If the cable is damaged, off-center, or nearing the end of its travel range, it creates an intermittent open circuit at extreme steering angles. The SRS warning light illuminates when the open circuit breaks the airbag firing loop, and extinguishes when the steering returns closer to center and the circuit reconnects.

109. A — Tempered glass is heat-treated to create compressive stress on the outer surfaces and tensile stress in the interior. When broken, these opposing stresses cause the glass to fragment into small, relatively blunt granules rather than the sharp, jagged shards produced by untempered glass. Tempered glass is used for side and rear windows where laminated glass is not required.

110. A — Tail lamp housing gaskets and mounting points are a frequently overlooked source of trunk water intrusion. When the gaskets deteriorate, shrink, or shift from age and temperature cycling, water can enter the trunk around the tail lamp mounting holes during rain or car washes. The leak path is often not obvious because the water runs along the inside of the body panel before dripping into the trunk.

111. D — When a single window does not operate from any switch (neither its local switch nor the driver's master switch), the fault is in the dedicated circuit for that specific window — the fuse, wiring, or connector that is common to all control paths. The window lock button is confirmed disengaged (which only affects rear windows), so the most basic check is the fuse and wiring that feed that individual window's circuit.

112. B — All deployed SRS components are single-use devices. The deployed airbag module, the fired seatbelt pretensioner and its retractor assembly, and any other deployed components (knee airbags, side curtain airbags) must all be replaced with new parts. The ACM may need to be replaced or cleared depending on the vehicle — some ACMs store deployment data permanently and require replacement, while others can be reset.

113. A — After a key fob battery replacement, if the vehicle displays "Key Not Detected," the most common cause is an incorrect replacement battery. Key fobs are powered by specific coin cell batteries (typically CR2025 or CR2032) with specific voltage output. Installing the wrong type, size, or voltage battery produces a signal that is too weak for the vehicle's receiver to detect at the normal operating range.

114. D — Power liftgate systems include an anti-pinch safety feature that reverses the motor direction if it detects an obstruction during opening or closing. A faulty anti-pinch sensor (which may use pressure-sensitive tape, Hall effect sensors, or current monitoring) can falsely detect an obstruction that doesn't exist, commanding the motor to reverse before the liftgate reaches its fully open position.

115. C — The evaporator surface operates at near-freezing temperatures during A/C operation, causing moisture in the cabin air to condense on the fins. When the A/C is turned off, this moisture remains on the evaporator surface in the dark, warm HVAC case — an ideal environment for mold and mildew growth. The organisms produce the musty odor that is most noticeable when the A/C is first activated and air is blown across the contaminated surface.

116. A — When the exterior handle operates correctly (the mechanism moves) but the door doesn't open, and the door is visibly misaligned with the body, the striker on the B-pillar is the most likely cause. If the striker has shifted position — from impact, vibration, or loosened bolts — the latch cannot fully release because the striker's position prevents the latch mechanism from clearing it during the opening movement.

117. B — In a parallel hybrid, both the internal combustion engine and the electric motor are mechanically connected to the drivetrain, and either or both can provide motive force to the drive wheels simultaneously. This distinguishes it from a series hybrid (where only the electric motor drives the wheels and the ICE drives a generator) and from a BEV (which has no ICE at all).

118. C — The generally accepted safe threshold for high-voltage DC in automotive applications is 30 volts. A reading of 2.5 volts is well below this threshold, confirming that the inverter capacitors have discharged and the system has adequately de-energized for safe service. The technician should still wear insulating gloves as standard practice during any HV service.

119. D — The permanent magnet synchronous motor (PMSM) is the dominant traction motor type in modern hybrids and BEVs because it offers the highest power density (power output per unit of weight and volume) and the highest efficiency of any automotive traction motor design. Rare-earth permanent magnets in the rotor create a strong magnetic field without consuming electrical energy, maximizing overall motor efficiency.

120. B — On a BEV, the 12-volt auxiliary battery is charged by the DC-DC converter, which is powered by the HV system. Disconnecting the 12V battery on a BEV is generally straightforward, but the technician should be aware that the HV system may respond to the loss of 12V power by opening the

HV contactors (a safety response). On some BEVs, the HV system should be properly shut down before 12V battery service to avoid triggering fault codes or unintended system responses.

121. C — The charge port, its locking mechanism, and the pilot signal circuit are the physical interface between the vehicle and the external charging station. The pilot signal circuit communicates the vehicle's readiness to charge, the maximum current the vehicle can accept, and the ground continuity verification. A damaged port, a faulty lock mechanism, or a broken pilot signal wire prevents the vehicle from establishing the handshake with the EVSE needed to initiate charging.

122. A — BEVs have no engine and therefore no waste heat to warm the cabin. The cabin heater draws energy directly from the HV battery — typically 3 to 7 kW for resistive heaters, less for heat pump systems. This energy consumption reduces the energy available for propulsion. Additionally, cold temperatures increase the battery's internal resistance and reduce its usable capacity. The combination of heater energy draw and reduced battery capacity significantly decreases driving range in winter.

123. D — High-voltage cables carry lethal voltages and must maintain full insulation integrity. Abraded outer insulation, even when the inner conductor shielding appears intact, reduces the safety margin and exposes the cable to moisture intrusion, further abrasion from road debris, and potential future conductor exposure. The compromised cable must be replaced to restore full insulation safety — tape or coatings are not acceptable repairs on HV circuits.

124. B — The BMS limits regenerative braking current when the battery is cold because charging a lithium-ion cell at high current in cold temperatures (below approximately 0°C to 10°C depending on chemistry) can cause lithium plating on the anode — a permanent and dangerous degradation mechanism that reduces capacity and can create internal short circuits. The BMS protects the battery by reducing the maximum regenerative current until the pack warms up.

125. C — The HV contactors are high-current electromagnetic relays inside the battery pack that connect and disconnect the HV battery from the vehicle's HV bus under the command of the BMS and the vehicle control module. When the vehicle enters "Ready" mode, the contactors close, connecting the battery to the inverter and motor. When the vehicle is shut down or a safety fault is detected, the contactors open, isolating the battery and de-energizing the HV circuit.