

PRACTICE EXAM 3: RED SEAL AUTOMOTIVE SERVICE TECHNICIAN SIMULATION (125 QUESTIONS)

1. A technician needs to lift a transmission weighing approximately 60 kg from the floor to a workbench. No mechanical lifting device is immediately available. What is the correct approach?

- A. Lift the transmission alone using proper back mechanics by bending at the knees and keeping the load close to the body
- B. Get assistance from a co-worker or obtain a mechanical lifting device before attempting to move the transmission
- C. Slide the transmission across the floor to the workbench and tip it up onto the surface using the bench edge as a pivot
- D. Place the transmission on a rolling stool and push it to the bench height using the stool as a platform for the lift

2. What does the "Danger" signal word on a WHMIS 2015 supplier label indicate about the product compared to a label with the "Warning" signal word?

- A. The product requires specialized disposal procedures that are not required for products carrying the Warning signal word
- B. The product is restricted to use by certified technicians only, while Warning products may be used by any shop personnel
- C. The product presents a more severe hazard than products carrying the Warning signal word for the same hazard category
- D. The product has been recalled by the manufacturer and should not be used until an updated formulation is made available

3. A technician is using a hydraulic press to remove a bearing from a shaft. What eye protection is required for this operation?

A. Standard prescription eyeglasses with side shields provide adequate protection for hydraulic press operations in the shop

B. A welding helmet with a clear lens must be worn to protect the entire face from any components that may separate under load

C. No eye protection beyond normal safety glasses is required since the press is enclosed and components are contained within the frame

D. Safety glasses or goggles must be worn because the bearing or shaft could fracture under the extreme force of the press, creating projectiles

4. A customer's vehicle is in the shop for brake service. Before beginning work, the technician reviews the repair order and notices the customer also mentioned an intermittent engine light. What documentation practice should be followed?

A. Record the additional concern on the repair order and inform the service advisor, but do not diagnose the engine light without customer authorization

B. Diagnose the engine light while the vehicle is in the shop for brakes to save the customer a return trip and add the findings to the invoice

C. Ignore the engine light concern since the vehicle was brought in for brake service only and the engine concern is outside the work scope

D. Clear the engine light codes without diagnosis to prevent the light from distracting the customer until they return for a separate appointment

5. What is the minimum number of seconds that eyes should be flushed at an eye wash station after a chemical splash?

A. Thirty seconds of flushing is sufficient for most automotive chemical splashes encountered in the shop environment

- B. A quick five-second rinse followed by medical attention is the recommended protocol for chemical eye exposure incidents
- C. A minimum of fifteen minutes of continuous flushing is required to dilute and remove chemical residue from the eye surfaces
- D. Flushing should continue until the burning sensation stops, regardless of time, then medical attention can be sought if needed

6. Which fire extinguisher operating technique is described by the acronym PASS?

- A. Point at the flame, Apply steady pressure, Squeeze the nozzle, Sweep across the top of the fire from left to right
- B. Pull the pin, Aim at the base of the fire, Squeeze the handle, Sweep the nozzle side to side across the base of the fire
- C. Push the trigger, Aim at the center of the fire, Spray continuously, Step backward slowly while maintaining discharge pressure
- D. Press the lever, Apply from a safe distance, Squeeze in short bursts, Sweep the room for additional fire sources after discharge

7. A shop's air compressor system is being used to inflate a tire on a split-rim wheel assembly. What critical safety practice must be followed?

- A. The tire must be inflated slowly in five-psi increments with a brief pause between each increment to allow the bead to seat gradually
- B. A second technician must hold the wheel assembly steady by standing directly over it while the first technician adds air pressure
- C. The tire must be fully deflated and the rim disassembled, inspected, and reassembled before any air pressure is applied to the assembly
- D. The tire must be placed inside a safety cage during inflation to contain the wheel components in the event of a catastrophic ring separation

8. A technician drops a wrench into the engine bay while working and it lands on the battery terminals, creating a spark. Why is this a safety concern?

A. A short circuit across the battery terminals can cause the wrench to heat rapidly to a temperature that causes severe burns and may ignite nearby combustibles

B. The spark may trigger the vehicle's security alarm system, which could startle the technician and cause them to fall from the work platform

C. The momentary voltage spike from the short circuit can permanently damage the vehicle's electronic control modules and wiring harness

D. The spark creates an electromagnetic pulse that can disrupt the calibration of the shop's electronic diagnostic equipment and scan tools

9. A technician observes that the lifting chains on the shop's engine hoist show visible rust and one link appears slightly elongated compared to the links around it. What is the correct action?

A. Remove the chain from service immediately and replace it, because a stretched or corroded link indicates the chain's load capacity has been compromised

B. Apply penetrating oil to the chain to loosen the rust, then test the chain by lifting a known heavy object to verify it holds without further stretching

C. File the rust from the affected links and paint the chain with rust-inhibiting primer to prevent further corrosion and restore it to service use

D. Mark the elongated link with paint and continue using the chain while monitoring the link for further stretching during each subsequent lift

10. A four-cylinder engine has a misfire on cylinder 2 at idle that disappears above 1,500 RPM. Compression test shows cylinder 2 at 95 psi while cylinders 1, 3, and 4 are between 155 and 162 psi. What is the significance of the misfire disappearing at higher RPM?

A. The ignition coil on cylinder 2 produces a stronger spark at higher RPM that overcomes the compression loss and fires the weakened charge

B. At higher RPM, the turbocharger boost compensates for the compression loss by forcing additional air-fuel charge into the weak cylinder

C. At higher RPM, the increased airflow velocity and reduced time for leakage allow the weakened cylinder to trap enough charge to combust

D. At higher RPM, the ECM switches to a richer fuel map that compensates for the compression loss by providing extra fuel to the weak cylinder

11. A technician performs a block test (combustion leak test) on a vehicle with an overheating complaint. The chemical reagent changes from blue to yellow when held above the open radiator neck with the engine running. What does this confirm?

A. The cooling system is contaminated with incompatible coolant types that have reacted chemically to produce the acidic compound detected

B. The engine oil has entered the cooling system through a failed oil cooler, and the oil hydrocarbons are being detected by the reagent

C. The radiator cap is not holding adequate system pressure, allowing atmospheric carbon dioxide to contaminate the coolant at the surface

D. Combustion gases are entering the cooling system through a head gasket breach, cracked head, or cracked block, confirming an internal leak

12. An engine has a persistent P0300 (Random/Multiple Cylinder Misfire Detected) code. Individual cylinder misfire counters show that misfires are distributed approximately equally across all four cylinders. What type of cause does this even distribution suggest?

A. A mechanical fault in a single cylinder that is intermittently affecting all cylinders through crankshaft torsional vibration transmission

B. A system-wide cause such as low fuel pressure, contaminated fuel, restricted exhaust, or vacuum leak rather than an individual cylinder fault

C. A failing crankshaft position sensor that is generating false misfire detections randomly across all cylinders due to signal noise interference

D. A worn timing chain that has shifted all valve timing events equally and is causing minor combustion instability in every cylinder simultaneously

13. A vehicle's mass airflow sensor reads 1.8 g/s at idle on a 2.4L four-cylinder engine. The expected range for this engine at idle is approximately 3.5 to 5.0 g/s. What effect would this underreporting have on the engine's operation?

A. The ECM calculates fuel delivery based on the MAF signal, so an underreported airflow causes the ECM to deliver too little fuel, creating a lean condition

B. The ECM ignores the MAF signal at idle and uses the MAP sensor exclusively, so the underreported MAF reading has no effect on idle fuel delivery

C. The ECM compensates by increasing the ignition timing advance to extract more power from each combustion event to offset the reduced fuel delivery

D. The underreported MAF signal causes the ECM to deliver excess fuel because it interprets the low airflow as a cold-start enrichment demand signal

14. During a cooling system inspection, a technician squeezes the upper radiator hose while the engine is at operating temperature and finds it extremely hard and pressurized — much firmer than expected. The coolant temperature gauge reads normal. What does this excessive pressure suggest?

A. The radiator cap is holding pressure above its rated specification due to a stuck pressure relief valve that prevents normal venting

B. The water pump is producing excessive flow that increases system pressure beyond the cap's rated level during normal operation

C. The engine block passages are restricted with scale deposits, forcing the water pump to generate higher pressure to move coolant

D. Combustion gases are pressurizing the cooling system through an internal head gasket leak, even though the engine temperature appears normal

15. An R-1234yf refrigerant system requires A/C service. What specific safety consideration applies to R-1234yf that does not apply to R-134a?

A. R-1234yf requires a specialized recovery machine that operates at a higher vacuum level than R-134a equipment to prevent residual release

B. R-1234yf must be stored at a controlled temperature below 20°C at all times because it becomes unstable at higher ambient temperatures

C. R-1234yf is classified as mildly flammable and must not be exposed to open flames, sparks, or hot surfaces during handling and service

D. R-1234yf requires the A/C system to be pressure-tested with helium rather than nitrogen because nitrogen reacts with the refrigerant chemically

16. A vehicle equipped with variable valve timing has a DTC for camshaft position timing over-retarded on bank 1. The engine has excessive oil sludge from missed oil change intervals. What is the relationship between the sludge and the DTC?

A. The sludge has contaminated the camshaft position sensor, causing it to report false position data that the ECM interprets as retarded timing

B. The sludge has clogged the fine oil passages in the VVT oil control valve and cam phaser, preventing the system from advancing the camshaft as commanded

C. The sludge has increased oil viscosity beyond the point where the oil pump can generate adequate pressure for any engine system to function

D. The sludge has caused the timing chain to jump multiple teeth on the camshaft sprocket, physically retarding the camshaft position permanently

17. A diesel engine has a fuel rail pressure that drops from the specified 25,000 psi to 18,000 psi within two seconds of the engine being shut off. Normal pressure should hold above 22,000 psi for at least ten seconds after shutdown. What does this rapid pressure drop indicate?

- A. A fuel system leak — either a leaking injector, a faulty rail pressure relief valve, or a worn high-pressure pump check valve — is allowing fuel to bleed down
- B. The fuel rail itself has developed a hairline crack from the extreme pressure cycling and is leaking externally under the intake manifold covering
- C. The ECM is commanding the fuel pressure regulator to dump rail pressure quickly after shutdown as a normal protective operating procedure
- D. The fuel filter is severely restricted and is causing a vacuum in the rail after the pump stops, pulling the pressure down through the filter media

18. A technician tests the fuel pressure on a port fuel injection system and measures 310 kPa at idle. The specification is 345 kPa at idle. The technician pinches the fuel return line closed while the engine is running and the pressure rises to 420 kPa. What does this test reveal?

- A. The fuel pump is producing adequate volume and pressure, but the fuel pressure regulator is opening too early and bleeding off excess pressure
- B. The fuel pump is weak and cannot produce adequate pressure even with the return line blocked because 420 kPa is still below the pump's normal capacity
- C. The fuel pressure regulator vacuum reference line is disconnected, causing the regulator to set pressure at the wrong reference point for the manifold condition
- D. The fuel injectors are leaking internally and the increased rail pressure from blocking the return line confirms the injectors are consuming excess fuel volume

19. An engine with hydraulic lash adjusters (lifters) produces a persistent ticking noise from the valve train at all temperatures, even after extended engine operation at operating temperature. The oil level and viscosity are correct. What does the persistent ticking after warm-up suggest?

- A. Normal hydraulic lifter operation during the oil warmup phase that will resolve within the first five to ten minutes of driving each day
- B. Contaminated oil filter that is restricting oil flow to the cylinder head, starving the lifters of adequate oil supply for proper pump-up

C. A contaminated mass airflow sensor that is causing lean misfire, which the technician is misidentifying as a valve train ticking noise

D. One or more hydraulic lifters have failed internally with a worn plunger, collapsed check ball, or scored bore that prevents proper oil retention and pump-up

20. A technician replaces a thermostat on a vehicle and refills the cooling system. After starting the engine, the heater blows cold air for an extended period even though the engine reaches operating temperature. What is the most likely cause?

A. The replacement thermostat is rated at a lower temperature than the original, causing the engine to run below the minimum heater core operating threshold

B. An air pocket trapped in the heater core is preventing coolant from circulating through it, and the system requires bleeding to purge the trapped air

C. The heater core has plugged during the service because debris dislodged by the coolant drain settled in the heater core's narrow internal passages

D. The replacement thermostat was installed backwards, causing coolant to bypass the heater core circuit and flow only through the radiator loop

21. On a five-gas exhaust analyzer, which gas reading directly indicates the efficiency of the catalytic converter's oxidation function?

A. Oxygen (O_2), which should decrease as the catalytic converter consumes it during the reduction reactions that convert NO_x into nitrogen

B. Hydrocarbons (HC), which should be elevated upstream of the converter and dramatically reduced downstream if oxidation is functioning

C. Carbon dioxide (CO_2), which should be high (14–15.5%) when the converter is efficiently oxidizing CO and HC into CO_2 and water vapor

D. Carbon monoxide (CO), which increases proportionally with the catalytic converter's efficiency as the converter breaks down fuel molecules

22. A vehicle's check engine light is on with a P0456 code (EVAP System Very Small Leak Detected). The fuel cap has been replaced and the code cleared, but it returns after two drive cycles. What is the next diagnostic step?

A. Replace the EVAP charcoal canister, which is the most common source of very small leaks after the fuel cap has been eliminated

B. Replace the EVAP canister vent valve and purge valve simultaneously, since either component could be the source of the small leak

C. Perform a visual inspection of all EVAP lines and connections for cracking, since very small leaks are usually visible to the naked eye

D. Perform a smoke test on the EVAP system to locate the small leak that is too minor to find by visual inspection or electronic detection alone

23. A spark plug removed from a cylinder has a white, blistered insulator nose and partially melted center electrode. What condition does this indicate?

A. Severe overheating of that cylinder from a lean air-fuel mixture, incorrect spark plug heat range, advanced ignition timing, or cooling system deficiency

B. Extended idling with a rich air-fuel mixture that has deposited lead compounds from fuel additives onto the insulator and electrode surfaces

C. Normal wear on a spark plug that has exceeded its service life and reached the end of its effective operating period in the combustion chamber

D. Oil contamination from a leaking valve stem seal that has burned onto the ceramic insulator and electrode surfaces over an extended operating period

24. A technician is testing a knock sensor using an oscilloscope. With the engine idling, the technician taps the engine block near the sensor with a wrench. What waveform response confirms the sensor is functional?

- A. A steady, continuous sine wave that increases in frequency proportionally with each consecutive tap on the engine block surface
- B. A sharp voltage spike that appears on the oscilloscope display at the exact moment of each tap, confirming the piezoelectric element is responding
- C. A gradual voltage increase that builds with each tap and remains elevated for several seconds after tapping stops before decaying to zero
- D. A square wave pulse that alternates between 0 volts and 5 volts with each tap, confirming the sensor's digital output to the ECM is functional

25. A diesel engine's DEF warning light illuminates and the message display reads "Refill DEF — Speed Limited in 200 km." What will happen if the driver continues without refilling the DEF tank?

- A. The engine will shut down completely after 200 km of additional driving to protect the SCR catalyst from operating without the reducing agent
- B. The exhaust aftertreatment system will switch to a bypass mode that routes untreated exhaust directly to the atmosphere for the remaining distance
- C. The fuel injection rate will be reduced progressively by the ECM, but the vehicle will continue operating at reduced speed without a hard shutdown
- D. The vehicle speed will be progressively limited and eventually restricted to a very low maximum speed until the DEF tank is refilled to an adequate level

26. What causes the characteristic "diesel knock" noise that is more pronounced in older diesel engines and during cold operation?

- A. Metal-to-metal contact between the piston skirt and the cylinder wall during the power stroke as the combustion force drives the piston sideways
- B. Detonation caused by premature ignition of the diesel fuel before the fuel injection event reaches the proper point in the compression stroke
- C. The rapid, uncontrolled pressure rise when injected fuel ignites suddenly in the compressed air, creating a sharp combustion pressure spike

D. Loose connecting rod bearings that allow the rod to shift position as the combustion pressure reverses the loading direction on the crankshaft journal

27. An ignition coil primary winding resistance measures 0.6 ohms, and the secondary winding resistance measures 8,500 ohms. The manufacturer's specifications are 0.4 to 0.8 ohms primary and 6,000 to 12,000 ohms secondary. What is the conclusion?

A. The coil has a shorted secondary winding that will produce insufficient spark voltage and must be replaced before returning to service

B. Both primary and secondary resistance readings are within the manufacturer's specified ranges, indicating the coil passes the static resistance test

C. The primary resistance is at the high end of specification, indicating the coil is degraded and approaching failure even though it currently tests within range

D. The secondary-to-primary turns ratio is incorrect for this application, indicating the wrong coil model was installed during the previous service

28. A PFI fuel system has a fuel pressure that drops to zero within thirty seconds of engine shutdown. The fuel pump check valve, fuel pressure regulator, and all hose connections have been tested and are holding properly. What is the remaining likely cause?

A. One or more fuel injectors are leaking internally past their pintle seats, allowing fuel to seep into the cylinders and draining the rail pressure

B. The fuel tank rollover valve is stuck in the open position, allowing fuel in the rail to drain back to the tank through the vapor recovery circuit

C. The fuel pump relay is de-energizing too quickly after key-off, preventing the fuel pump from maintaining the residual pressure charge in the rail

D. The fuel rail itself has developed porosity from internal corrosion that allows fuel to weep through the metal wall at a rate too slow to detect visually

29. A vehicle's engine temperature gauge fluctuates erratically between cold and normal while driving. The actual coolant temperature measured with a scan tool remains stable at 92°C. What does this discrepancy indicate?

A. The thermostat is partially stuck and opening and closing intermittently, causing actual temperature fluctuations that the scan tool sensor cannot detect

B. The scan tool is reading a different sensor than the one that feeds the instrument cluster gauge, and both readings may be independently inaccurate

C. The water pump impeller has deteriorated and is providing inconsistent coolant flow that affects the gauge sender location but not the ECT sensor location

D. The coolant temperature sender unit that feeds the instrument cluster gauge has a fault — not the ECT sensor that feeds the ECM and scan tool data

30. An engine has a P0420 code (Catalyst System Efficiency Below Threshold, Bank 1). The upstream O₂ sensor switches rapidly between rich and lean as expected. The downstream O₂ sensor also switches rapidly, closely mirroring the upstream pattern. What does this downstream sensor behavior confirm?

A. Both oxygen sensors are functioning correctly and the P0420 code is a false detection caused by a software calibration error in the ECM

B. The upstream sensor is contaminated and producing false switch signals that are passing through the converter and appearing at the downstream sensor

C. The catalytic converter has lost its oxygen storage capacity and can no longer dampen the exhaust gas oscillations, confirming converter degradation

D. The downstream sensor has failed and is generating its own independent switching pattern that coincidentally matches the upstream sensor's timing

31. A turbocharged engine has a wastegate that is stuck in the closed position. What symptom will this produce?

- A. Uncontrolled boost pressure that exceeds the target, potentially causing engine detonation, excessive cylinder pressure, and engine component damage
- B. Zero boost pressure because the exhaust is bypassing the turbine completely, resulting in power loss identical to a naturally aspirated engine
- C. Normal boost pressure at low RPM with gradual pressure decay at higher RPM as the turbocharger reaches its maximum rotational speed limit
- D. Intermittent boost surging as the ECM oscillates between commanding the wastegate open and closed in an attempt to control the stuck valve

32. A technician measures the CAN bus voltage at the OBD II DLC with the ignition on and engine off. CAN-H reads a steady 4.2 volts and CAN-L reads a steady 0.8 volts. Both voltages are constant with no fluctuation. What does this indicate?

- A. The CAN bus is functioning normally with both lines at their correct operating voltages during active module communication on the network
- B. A module on the bus has a stuck CAN transceiver that is driving the bus into a permanent dominant state, preventing all other communication
- C. The scan tool is connected and actively commanding a diagnostic session that holds the bus in a fixed state until the session is released
- D. The bus is in a permanently dominant state because a CAN-H or CAN-L wire has shorted to a voltage source in the vehicle wiring harness

33. A vehicle's instrument cluster displays the wrong engine temperature information — it shows cold even when the scan tool confirms the ECT sensor reads 95°C. All other instrument cluster displays are correct. What is the most likely cause?

- A. The ECT sensor itself has a dual-output fault where one internal element reads correctly for the ECM while the other reads incorrectly for the gauge
- B. The instrument cluster is receiving the correct data on the CAN bus but has an internal fault in the temperature gauge driver circuit or display element

C. The gateway module is filtering the coolant temperature data and preventing it from reaching the instrument cluster while passing all other data normally

D. The CAN bus has a partial communication fault that selectively blocks temperature data while allowing all other data packets to pass to the cluster

34. A vehicle has an aftermarket remote start system installed. Since the installation, the vehicle intermittently displays multiple warning lights and the scan tool occasionally shows U-codes from various modules. What is the most likely cause?

A. The remote start system is drawing excessive current from the battery, causing voltage drops that reset modules and trigger fault codes

B. The remote start system is incompatible with the vehicle's immobilizer and is triggering security faults that cascade through the network

C. The aftermarket wiring splice or connection to the CAN bus is introducing noise or intermittent signal disruption on the communication network

D. The remote start module is broadcasting unauthorized messages on the CAN bus that conflict with the factory modules' expected data patterns

35. What is the primary reason that CAN bus wires are twisted together as a twisted pair rather than run as two parallel straight wires?

A. Twisting reduces the physical length of wire needed to span the same distance, saving material cost and reducing overall harness weight

B. Twisting prevents the wires from separating during vehicle vibration, maintaining the correct physical spacing for consistent signal impedance

C. Twisting allows the two wires to share heat dissipation equally, preventing one wire from overheating due to higher current on the dominant signal

D. Twisting provides electromagnetic interference rejection because induced noise affects both wires equally and cancels out in the differential signal

36. After reprogramming an ECM, the vehicle starts but the idle is unstable and the short-term fuel trims are oscillating widely between +15% and -12%. After thirty minutes of driving, the idle stabilizes and fuel trims settle to $\pm 3\%$. What occurred?

A. The new ECM calibration reset all adaptive learned values to defaults, and the module needed driving time to relearn idle, fuel trim, and throttle parameters

B. The programming process left a corrupted calibration file that the ECM detected and self-corrected during the initial thirty minutes of operation

C. The battery voltage dropped during the reprogramming event, causing partial memory loss that the ECM rebuilt from the factory recovery partition

D. The programming tool introduced a software conflict between the old and new calibrations that the ECM resolved by averaging both data sets together

37. A vehicle's BCM stores a DTC for a rear window defogger circuit fault. The technician tests the rear window defogger grid and finds it functional. The DTC does not return after clearing. What was the most likely cause of the original DTC?

A. The rear window defogger circuit experienced a voltage spike from the alternator that the BCM misinterpreted as a circuit fault during normal operation

B. A momentary poor connection in the defogger circuit — possibly from a loose connector or corroded terminal — that has since reseated or made better contact

C. The BCM's internal monitoring circuit has a defective comparator that occasionally generates false fault detections for the defogger output driver

D. Atmospheric humidity conditions temporarily affected the rear window grid's resistance value enough to exceed the BCM's monitoring threshold range

38. A scan tool performs a "module scan" and lists all modules found on the network. One expected module — the parking assist module — does not appear in the list. The vehicle is equipped with parking sensors that were working until recently. What should be investigated?

- A. The parking assist module software needs to be updated to the latest version that is compatible with the scan tool's current communication protocol
- B. The scan tool needs to be updated with the latest vehicle coverage software because the parking module uses a proprietary communication protocol
- C. The parking assist module's power supply, ground, and CAN bus connection should be checked for faults that would prevent the module from communicating
- D. The parking assist module is located on a LIN sub-network that is not directly accessible from the OBD II DLC and requires a separate access point

39. A technician needs to replace a wheel speed sensor on a vehicle. After replacing the sensor and clearing codes, the ABS warning light turns off during a test drive. However, the speedometer now reads 10% higher than actual vehicle speed. What went wrong?

- A. The replacement sensor is for a different vehicle application and has a different number of pulses per revolution than the original sensor specification
- B. The replacement sensor's mounting depth is incorrect, causing it to read the tone ring teeth at a higher amplitude that the ABS module misinterprets as speed
- C. The ABS module requires a sensor recalibration procedure after replacement to adjust its internal calculation algorithm for the new sensor's output
- D. The original sensor had a built-in signal conditioning circuit that divided the raw pulse count, and the replacement sensor lacks this circuit

40. A vehicle with start-stop technology will not restart the engine after an automatic stop at a traffic light. The dashboard displays "Start-Stop Unavailable." No DTCs are stored. What is the most common cause of this condition?

- A. The start-stop system has detected that the vehicle's battery state of charge or health has fallen below the minimum threshold for reliable automatic restart
- B. The engine coolant temperature has exceeded the start-stop system's maximum operating temperature and the system is in a thermal protection mode

C. The passenger cabin temperature has not reached the HVAC set point, so the system keeps the engine running to maintain compressor operation for cooling

D. The brake pedal pressure sensor has detected that the driver's foot pressure is below the minimum threshold that confirms the driver intends to remain stopped

41. A vehicle has CAN bus communication issues. The technician measures termination resistance at the DLC and reads 40 ohms. What does this value indicate?

A. A third terminating resistor has been added to the bus by an aftermarket module, reducing the parallel resistance below the normal 60-ohm specification

B. One of the two terminating resistors has decreased in value due to heat damage, dropping from its normal 120 ohms to approximately 80 ohms per resistor

C. Both terminating resistors are present but a parallel resistance path from a shorted module or damaged wire is adding a third resistance path to the circuit

D. An additional resistance path exists on the bus — either from an aftermarket device, a shorted module, or a parallel wiring fault — that is reducing the total termination resistance below the expected 60 ohms

42. A vehicle's keyless entry system has reduced range — the key fob must be held within two feet of the door to unlock. New fob batteries have been installed. What should be investigated?

A. The key fob's internal antenna has cracked from repeated drops, reducing its transmission power output despite having adequate battery voltage

B. The keyless entry receiver antenna in the vehicle has a corroded connection or damaged wiring that is reducing its sensitivity to the fob's signal

C. The keyless entry receiver module in the vehicle has a corroded antenna connection or is obstructed by aftermarket window tinting that blocks the RF signal

D. The vehicle's 12-volt battery is in a marginal state of charge that is reducing the power available to the keyless entry receiver module's amplification circuit

43. Why is it critical to verify that all vehicle modules have exited sleep mode before interpreting a parasitic draw reading?

A. Modules in sleep mode draw zero current, so measuring before they sleep gives an artificially high reading that misidentifies normal module keep-alive as drain

B. Modules that are still awake draw significantly more current than sleeping modules, and measuring before all modules sleep produces a falsely high draw reading

C. Modules cycle between sleep and wake states randomly, and measuring during a wake cycle gives an unstable reading that cannot be used for diagnosis

D. Modules in the process of entering sleep mode may activate their internal memory backup circuits, creating a temporary current spike that damages the DVOM

44. A front-wheel-drive vehicle has a vibration under acceleration from a stop that disappears at steady cruising speed. The vibration is felt through the steering wheel and floor. What is the most likely cause?

A. A worn or damaged inner CV joint (tripod joint) on one of the half-shafts that produces vibration under the torque loading of acceleration

B. An engine misfire that is more pronounced under load during acceleration and smooths out at steady-state cruising with lighter throttle

C. A worn front wheel bearing that is loaded by the acceleration forces and settles once the vehicle reaches a constant cruising speed condition

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

45. A customer reports that their automatic transmission "hunts" between two gears during light-throttle highway cruising — repeatedly upshifting and immediately downshifting. What is the most likely cause?

A. Worn clutch packs in both gear positions that slip under light load, causing the TCM to cycle between gears to find one that holds adequately

- B. A faulty output speed sensor that is sending erratic speed data to the TCM, causing it to continuously recalculate the correct gear for the speed
- C. The transmission is operating near the calibrated shift point boundary between two gears, and a minor sensor input variation is causing the cycling
- D. The torque converter clutch is shuddering and the TCM is misinterpreting the vibration as a need to change gears to find a smoother operating point

46. A four-wheel-drive truck has a whining noise that is present in both 2WD and 4WD modes, increases with vehicle speed, and does not change with engine RPM changes at a given road speed. What component is most likely the source?

- A. The transfer case chain or gear set, since the noise would only be present in 4WD mode if it were a front-axle-only component
- B. The transmission input shaft bearing, which would produce a noise that changes with engine RPM regardless of vehicle speed
- C. The engine's accessory drive belt or idler pulley, which would produce a noise proportional to engine RPM rather than vehicle speed
- D. The rear differential ring and pinion gear set, which produces speed-dependent noise and is active in both 2WD and 4WD operating modes

47. On a manual transmission, what is the function of the pilot bearing (or bushing) located in the center of the crankshaft flange or flywheel?

- A. It supports and centers the tip of the transmission input shaft within the crankshaft, allowing the shaft and crankshaft to rotate at different speeds when the clutch is disengaged
- B. It provides the thrust bearing surface that absorbs the axial load created by the pressure plate's clamping force against the clutch disc
- C. It provides the return spring tension that centers the clutch disc on the input shaft splines after the clutch is released from full disengagement

D. It seals the rear of the crankshaft to prevent engine oil from leaking onto the clutch disc friction material and contaminating the friction surfaces

48. A vehicle has an automatic transmission that shifts normally when cold but slips in third gear after the transmission reaches operating temperature. What does this pattern suggest?

A. The transmission fluid is overfilled and foaming at operating temperature, reducing hydraulic pressure and causing the third-gear clutch to slip

B. A hard part (gear, shaft, or housing) has a thermal expansion issue that causes mechanical interference with the third-gear engagement components

C. The transmission's main pressure regulator is failing, and the reduced viscosity of hot fluid allows more leakage past the regulator, dropping line pressure

D. The third-gear clutch pack has a worn seal or piston that only leaks enough to cause slipping when the fluid thins at operating temperature

49. What is the function of the one-way clutch (sprag or roller clutch) found inside some automatic transmissions?

A. It locks the transmission output shaft to the case during Park mode to prevent the vehicle from rolling when parked on an incline

B. It prevents the engine from being driven by the wheels during deceleration by disconnecting the torque converter from the transmission

C. It allows a component to rotate freely in one direction but locks in the other direction, providing smooth holding force during specific gear transitions

D. It connects the transmission oil pump directly to the torque converter turbine so the pump can generate pressure even when the vehicle is stationary

50. A rear-wheel-drive vehicle produces a single heavy clunk from the rear driveline when the transmission shifts from first to second gear under moderate acceleration. No clunk occurs during any other shift. What is the most likely cause?

- A. The first-to-second shift accumulator piston is stuck, causing an abrupt pressure spike during the shift that creates a harsh engagement noise
- B. A worn first-gear band or clutch that releases abruptly during the shift, allowing a momentary speed mismatch that transmits as a driveline clunk
- C. The exhaust system is contacting the driveshaft during the torque change associated with the shift, producing a metallic clunk from underneath the vehicle
- D. Excessive universal joint play or ring and pinion backlash that takes up during the torque reversal associated with the specific first-to-second shift event

51. A vehicle owner reports that the clutch pedal on their manual transmission vehicle has gradually risen higher over the past several months and now engages very close to the top of the pedal travel. What does this indicate?

- A. The clutch master cylinder push rod is slowly adjusting itself longer, pushing the engagement point progressively higher in the pedal arc over time
- B. The clutch disc friction material is wearing thinner, requiring less release bearing travel to disengage the clutch and shifting the engagement point higher
- C. The hydraulic fluid in the clutch release system has expanded from heat absorption, effectively lengthening the hydraulic column and raising the pedal
- D. The pressure plate diaphragm spring is weakening from fatigue, requiring less pedal effort to disengage and creating the sensation of a higher engagement

52. A transfer case makes a grinding noise only when shifting into 4WD Low range from 4WD High range while the vehicle is stationary. The shift into 4WD High from 2WD is smooth. What is the likely cause?

- A. The low-range shift mechanism synchronizer or sliding gear is worn, causing grinding during the low-range engagement that requires speed matching between gear sets
- B. The transfer case fluid is contaminated with water that has frozen inside the low-range gear set and is creating mechanical resistance during engagement

C. The front axle disconnect actuator is not fully engaging, creating a speed mismatch between the transfer case and front differential during low-range selection

D. The transfer case chain has stretched beyond the tensioner's adjustment range and is contacting the case housing only during the low-range gear position

53. A customer reports that their vehicle's automatic transmission shifts harshly into reverse from park but shifts normally into all forward gears. What is the most likely cause?

A. The reverse clutch piston seal has failed and is allowing rapid, uncushioned application of the reverse clutch pack without hydraulic dampening

B. The forward clutch accumulator is absorbing the pressure spike during forward gear engagement but no accumulator exists for the reverse circuit

C. The reverse clutch pack or band has worn friction material that grabs abruptly rather than applying progressively, causing the harsh engagement

D. The transmission mount has worn on the side that loads during reverse engagement, allowing the transmission to shift position and create the harsh feel

54. An AWD vehicle's rear differential has a whine that is audible at all speeds. The differential fluid is at the correct level and shows no signs of contamination. A fluid change does not resolve the noise. What is the most likely cause?

A. The rear differential pinion bearing preload is set too tight, causing the bearings to run under excessive load and produce a constant whine at all speeds

B. The rear axle shaft splines are worn and producing a whine as they rotate within the side gear splines under the constant load of the AWD system

C. The rear differential side bearings are worn and allowing the ring gear to shift position, altering the gear mesh pattern and producing a constant whine

D. The rear differential ring and pinion gear set is worn or has developed a pattern defect that produces noise proportional to the constant rotation speed

55. A concentric slave cylinder (CSC) is being replaced along with the clutch disc and pressure plate. What critical assembly step is unique to a CSC installation?

A. The CSC must be filled with fluid and pre-bled on the bench before installation because air trapped inside cannot be bled through conventional methods once installed

B. The CSC must be bolted to the pressure plate rather than the transmission front bearing retainer, which requires a different installation orientation than external cylinders

C. The CSC release bearing must be manually compressed and locked with a retaining clip before installation to prevent it from extending past the bell housing face

D. The CSC must be electrically connected to the BCM for position calibration before the transmission is bolted to the engine to establish the zero-travel reference point

56. A vehicle with a torque-on-demand AWD system (front-drive biased with an electronically controlled rear coupling) activates the rear wheels only under hard acceleration from a stop, and the engagement produces a noticeable jerk. Under normal driving, only the front wheels are driven. What is the most likely cause of the jerky engagement?

A. The electronic coupling's multi-plate clutch pack has worn friction material that causes it to grab abruptly rather than progressively engaging

B. The rear drive shaft universal joints are seized, preventing the smooth transfer of torque from the coupling to the rear differential during engagement

C. The rear differential has failed internally and is locking both rear wheels together rather than allowing speed differentiation during the AWD engagement

D. The AWD control module is receiving incorrect wheel speed data that causes it to delay engagement until significant front wheel slip has already occurred

57. A customer reports that the check engine light came on after having the tires rotated on their AWD vehicle. Two tires are original and two are recent replacements of the same brand and size but with full tread depth. What is the most likely cause?

- A. The tire rotation placed tires of significantly different tread depth on opposite axles, causing a speed differential that triggered an AWD system fault code
- B. The TPMS sensors were not relearned after the rotation and the TPMS fault triggered the check engine light through a shared warning circuit in the BCM
- C. The lug nut torque was not set correctly during the rotation and a loose wheel is producing vibration that the ECM is detecting as a crankshaft speed irregularity
- D. The tire rotation changed the vehicle's overall rolling circumference enough to trigger a speed sensor rationality fault between the wheel speed and transmission output

58. A manual transmission makes a growling noise in all forward gears that changes pitch with vehicle speed. The noise is not present in neutral with the clutch engaged. However, when the clutch pedal is depressed in neutral, the noise appears. What bearing is most likely worn?

- A. The countershaft (cluster gear) front bearing, which rotates whenever the input shaft is spinning regardless of which gear is selected or whether the clutch is engaged
- B. The output shaft rear bearing, which always rotates proportionally to vehicle speed and should produce noise in all gears but not in stationary neutral
- C. The input shaft bearing, which rotates with the engine whenever the clutch is engaged and stops when the clutch disengages in neutral position
- D. The reverse idler gear bearing, which is loaded by the countershaft rotation and produces noise proportional to the input shaft speed at all times

59. A vehicle's automatic transmission operates normally in all gears except overdrive. When the transmission attempts to shift into overdrive, the engine RPM flares and the shift does not complete. What is the most likely cause?

- A. The overdrive clutch pack or band has worn friction material or a leaking apply circuit that cannot hold under the load of overdrive gear engagement
- B. The overdrive solenoid is stuck in the off position and is not commanding the valve body to direct fluid to the overdrive apply circuit at the shift point

C. The torque converter clutch is engaging prematurely during the overdrive shift, creating a speed mismatch that the TCM interprets as a failed shift event

D. The vehicle speed sensor is reading higher than actual, causing the TCM to believe the vehicle is above the maximum overdrive engagement speed threshold

60. A heavy-duty pickup truck with a manual transmission has a clutch that engages smoothly but cannot transmit full engine torque under heavy load — the engine RPM rises while the vehicle speed does not increase proportionally during towing. What is the most likely cause?

A. The flywheel's friction surface has become glazed from repeated overheating during previous towing events, reducing the coefficient of friction between the disc and flywheel

B. The clutch disc friction material is worn to near minimum thickness or contaminated with oil, and can no longer generate enough friction force to transmit the engine's full torque output

C. The pressure plate diaphragm spring has overheated and lost its clamping tension, applying insufficient force to hold the clutch disc against the flywheel under heavy load

D. The transmission input shaft splines are worn and allowing the clutch disc hub to slip on the shaft under high torque, which feels identical to clutch slipping at the friction surfaces

61. A circuit contains two resistors wired in series: one at 3 ohms and one at 5 ohms, connected to a 12-volt source. What is the total circuit resistance and the current flowing through the circuit?

A. Total resistance is 1.88 ohms and the current is 6.4 amps, calculated using the parallel resistance formula for the two series resistors

B. Total resistance is 15 ohms and the current is 0.8 amps, calculated by multiplying the two resistance values and dividing voltage by the product

C. Total resistance is 8 ohms and the current is 1.5 amps, because series resistances add directly and current equals voltage divided by total resistance

D. Total resistance is 8 ohms and the current is 96 amps, calculated by multiplying the voltage by the total resistance using Watt's power formula

62. A technician is measuring voltage drop across the positive battery cable during starter cranking. The meter leads are placed on the battery positive post and on the starter solenoid B+ terminal. The reading shows 0.15 volts. What does this measurement indicate?

- A. The voltage drop is excessive and indicates high resistance in the positive battery cable or its terminal connections that must be repaired
- B. The starter solenoid internal contacts are burned and not passing full current, which is causing the voltage drop reading on the positive cable
- C. The positive battery cable has an internal break that is limiting current flow and producing the voltage drop reading detected by the meter
- D. The voltage drop is within the acceptable range for the positive battery cable circuit, indicating the cable and its connections are in good condition

63. A vehicle's horn does not work. The fuse is good. The technician applies 12 volts directly to the horn and it sounds normally. What does this confirm?

- A. The horn switch in the steering wheel is stuck in the open position and is not completing the circuit when the driver presses the horn button
- B. The horn itself and its ground connection are functional, and the fault is in the supply circuit — the horn relay, switch, clockspring, or wiring
- C. The clockspring has an open circuit in the horn wire that prevents the horn button signal from reaching the horn relay in the fuse box
- D. The horn relay has failed in the open position, preventing battery voltage from reaching the horn through the relay's normally open contacts

64. A vehicle has a charging system output of 14.6 volts with a conventional flooded battery. The same vehicle is now being fitted with an AGM battery for a start-stop system upgrade. What charging system adjustment may be required?

- A. The voltage regulator or charging system calibration may need to be updated because AGM batteries require a lower maximum charge voltage to prevent damage
- B. No adjustment is needed because AGM batteries accept the same charging voltage range as flooded batteries without any risk of damage or overcharge
- C. The alternator must be replaced with a higher-output unit because AGM batteries require significantly more current during the initial charge acceptance phase
- D. The charging wire from the alternator to the battery must be upgraded to a larger gauge because AGM batteries draw higher continuous current during charging

65. A technician is troubleshooting a tail lamp circuit. The right tail lamp works, but the left tail lamp does not illuminate. The bulb has been replaced with a known-good unit. The technician tests for voltage at the left tail lamp socket with the lights on and reads 12.2 volts on the supply wire. What should be tested next?

- A. The tail lamp relay, since the supply voltage confirms the fuse and switch are functional but the relay may have an intermittent internal contact fault
- B. The BCM tail lamp output driver, since the supply voltage is present but the BCM may be limiting current to the left tail lamp circuit specifically
- C. The ground circuit for the left tail lamp socket, since adequate supply voltage is present but a poor ground would prevent current from flowing through the bulb
- D. The headlamp switch, since the supply voltage reading may be phantom voltage from an adjacent circuit and the switch may not be sending true power output

66. An alternator is producing 14.4 volts at its output terminal, but the battery is consistently undercharged. A voltage drop test from the alternator B+ terminal to the battery positive terminal reads 2.1 volts while the alternator is under load. What is the problem?

- A. Excessive resistance in the charging circuit wire between the alternator and battery is consuming 2.1 volts, leaving only 12.3 volts to charge the battery
- B. The battery has a shorted cell that is absorbing the 2.1-volt difference internally and preventing the battery from reaching full charge potential

C. The alternator's internal voltage regulator is malfunctioning and is cycling the field current at an incorrect duty cycle that reduces effective output

D. The battery negative terminal has corrosion that is adding resistance to the return path and reducing the effective charging voltage by 2.1 volts

67. A vehicle's power window motor runs but the window does not move. There is a grinding noise from inside the door when the switch is pressed. What is the most likely cause?

A. The window motor's internal brushes have worn to the point where the motor produces torque but at insufficient force to lift the glass weight

B. The window glass has come off the regulator mounting bracket and the motor is driving the regulator mechanism without moving the glass

C. The window regulator cable or gear mechanism has failed, and the motor is spinning freely without engaging the mechanical drive to move the glass

D. The window channel guide has become obstructed with debris, and the motor is stalling against the obstruction while producing the grinding sound

68. A customer reports that the vehicle's battery goes dead after sitting for three days. A parasitic draw test shows 450 milliamps. The technician begins pulling fuses one at a time. When the fuse for the interior lights circuit is removed, the draw drops to 35 milliamps. What is the next step?

A. Replace the interior light fuse with a higher-amperage fuse to handle the current draw that the circuit is demanding during the key-off period

B. Investigate the individual components on the interior lights circuit to identify which specific component is drawing the excessive 415 milliamps

C. Replace the BCM, since it controls all interior lighting circuits and an internal fault in the BCM is the most likely cause of the excess draw on that fuse

D. Replace all interior light bulbs with LED equivalents, since the reduced current draw of LEDs will bring the total parasitic draw within acceptable limits

69. A vehicle's scan tool data shows that the A/C compressor is commanded on by the ECM, but the compressor clutch does not engage. The technician measures voltage at the compressor clutch connector and reads 0 volts with the A/C commanded on. Where is the most likely fault?

- A. The compressor clutch coil has an open circuit that prevents current flow even when voltage is applied by the relay and control circuit
- B. The A/C system is low on refrigerant and the low-pressure cutoff switch has opened the compressor clutch circuit to protect the compressor
- C. The compressor clutch relay, its control circuit, or the wiring between the relay and the compressor connector has a fault preventing voltage delivery
- D. The compressor clutch air gap has widened beyond the specification and the magnetic field cannot pull the clutch plate against the pulley from that distance

70. A vehicle's headlamps produce a visible flicker at idle that disappears at higher engine RPM. No other electrical symptoms are present. What is the most likely cause?

- A. The headlamp bulbs are nearing the end of their service life and the filaments are developing a resonant frequency vibration at idle engine speed
- B. The battery has a weak cell that cannot absorb the alternator's output ripple at idle, allowing the ripple to modulate the headlamp voltage visibly
- C. The headlamp ground connection has high resistance that creates a varying voltage drop at the different current levels produced by idle speed charging
- D. The alternator has a failing diode that produces excessive AC ripple, which is more pronounced at idle when the alternator output is lowest

71. A vehicle's HVAC system delivers air only from the defrost vents regardless of which mode is selected on the control panel. Floor, panel, and bi-level modes are not available. What is the most likely cause?

- A. The blower motor speed controller has failed and is directing airflow only through the defrost ductwork as a default operating condition
- B. The mode door actuator has failed or the mode door is stuck in the defrost position, and cannot move to redirect air to other outlet positions
- C. The HVAC control module has lost communication with the BCM and is defaulting to defrost mode as a safety measure for windshield visibility
- D. The cabin air filter is severely restricted, causing high backpressure that forces all airflow through the defrost vents which offer the least resistance

72. A vehicle with automatic climate control has a poor cooling complaint. The compressor engages and the high-side pressure is normal, but the low-side pressure reads unusually high at 345 kPa (50 psi). Normal low-side is 175–250 kPa (25–35 psi). What is the most likely cause?

- A. The compressor's internal valves have failed and it is not effectively compressing refrigerant from the low side to the high side of the system
- B. The system is overcharged with refrigerant, and the excess liquid refrigerant in the evaporator cannot evaporate efficiently, raising low-side pressure
- C. The condenser fan is running at maximum speed continuously, overcooling the condenser and driving excess liquid to the evaporator too quickly
- D. The orifice tube or TXV is stuck open, allowing excessive unrestricted refrigerant flow into the evaporator and failing to create the necessary pressure drop

73. What type of DVOM test setting is used to check for voltage present in a circuit when the circuit is energized and the meter is connected in parallel?

- A. The ohms (resistance) setting, which measures the opposition to current flow in the circuit when the meter is placed across the component
- B. The amps (current) setting, which measures the flow of electrons through the circuit when the meter is inserted in series with the load

C. The continuity setting, which sends a small test current through the circuit and confirms the path is complete by producing an audible tone

D. The DC volts setting, which measures the electrical potential difference between the two points where the meter leads are connected

74. A vehicle's electric cooling fans do not activate at all. The coolant temperature on the scan tool shows 108°C. The fan relay has been tested and works when 12 volts is applied directly to the relay coil terminals. What should be checked next?

A. The coolant temperature sensor for an inaccurate reading that may be falsely showing 108°C while the actual temperature is below the fan activation threshold

B. The fan motors for seized bearings or open windings that would prevent them from running even when the relay provides power to the motor circuit

C. The ECM's fan relay control output circuit to verify the ECM is commanding the relay coil with a ground signal at the current high coolant temperature

D. The radiator cap for a stuck-open pressure relief that is allowing coolant to boil at a lower temperature and falsely reading as overheat on the scan tool

75. A customer reports an intermittent burning smell from under the hood. The technician finds that a section of wiring harness near the exhaust manifold has melted insulation exposing several bare copper conductors. What is the primary risk?

A. The exposed conductors will gradually corrode from exhaust heat and moisture, leading to increased circuit resistance and eventual open circuits in those wires

B. The exposed conductors can short to each other or to ground, causing blown fuses, damaged modules, electrical fires, or loss of critical circuit functions

C. The melted insulation will release toxic fumes into the cabin through the HVAC fresh air intake, creating a health hazard for the vehicle occupants

D. The exposed copper will create electromagnetic interference that disrupts the CAN bus communication for modules with wiring routed through that section

76. A vehicle with R-134a air conditioning has just had the system evacuated and recharged. The specified charge weight is 680 grams. The technician charged the system by weight using a refrigerant scale. What would happen if the system were accidentally overcharged to 900 grams?

- A. The compressor would cycle off immediately upon starting due to the high-pressure cutoff switch activating from the excessive head pressure
- B. The evaporator would freeze and block all airflow through the HVAC case, causing the blower motor to overheat from the increased backpressure
- C. The cabin cooling would actually improve significantly because more refrigerant means greater heat absorption capacity in the evaporator core
- D. Both high-side and low-side pressures would rise above normal, the compressor head pressure would increase, and cooling efficiency would decrease

77. A vehicle has an A/C system with a thermostatic expansion valve (TXV). The system is fully charged and the compressor is running, but the cooling output is very poor. The suction line from the evaporator to the compressor is warm to the touch instead of cold. What does this indicate?

- A. The TXV is stuck closed or severely restricted, starving the evaporator of refrigerant so no heat absorption occurs and the suction line remains warm
- B. The TXV is stuck wide open, flooding the evaporator with excessive refrigerant that cannot fully evaporate and exits as cold liquid rather than warm gas
- C. The compressor has failed internally and is not generating suction at the evaporator inlet, allowing the refrigerant to stagnate and warm in the suction line
- D. The evaporator core is completely blocked with debris, preventing airflow across the fins and eliminating the heat source that the refrigerant needs to absorb

78. A customer complains of a musty odor from the air vents that is most noticeable when the A/C is first turned on. What is the most likely cause and the appropriate service?

- A. A refrigerant leak at the evaporator that produces a chemical odor similar to mildew, requiring a leak repair and system recharge to resolve the smell
- B. A failed cabin air filter that has saturated with fuel vapors from the engine bay and is releasing the odor when air is pushed through the HVAC intake
- C. Mold and mildew growth on the evaporator surface from residual moisture, which can be treated with an HVAC antimicrobial cleaner and evaporator cleaning
- D. Deteriorating foam insulation inside the HVAC case that is breaking down from age and temperature cycling and releasing organic decomposition odors

79. A vehicle's daytime running lamps (DRLs) do not illuminate. The headlamps function correctly on both low and high beam when manually switched on. What should be checked first?

- A. The DRL control module or the DRL function within the BCM, including its inputs (ambient light sensor, ignition state, parking brake) for proper DRL activation logic
- B. The DRL bulbs for burned-out filaments, since DRLs typically use the same bulb as the headlamps but at a reduced voltage that may not illuminate a failed filament
- C. The headlamp switch for a fault in the auto-headlamp position, since DRLs are typically controlled through the automatic headlamp circuit on modern vehicles
- D. The alternator output for reduced voltage that may be below the threshold required to illuminate the DRL circuit while providing adequate voltage for full headlamp operation

80. A vehicle's battery is three years old and tests "Good" on a conductance tester. The battery is fully charged. However, the customer reports the vehicle occasionally cranks slowly on cold mornings, and the slow cranking has been getting worse over the past winter. What is the most likely explanation?

- A. The conductance tester is giving a false "Good" result because the battery's internal temperature during testing is warmer than cold-morning conditions
- B. The battery's cold cranking amp rating is adequate for the vehicle but marginally so, and the rating decreases with age even though the tester reads "Good"

C. The slow cranking is not battery-related — it is caused by increased engine oil viscosity in cold temperatures that requires more cranking current than normal

D. The starter motor is developing high internal resistance from worn brushes that increases current demand, which the aging battery cannot fully supply in cold conditions

81. What safety feature do modern LED headlamp assemblies often have that differs from replaceable halogen bulb headlamp assemblies?

A. LED assemblies include an internal cooling fan or heat sink to manage the thermal output of the LED chips and prevent premature LED degradation

B. LED assemblies use a higher voltage supply (24V) that requires a dedicated DC-DC boost converter integrated into the headlamp assembly housing

C. LED assemblies incorporate an automatic beam pattern adjustment motor that continuously varies the beam angle based on vehicle speed and road conditions

D. LED assemblies include an integrated ADAS camera in the headlamp housing that shares the optical path with the LED light output elements for lane detection

82. A vehicle's rear window defroster works on one half of the rear window but not the other. What is the most likely cause?

A. The rear window defroster relay has a partial internal failure that is only energizing half of the dual-circuit defroster grid design used on some vehicles

B. The vehicle's BCM is limiting defroster current to reduce alternator load, resulting in only half the grid elements receiving sufficient current to produce heat

C. One or more grid lines in the non-functioning area are broken, interrupting the current path through those specific heating elements on that portion of the glass

D. The rear window glass has a manufacturing defect that created an area of higher resistance in the grid that prevents adequate current flow through that section

83. A technician performs an ADAS calibration on a forward-facing camera after a windshield replacement. The static calibration fails repeatedly. The target is positioned at the manufacturer-specified distance and height. What should be verified?

A. The floor is level, the vehicle's tire pressures are at specification, the vehicle is unloaded, and no reflective objects or visual clutter are within the camera's field of view

B. The replacement windshield has the correct acoustic interlayer and UV coating specified by the manufacturer for ADAS camera optical compatibility

C. The vehicle's battery is above 12.6 volts, since low battery voltage can cause the ADAS module to abort the calibration routine to protect memory integrity

D. The ADAS camera hardware is the same part number as the original, since different camera versions have different calibration targets and fixture requirements

84. A vehicle has a steering pull to the right. Alignment angles are within specification. Tire pressures are correct and tires are the same brand, size, and tread depth. Swapping the front tires left to right causes the pull to switch to the left side. What does this indicate?

A. The right front wheel bearing is worn and introducing a camber-like effect that mimics an alignment pull toward the right side during driving

B. One of the front tires has an internal construction defect (ply steer or belt shift) that creates a directional pull regardless of the alignment settings

C. The right front brake caliper is dragging slightly and creating an asymmetric braking force that feels like a steering pull toward the right side

D. The steering rack has internal wear that creates an off-center bias when the rack is loaded, which reverses when the tire swap changes the loading direction

85. A customer reports that the steering wheel vibrates only during braking from highway speed. The vibration is not present during normal driving. What is the most likely cause and what measurement confirms it?

- A. Worn front struts that allow the suspension to oscillate during the weight transfer of braking, confirmed by a bounce test showing more than two oscillations
- B. Front brake rotor thickness variation that causes uneven braking force as the rotor rotates past the pads, confirmed by measuring DTV with a micrometer at multiple points
- C. An unbalanced front wheel that resonates at the specific deceleration rate of highway braking, confirmed by a dynamic wheel balance measurement on a balancer
- D. Worn front wheel bearings that develop play under the axial loading of braking forces, confirmed by checking for play at the 12 and 6 o'clock positions with the wheel elevated

86. A power steering fluid reservoir is consistently low despite no visible leaks on the ground or on any external components. Where should the technician look for a hidden leak source?

- A. The engine oil pan, since some vehicles route the power steering cooler lines through the oil pan gasket area where leaks can mix with the engine oil
- B. The transmission bell housing, since the power steering pump shares a seal with the torque converter housing on some front-wheel-drive transaxle designs
- C. The power steering gear or rack bellows boots, since a leaking rack seal can fill the bellows with fluid without any external drip reaching the ground
- D. The brake master cylinder reservoir, since some vehicles share a common fluid supply between the power steering and the brake system hydraulic circuits

87. A vehicle's front suspension has a pronounced clunking noise when driving over bumps. The technician suspects a worn ball joint. On this vehicle, the lower ball joint carries the suspension load (spring on the lower control arm). What is the correct inspection method?

- A. With the vehicle on a lift and wheels hanging free, grasp the tire at 3 and 9 o'clock and rock it to check for lateral movement that indicates ball joint wear
- B. With the vehicle on a lift and wheels hanging free, grasp the tire at 12 and 6 o'clock and rock it to check for vertical movement in the loaded ball joint

C. Place a jack under the lower control arm to unload the ball joint, then check for play by prying between the control arm and knuckle or rocking the wheel at 12 and 6 o'clock

D. Place a jack under the frame to fully compress the suspension, then check for play by rocking the wheel at 12 and 6 o'clock while the joint is under maximum load

88. During a four-wheel alignment, the technician finds that the rear toe on the left rear wheel is significantly out of specification (toe-out). The vehicle has an independent rear suspension. What symptom would this condition produce?

A. Accelerated feathered-edge tire wear on the left rear tire, a thrust angle deviation, and the steering wheel may be off-center during straight-line driving

B. The vehicle will pull to the left during braking because the rear toe misalignment creates an asymmetric braking force distribution front-to-rear

C. The ABS system will activate prematurely during straight-line braking because the left rear wheel will decelerate at a different rate than the right rear

D. The vehicle will oversteer in left turns because the left rear toe-out reduces the cornering force available from the left rear tire during left-hand turning

89. A vehicle with electronic stability control has the ESC activate during normal straight-line driving on a flat, dry road. The ESC light flashes intermittently. What is the most likely cause?

A. The ESC control module has a software fault that has lowered its activation threshold below the normal range, causing false intervention during regular driving

B. The front and rear tires are different sizes, creating a constant speed differential that the ESC interprets as wheel spin or loss of traction during normal driving

C. The ESC system is functioning correctly and the road surface has a micro-texture variation that is causing intermittent traction loss undetectable by the driver

D. A faulty wheel speed sensor, yaw rate sensor, or steering angle sensor is providing incorrect data that causes the ESC to perceive instability where none exists

90. A vehicle's brake pedal feels spongy and has excessive travel before the brakes engage. The brake fluid level is full, there are no visible leaks, and the brake pads and rotors are within specification. What is the most likely cause?

A. Worn brake pad friction material that has reached the minimum thickness, requiring the caliper pistons to travel further before the pads contact the rotors

B. A faulty brake booster that is providing too much assist, causing the pedal to feel soft because the driver's effort is amplified beyond the normal range

C. Air trapped in the hydraulic brake system that compresses under pedal pressure instead of transmitting the force directly to the caliper pistons

D. Glazed brake pads that have a reduced coefficient of friction and require more pedal pressure to achieve the same braking force as non-glazed pads

91. A front-wheel-drive vehicle has a vibration that occurs only during hard acceleration from a stop and disappears at steady cruising speed. The vibration is felt through the steering wheel. What is the most likely cause?

A. A worn or binding inner CV joint (tripod joint) that cannot accommodate the plunge and angle changes required during hard acceleration launch torque loading

B. A worn engine mount that allows the engine to shift position under high torque, transmitting the vibration through the subframe to the steering column

C. An out-of-balance front tire that produces vibration at the specific wheel speed reached during hard acceleration but not at steady cruising RPM conditions

D. A worn front wheel bearing that is loaded by the combined acceleration and cornering forces during launch and unloaded during steady-state cruising operation

92. A vehicle's TPMS warning light is on and the display shows all four tires at the correct pressure. What does this indicate?

- A. The TPMS system has a fault unrelated to tire pressure — likely a failed sensor battery, a sensor communication fault, or a module error
- B. The TPMS system has detected a slow leak in one tire that has not yet dropped below the warning threshold but is losing pressure at an abnormal rate
- C. The ambient temperature has dropped, causing the TPMS module to recalculate expected pressures and flag a warning despite actual pressures being correct
- D. The tire rotation interval has been exceeded, and the TPMS module is reminding the driver that tire rotation is due based on the distance-driven counter

93. A rear drum brake has a pull to the left during braking. The left rear brake shoes have significantly more friction material remaining than the right rear shoes. What does this indicate?

- A. The left rear brake is applying normally while the right rear is not applying with equal force, causing the vehicle to pull toward the side that is braking harder
- B. The left rear brake is applying with excessive force because the wheel cylinder is stuck extended, pulling the vehicle toward the overbraking left side
- C. The right rear brake shoes are worn more because they are applying correctly while the left rear shoes are not applying fully, causing a pull toward the functional right side
- D. The left rear drum is out-of-round, creating a periodic variation in braking force that pulls the vehicle intermittently toward the left side during brake application

94. A tire pressure placard on the door jamb specifies 240 kPa (35 psi) for all four tires. The tire sidewall shows "Max Press 350 kPa (51 psi)." A customer asks if they should inflate to the sidewall maximum for better fuel economy. What is the correct advice?

- A. Inflating above the placard pressure improves fuel economy without any drawbacks and should be recommended to all customers seeking better mileage
- B. The placard pressure is a minimum recommendation and inflating halfway between the placard and the sidewall maximum provides the best balance

C. The sidewall pressure is for specialized applications such as heavy loading and the placard pressure should always be used for normal driving conditions

D. The placard pressure is the vehicle manufacturer's recommended pressure for optimal ride, handling, traction, and tire wear — not the tire's maximum pressure

95. A vehicle has a worn front strut mount bearing on the left side. What symptoms does this produce?

A. A vibration felt through the steering wheel at highway speed that disappears during braking due to the weight transfer unloading the worn bearing

B. A clunking or popping noise when turning the steering wheel, especially at low speed, and possibly a binding sensation in the steering during parking maneuvers

C. An intermittent pull to the left during highway driving that corrects itself when the steering wheel is released and allowed to self-center from caster return

D. A persistent squeal from the left front wheel area during straight-line driving that changes pitch with vehicle speed but not with steering input

96. What does the thrust angle being outside specification indicate on a vehicle with a non-adjustable rear axle?

A. The rear axle is misaligned relative to the vehicle centerline due to shifted leaf spring mounts, a bent axle housing, or body/frame damage

B. The front toe settings are incorrect and need to be readjusted to compensate for the thrust angle deviation measured at the rear of the vehicle

C. The steering gear is mounted off-center on the subframe and needs to be shimmed to correct the thrust line deviation at the rear axle position

D. The front caster angles are unequal and are creating a pull that the alignment machine is misinterpreting as a rear thrust angle deviation reading

97. A vehicle's anti-lock braking system activates at very low speed (below 10 km/h) during normal braking on dry pavement. This low-speed activation was not present previously. What is the most likely cause?

A. The brake pads have been recently replaced with a higher-friction compound that provides more braking force and triggers ABS activation at lower threshold speeds

B. The ABS module's software has been corrupted by a voltage spike, lowering the lockup detection threshold and causing premature activation at low speed

C. The tires have been recently replaced with a different brand that has a higher coefficient of friction than the original tires specified for the ABS calibration

D. A wheel speed sensor is producing an erratic or dropout signal at low speed that the ABS module interprets as incipient wheel lockup, triggering intervention

98. During an inspection, a technician finds that the inner edges of both front tires show smooth, even wear while the outer edges have full tread remaining. What alignment angle is most likely the cause?

A. Excessive positive caster on both front wheels that is concentrating braking forces on the inner edge of the tire contact patch during normal deceleration

B. Excessive toe-out that is dragging both tires outward across the road surface and producing a feathered wear pattern on the inner tread edges of both tires

C. Excessive negative camber on both front wheels that tilts the top of each wheel inward, concentrating the vehicle's weight on the inner edge of each tire's contact patch

D. Insufficient steering axis inclination that allows the front wheels to rock inward under load, creating a dynamic negative camber effect during driving

99. A vehicle's brake warning light and ABS light are both illuminated simultaneously. What does the combined illumination of both lights typically indicate?

A. A minor ABS sensor fault that triggers both lights as a precautionary measure even though both the standard brakes and the ABS system remain fully functional

- B. A fault in the ABS system that is serious enough to disable ABS and also affects the standard brake system — typically a hydraulic control unit or shared circuit fault
- C. Two completely independent faults — one in the ABS system and one in the standard brake system — that have coincidentally occurred at the same time
- D. A wheel speed sensor calibration error that requires a scan tool reset to clear both lights and restore normal ABS and standard brake system operation

100. A serviceable (adjustable) front wheel bearing has been repacked with fresh grease and is being adjusted on the spindle. The technician tightens the spindle nut while rotating the wheel, then loosens the nut. Why is the wheel rotated during the tightening step?

- A. Rotating the wheel while tightening seats the bearing rollers against their races and distributes the fresh grease evenly throughout the bearing assembly
- B. Rotating the wheel during tightening generates heat that helps the grease penetrate the bearing surfaces and create a protective film on the race contact areas
- C. Rotating the wheel creates centrifugal force that expels any trapped air bubbles from between the bearing rollers and ensures full contact across the race surface
- D. Rotating the wheel during tightening allows the technician to feel for bearing roughness that would indicate the need for bearing replacement before final adjustment

101. A vehicle equipped with electronic brake force distribution (EBD) has a dashboard warning indicating an EBD malfunction. What does EBD normally control?

- A. The ratio of regenerative braking to friction braking on hybrid vehicles to maximize energy recovery while maintaining brake pedal feel consistency
- B. The activation threshold and intervention intensity of the electronic stability control system during cornering and evasive maneuver situations
- C. The timing of the ABS pump motor activation relative to the wheel speed sensor inputs to optimize the ABS pressure modulation cycle frequency

D. The distribution of braking force between the front and rear axles based on vehicle loading, deceleration rate, and dynamic weight transfer conditions

102. A vehicle's right front brake caliper is found to have a seized slide pin. What symptom does a seized caliper slide pin produce?

A. The brake pedal pulsates during braking because the stuck pin prevents the caliper from following the rotor's slight runout and creates uneven pad contact

B. The rear brakes compensate for the reduced front braking by applying with greater force, causing premature rear brake pad wear and rear brake noise

C. The brake pad on the seized side wears unevenly — one pad wears significantly faster than the other because the caliper cannot float to equalize pad pressure

D. The parking brake does not hold on the affected corner because the caliper slide pin also controls the parking brake cable linkage on disc brake parking systems

103. A technician is measuring brake rotor thickness on a vehicle with a brake pulsation complaint. The micrometer readings at eight equally spaced points around the rotor are: 25.02, 25.03, 25.01, 25.02, 25.03, 24.99, 25.02, 25.01 mm. The minimum thickness specification is 24.50 mm and the maximum allowable thickness variation is 0.013 mm. What is the diagnosis?

A. The rotor is below minimum thickness and must be replaced because the thinnest reading of 24.99 mm is approaching the minimum specification too closely

B. The rotor is at minimum thickness and cannot be machined because any material removal would take it below the 24.50 mm discard specification

C. The readings are all above minimum thickness, but the thickness variation is 0.04 mm, which exceeds the 0.013 mm maximum, confirming the rotor is causing the pulsation

D. The rotor is within all specifications since the thickness variation is less than 0.05 mm and the readings are all above minimum thickness, so the rotor is not the pulsation source

104. A vehicle has a vibration at 100 km/h that is felt through the steering wheel. Balancing the front wheels does not resolve the vibration. What should be checked next?

- A. The front brake rotors for excessive lateral runout that produces a vibration at the rotational frequency corresponding to 100 km/h without brake application
- B. The rear tires for balance and runout, since rear tire imbalance can transmit through the vehicle structure and be felt in the steering wheel on some vehicles
- C. The exhaust system for a contact point with the vehicle body that resonates at the specific frequency produced by the engine RPM at 100 km/h in the current gear
- D. The transmission for a torque converter imbalance that produces a vibration at the specific output shaft speed corresponding to 100 km/h vehicle speed

105. A tire has a nail puncture in the center of the tread. The tire is otherwise in good condition with 7/32" of tread remaining. The tire has no previous repairs. Can this tire be safely repaired?

- A. No — any tire puncture requires complete tire replacement regardless of the puncture location, size, or the amount of tread remaining on the tire
- B. No — the tire must be replaced because the nail has damaged the steel belts beneath the tread and the structural integrity cannot be restored by a plug or patch
- C. Yes — but only with an external plug that is installed from the outside of the tire without dismounting it, as internal patches weaken the tire carcass from inside
- D. Yes — a puncture in the repairable area of the tread can be properly repaired using an internal patch-plug combination after inspecting the interior for damage

106. An electric power steering system has a DTC for a torque sensor fault. What symptom does this fault typically produce?

- A. The steering feels normal but the EPS warning light illuminates, and the system continues to provide full assist despite the stored fault code

- B. The steering becomes locked in the straight-ahead position, preventing the driver from turning the wheel in either direction until the sensor is replaced
- C. The EPS system disables power assist entirely as a safety measure because it cannot determine the driver's steering intent without a valid torque sensor signal
- D. The steering provides assist in one direction only, with the other direction receiving no assist because the torque sensor can only detect input in one rotational direction

107. A deployed driver's side airbag must be removed from a vehicle that is being repaired after a collision. The SRS system has been properly disarmed. How should the deployed module be handled and stored?

- A. The deployed module can be handled and stored without the same precautions as an undeployed module, since it has already fired and contains no remaining pyrotechnic charge
- B. The deployed module must be stored in a sealed metal container for a minimum of 24 hours to allow any residual chemical compounds from the deployment to fully dissipate
- C. The deployed module must be returned to the manufacturer in its original packaging for recycling, and the technician must document the deployment event serial number
- D. The deployed module must be treated as hazardous waste and disposed of according to the manufacturer's and local jurisdiction's specific disposal procedures

108. A vehicle's interior door panel must be removed to access the power window regulator behind it. What is the correct approach to prevent damage during removal?

- A. Use a metal pry bar to lever the panel away from the door frame starting from the top edge where the clips are strongest and least likely to break
- B. Use non-marring plastic trim tools to release the retaining clips progressively, starting from the correct edge and working around the panel systematically
- C. Pull the panel directly outward with both hands using firm, even force to release all retaining clips simultaneously and prevent any individual clip from breaking

D. Use a heat gun to soften the adhesive retaining the panel to the door frame before attempting to pry the panel away from the metal door surface

109. A vehicle's occupant classification sensor (OCS) in the front passenger seat has a fault code. The passenger airbag OFF indicator is illuminated on the dashboard. What does this mean?

A. The passenger frontal airbag has been permanently disabled by the dealer due to a recall and cannot be reactivated until the recall repair is completed

B. The front passenger seat heater element has overheated and the system has disabled the airbag as a precaution against the seat sensor being damaged by heat

C. The system cannot determine the passenger's size or weight, so the passenger frontal airbag may be disabled or set to a reduced deployment force as a safety measure

D. The front passenger seat is detected as unoccupied and the airbag has been disabled to conserve the SRS backup capacitor energy for the driver's side deployment

110. A technician is replacing a door mirror assembly that includes a heated mirror element and an integrated turn signal repeater lamp. What must be disconnected before removing the mirror?

A. The vehicle's negative battery cable must be disconnected and the SRS capacitor discharge time must be observed because the mirror is near the side curtain airbag

B. The mirror's electrical connector inside the door must be disconnected before the mirror is unbolted from the door to prevent pulling and damaging the wiring harness

C. The BCM must be placed in service mode using the scan tool to prevent false fault codes from being stored when the mirror circuits are interrupted during removal

D. The mirror's electrical connector at the mirror base must be unplugged from the outside of the vehicle before removing the three mirror mounting bolts through the door panel

111. A vehicle's laminated windshield has a small stone chip in the driver's line of sight. The chip does not extend through to the inner layer. What is the correct service recommendation?

- A. Repair the chip with a windshield repair resin to prevent it from spreading into a crack, and verify ADAS recalibration is not required for a repair-only service
- B. Replace the windshield immediately because any damage in the driver's direct line of sight is an automatic replacement regardless of chip size or resin repairability
- C. Apply clear adhesive tape over the chip as a temporary seal and schedule a replacement at the customer's convenience within the next six months of driving use
- D. Leave the chip unrepaired since laminated glass is designed to resist spreading and the PVB interlayer will prevent the chip from becoming a structural concern

112. After a battery replacement on a vehicle with a power liftgate, the liftgate operates but the auto-close feature closes the liftgate with excessive force and does not stop when an obstruction is placed in its path. What is the most likely cause?

- A. The liftgate motor has been damaged by a voltage spike during the battery replacement and is now operating at a higher speed than its normal calibration allows
- B. The power liftgate anti-pinch feature has lost its learned position data due to the battery disconnection and requires an initialization procedure to relearn the travel endpoints
- C. The liftgate latch mechanism has been knocked out of alignment during the battery replacement and is creating excessive resistance that overrides the anti-pinch detection
- D. The BCM has lost its liftgate configuration settings and must be reprogrammed with the vehicle-specific software to restore the auto-close force limitation parameters

113. What is the purpose of the child safety lock feature on the rear doors of a vehicle?

- A. It prevents the rear windows from being opened by rear seat passengers, ensuring children cannot extend their arms outside the vehicle during driving
- B. It activates a speed-sensitive automatic locking feature that locks the rear doors when the vehicle exceeds 15 km/h, preventing children from opening them while moving
- C. It disables the rear door interior handle so the door can only be opened from the outside, preventing a child from opening the door while the vehicle is in motion

D. It limits the rear door opening angle to 45 degrees to prevent the door from contacting vehicles in adjacent parking spaces when children push the door open

114. An automatic headlamp system does not turn on the headlamps at dusk when ambient light decreases. The headlamps work correctly when manually switched on. What should be checked?

A. The alternator output voltage, since reduced charging voltage may prevent the automatic headlamp module from detecting the transition from daylight to darkness

B. The headlamp bulbs for a mismatch in wattage that confuses the automatic module's feedback circuit and prevents it from confirming that the lamps have illuminated

C. The headlamp switch position to verify it is set to the "AUTO" position, and the ambient light sensor on the dashboard for contamination, obstruction, or a fault

D. The BCM for a software update that may have changed the automatic headlamp activation threshold, requiring a dealer-level recalibration of the light sensor sensitivity

115. A vehicle has a persistent condensation problem inside the headlamp housing, causing moisture to collect on the inner lens surface. What is the most likely cause?

A. A cracked or improperly sealed headlamp housing that allows moist air to enter, where it condenses on the cooler inner lens surface during temperature changes

B. The headlamp bulb is the wrong wattage, generating excessive heat that creates a thermal differential between the housing and the lens causing internal condensation

C. The vehicle is being driven primarily in humid conditions and the condensation is a normal occurrence that will clear once the headlamps are operated for an extended period

D. The headlamp electrical connector has a moisture seal that has been omitted during a previous service, allowing water to enter the housing through the wiring pass-through

116. A vehicle's exterior body side moulding has pulled away from the door panel at one end. The moulding is held in place by adhesive tape. What is the correct repair method?

- A. Apply cyanoacrylate (super glue) to the moulding and press it firmly against the door panel for thirty seconds until the adhesive sets and the moulding is secured
- B. Push the moulding back against the door panel and secure it with sheet metal screws drilled through the moulding into the door skin at six-inch intervals along its length
- C. Clean both the moulding and the door panel surface, apply new automotive-grade double-sided adhesive tape, and press the moulding firmly into position for a secure bond
- D. Leave the moulding detached until the next body shop visit since the adhesive has reached the end of its service life and the entire moulding must be replaced with a new unit

117. A hybrid vehicle owner reports that the engine starts and runs frequently during short city trips, even though the battery state of charge indicates 70%. On previous trips with similar SOC, the vehicle operated in EV mode for longer periods. What has changed?

- A. The HV battery has developed internal resistance from cell degradation, causing the BMS to rely on the engine earlier despite the displayed SOC reading
- B. The vehicle is in a cold climate condition that reduces battery performance, causing the system to rely more on the engine for both propulsion and cabin heating
- C. The vehicle's adaptive driving algorithm has learned the driver's aggressive acceleration habits and proactively starts the engine to prevent excessive battery discharge
- D. The HV battery cooling system has a fault that is causing the BMS to limit electric-only driving to prevent overheating, even at moderate ambient temperatures

118. A battery electric vehicle displays a "High Voltage System Fault — Service Required" warning and limits speed to 30 km/h. What should the technician do before connecting the scan tool?

- A. Attempt to reproduce the fault by driving the vehicle normally to determine if the warning is intermittent or caused by a specific operating condition
- B. Disconnect the 12-volt auxiliary battery and remove the HV service disconnect to de-energize the system before connecting any diagnostic equipment

C. Connect the scan tool and read DTCs immediately since the system is still partially operational and the fault may clear if the vehicle is powered down first

D. Verify that appropriate HV safety equipment is available, don insulating gloves, and connect the scan tool through the OBD II DLC without de-energizing the system

119. What is the primary advantage of a heat pump system for cabin heating in a battery electric vehicle compared to a resistive PTC heater?

A. A heat pump transfers heat from the outside air into the cabin using the refrigerant cycle, requiring significantly less electrical energy than a resistive heater for the same heat output

B. A heat pump operates instantly at full capacity from startup, while a resistive heater requires several minutes to reach its operating temperature and begin producing useful heat

C. A heat pump is mechanically simpler than a resistive heater because it uses only the existing coolant circuit without requiring any additional refrigerant plumbing or components

D. A heat pump produces dry heat that prevents windshield fogging, while a resistive heater produces humid heat that increases cabin moisture and requires frequent defrosting

120. A hybrid vehicle's regenerative braking warning message indicates "Regenerative Braking Limited." The HV battery SOC is at 95%. What is the most likely reason for the limitation?

A. The regenerative braking motor has overheated from extended downhill driving and the BMS has limited regeneration to protect the motor windings from thermal damage

B. The friction brake pads are below minimum thickness and the system has disabled regeneration to force the driver to use the friction brakes for pad wear equalization

C. The HV battery is nearly full and cannot accept additional charging energy from regeneration without risking overcharge, so the BMS limits the regenerative braking current

D. The ABS system has detected a wheel speed sensor fault and has disabled regenerative braking to prevent uneven braking force distribution between the driven and non-driven wheels

121. A technician needs to service a high-voltage orange cable connector on a hybrid vehicle. The HV system has been fully de-energized following the manufacturer's procedure and zero voltage has been verified. What additional precaution applies when disconnecting HV connectors?

- A. The connector must be cooled with compressed air before handling because the high current flow through the connector generates residual heat that causes thermal burns
- B. HV connectors have specific locking mechanisms and interlock circuits that must be released in the correct sequence to avoid damaging the connector or triggering false DTCs
- C. The connector must be wrapped in aluminum foil after disconnection to prevent static electricity from building on the exposed terminals during the service period
- D. The technician must ground themselves to the vehicle chassis using a grounding strap before touching the connector to prevent electrostatic discharge damage to the HV components

122. What is the significance of the insulation resistance test performed on a hybrid or electric vehicle's high-voltage system?

- A. It measures the resistance of the HV cable insulation material itself to determine if the cable jacket has degraded from heat exposure and requires preventive replacement
- B. It measures the voltage drop across the HV cable length to determine if the cable's copper conductors have corroded and need replacement due to increased resistance
- C. It measures the capacitance between the HV cables and the vehicle chassis to determine if electromagnetic interference is being generated by the HV system components
- D. It measures the resistance between the HV circuit and the vehicle chassis to verify that no current leakage path exists that could create a shock hazard for occupants or technicians

123. A plug-in hybrid vehicle charges normally from a Level 2 home charging station but fails to charge from a public DC fast charger. No fault codes are stored. What is the most likely explanation?

- A. The vehicle is not equipped with a DC fast charging inlet or capability — many plug-in hybrids support only Level 1 and Level 2 AC charging and do not have DC fast charge hardware

- B. The public DC fast charger is incompatible with all plug-in hybrid vehicles and can only charge battery electric vehicles with larger battery packs and higher voltage systems
- C. The vehicle's onboard charger has a fault that prevents it from accepting the higher voltage of DC fast charging while still functioning normally at the lower Level 2 AC voltage
- D. The vehicle's BMS is preventing DC fast charging because the ambient temperature is above the maximum threshold for high-speed charging, and the system is protecting the battery

124. A battery electric vehicle has reduced driving range and the scan tool shows that the maximum pack capacity has dropped from the original 64 kWh to 56 kWh. The vehicle has 120,000 km on the odometer. What does this indicate?

- A. A single failed cell module within the pack that has dropped its voltage to zero and is no longer contributing its energy to the total pack capacity measurement
- B. A cooling system fault that has allowed the battery to operate at elevated temperatures, accelerating chemical degradation and permanently reducing cell capacity
- C. A BMS calibration error that is underreporting the actual pack capacity and can be corrected by performing a BMS reset and full charge-discharge calibration cycle
- D. Normal battery aging and degradation from charge-discharge cycling over 120,000 km that has gradually and permanently reduced the total energy storage capacity of the pack

125. During a routine service on a battery electric vehicle, the technician needs to rotate the tires. The vehicle does not require HV de-energization for this procedure. What BEV-specific consideration applies to the tire rotation?

- A. The tires must be rotated in the opposite pattern from a conventional vehicle because the regenerative braking system reverses the normal tire wear distribution pattern
- B. The tire pressure must be set to a BEV-specific pressure that differs from the door jamb placard because the heavier battery pack weight requires higher inflation pressures
- C. The TPMS must be relearned after rotation, and the wheel torque specification may be higher than a comparable conventional vehicle due to the increased vehicle weight from the battery

D. The tire rotation interval on a BEV is double that of a conventional vehicle because regenerative braking reduces tire wear by half compared to friction-brake-only deceleration

Practice Exam 3: Answer Key and Explanations

1. B — A 60 kg transmission exceeds the safe solo lifting weight for most workers. Workplace safety regulations and best practices require that loads of this weight be moved using mechanical lifting devices (hoists, jacks, or carts) or with the assistance of a co-worker. Attempting to lift 60 kg alone — regardless of technique — creates a high risk of back injury that is entirely preventable.

2. C — WHMIS 2015 uses two signal words: "Danger" for more severe hazards and "Warning" for less severe hazards within the same hazard classification system. If a product carries the Danger signal word, it poses a greater risk of harm from the identified hazard than a product carrying the Warning signal word for that same type of hazard.

3. D — Hydraulic presses generate enormous force — often tens of thousands of pounds — concentrated on the bearing and shaft interface. If the bearing, shaft, or press tooling fractures under this force, fragments can be launched at high velocity. Safety glasses or goggles must be worn to protect the eyes from these potential projectiles during any press operation.

4. A — Proper documentation practices require recording all customer concerns on the repair order, even those outside the current work scope. The technician should document the engine light concern and inform the service advisor, who can then contact the customer to authorize the additional diagnosis. Performing work without authorization or ignoring a stated concern are both unacceptable practices.

5. C — Chemical eye exposure requires a minimum of fifteen minutes of continuous flushing with clean water at the eye wash station. This extended flushing time is necessary to dilute and remove chemical residue that may have penetrated the tear film and contacted the corneal surface. Brief rinses are insufficient because chemicals continue to cause damage as long as any residue remains.

6. B — PASS stands for Pull the pin, Aim at the base of the fire (not the flames), Squeeze the handle, and Sweep side to side across the base. Aiming at the base of the fire addresses the fuel source rather than the flames above it, which is essential for effective extinguishment. Sweeping ensures the extinguishing agent covers the entire fuel surface.

7. D — Split-rim (multi-piece rim) wheel assemblies can separate explosively during inflation if a component is damaged, corroded, or improperly seated. The forces involved in a ring separation are

sufficient to cause fatal injuries. Inflating split-rim assemblies inside a safety cage contains the components if separation occurs, protecting anyone in the vicinity.

8. A — A metal wrench dropped across battery terminals creates a dead short through the wrench, potentially drawing hundreds of amps. This massive current flow heats the wrench to temperatures that can cause severe contact burns, melt the wrench to the terminals, and ignite nearby combustible materials. The short can also produce sparks that ignite hydrogen gas emitted by the battery.

9. A — A chain link that is visibly elongated (stretched) compared to its neighbors indicates that the link has been plastically deformed by overloading — its yield strength has been exceeded and its load-carrying capacity is permanently compromised. Corroded chain also loses cross-sectional area, further reducing capacity. The chain must be removed from service and replaced; no repair can restore a stretched or corroded chain.

10. C — At low RPM (idle), the engine cycles slowly and each cylinder has more time per cycle. A cylinder with low compression (95 psi vs. 155–162 psi) leaks enough charge during the longer dwell at low RPM to prevent combustion. At higher RPM, the faster cycling reduces the time available for leakage, and the increased airflow velocity helps the weakened cylinder retain enough charge to fire, masking the misfire.

11. D — The combustion leak test (block test) detects the presence of combustion gases — specifically CO₂ and CO — in the cooling system. The chemical reagent changes color (typically blue to yellow) when exposed to these gases. A positive result confirms that a path exists between the combustion chamber and the coolant jacket — a head gasket breach, cracked head, or cracked block.

12. B — Random/multiple misfire codes with approximately equal distribution across all cylinders indicate a system-wide cause rather than an individual cylinder fault. Individual cylinder faults (bad coil, burned valve, failed injector) produce single-cylinder misfire codes. System-wide causes — low fuel pressure, contaminated fuel, restricted exhaust, or a large vacuum leak affecting all cylinders — produce the even multi-cylinder pattern.

13. A — The ECM calculates the base fuel injector pulse width primarily from the MAF signal — more air mass equals more fuel needed. When the MAF underreports airflow (1.8 g/s actual vs. 3.5–5.0 g/s expected), the ECM delivers fuel for 1.8 g/s worth of air when the engine is actually ingesting 3.5+ g/s, creating a lean condition that triggers positive fuel trim corrections.

14. D — Combustion gases leaking into the cooling system through an internal head gasket breach pressurize the system with high-pressure gas that the radiator cap cannot vent fast enough. The coolant temperature may read normal initially because the leak is pressurizing the system before it has caused significant overheating — but the excessive hose pressure is the early warning sign.

15. C — R-1234yf is classified as mildly flammable (A2L classification), unlike R-134a which is non-flammable. This means R-1234yf must not be exposed to open flames, sparks, hot surfaces, or ignition sources during recovery, handling, and charging. Dedicated R-1234yf-certified equipment with leak detection and safety features must be used for all service operations.

16. B — VVT systems operate through fine oil passages in the oil control valve (VVT solenoid) and the cam phaser. Engine sludge from missed oil changes clogs these passages, restricting or blocking the oil flow that moves the phaser vanes. When the phaser cannot advance as commanded, the camshaft remains retarded, and the ECM sets the over-retarded DTC.

17. A — The common rail stores fuel at extremely high pressure. After shutdown, the fuel should remain pressurized as the check valves and injector seats hold the rail sealed. A rapid pressure drop indicates fuel is escaping — through a leaking injector that drips into a cylinder, a faulty rail pressure relief valve that vents fuel back to the tank, or a worn high-pressure pump check valve that allows backflow.

18. C — Pinching the return line closed eliminates the regulator from the equation. The pressure rising to 420 kPa proves the pump can produce adequate pressure — the pump is healthy. But the regulator is opening too early (at 310 kPa instead of the specified 345 kPa), bleeding off excess fuel to the return line prematurely and keeping the rail pressure below specification during normal operation.

19. D — A ticking noise that persists after the engine reaches full operating temperature and after extended running eliminates the possibility of air in the lifters (which purges within minutes of warmup). Persistent ticking with correct oil level and viscosity indicates one or more lifters have internal mechanical failures — a worn plunger, collapsed check ball, or scored bore that prevents the lifter from maintaining its oil charge.

20. B — After a cooling system service that involves draining and refilling, air pockets commonly form in the highest points of the system — and the heater core, mounted high behind the dashboard, is one of the most common locations. The trapped air prevents coolant from flowing through the core, so no heat is transferred to the cabin air despite the engine being at operating temperature. Bleeding the system purges the air pocket.

21. C — CO₂ is the product of complete, efficient combustion. When the catalytic converter's oxidation function is working properly, it converts CO and HC into CO₂ and water. A healthy engine with a healthy converter produces CO₂ levels of 14% to 15.5%. Low CO₂ combined with elevated CO and HC indicates incomplete combustion or poor converter efficiency.

22. D — A P0456 (very small leak) is too minor to find by visual inspection or standard electronic leak detection in most cases. A smoke machine pressurizes the EVAP system with visible smoke that traces the entire vapor path and exits at the leak point — even leaks as small as 0.5 mm in diameter produce a visible wisp of smoke that pinpoints the exact location.

23. A — A white, blistered insulator with partially melted electrodes indicates extreme overheating of the combustion chamber. The ceramic insulator has exceeded its thermal limit, which occurs from a lean air-fuel mixture (insufficient fuel to cool combustion), incorrect plug heat range (too hot), over-advanced ignition timing, or a cooling system deficiency at that cylinder.

24. B — The knock sensor is a piezoelectric element that generates a voltage when subjected to mechanical vibration. Tapping the block near the sensor produces a mechanical vibration that the piezoelectric crystal converts into a sharp voltage spike visible on the oscilloscope. The presence of this spike at each tap confirms the sensor's piezoelectric element is functional.

25. D — When DEF runs out, the SCR system cannot reduce NO_x emissions. Environmental regulations require the vehicle to progressively reduce performance to compel the driver to refill. The vehicle first limits speed, and if the driver continues without refilling, eventually restricts maximum speed to a very low limit (typically 8 km/h on some systems) that makes highway driving impossible.

26. C — Diesel knock is caused by the ignition delay period — the brief interval between when fuel is injected into the superheated compressed air and when it actually ignites. During this delay, fuel accumulates in the combustion chamber. When it finally ignites, the large accumulated charge burns rapidly, producing a sharp pressure spike that creates the characteristic knocking sound.

27. B — Primary resistance of 0.6 ohms falls within the 0.4–0.8 ohm specification, and secondary resistance of 8,500 ohms falls within the 6,000–12,000 ohm specification. Both windings pass the static resistance test. However, resistance within specification does not guarantee the coil is good under operating conditions — a coil can pass static tests and still fail under heat and load.

28. A — With the check valve, regulator, and connections all confirmed as holding properly, the remaining fuel system component that contacts the pressurized fuel rail is the injector. One or more injectors are leaking past their pintle seats when the engine is off, allowing fuel to seep into the cylinders and draining the rail pressure to zero. This also causes hard starting (from a depressurized rail) and possible fuel-wash of cylinder walls.

29. D — The scan tool reads the ECT sensor (which feeds the ECM), showing a stable 92°C. The instrument cluster gauge shows erratic readings from a different source — the coolant temperature sender that specifically feeds the gauge. Two different sensors for two different purposes, and the sender that feeds the gauge has developed a fault (intermittent internal connection, corroded contacts, or degraded element).

30. C — A healthy catalytic converter stores and releases oxygen as the air-fuel ratio oscillates slightly rich and lean, dampening the downstream sensor signal. When the converter degrades and loses this oxygen storage capacity, the downstream sensor's signal begins to mirror the upstream sensor's rapid switching — confirming the converter can no longer buffer the exhaust gas oscillations and has lost its catalytic efficiency.

31. A — The wastegate's job is to bypass exhaust gas around the turbine when the target boost pressure is reached. A stuck-closed wastegate forces all exhaust through the turbine at all times, allowing boost pressure to continue rising beyond the target. This uncontrolled overboost can cause severe detonation, excessive cylinder pressure, and potential engine damage.

32. B — Normal CAN bus voltage shows both lines at 2.5V during idle (recessive state) and CAN-H rising to 3.5V / CAN-L dropping to 1.5V during data transmission. A constant 4.2V on CAN-H and 0.8V on CAN-L with no fluctuation means the bus is stuck in a permanent dominant state — a module's transceiver is clamping the lines and preventing any other module from communicating.

33. B — The instrument cluster receives coolant temperature data over the CAN bus from the ECM. If the scan tool (which also reads from the CAN bus) shows correct temperature data, the data on the bus is accurate. The cluster is receiving the correct data but is not displaying it correctly — indicating an internal cluster fault in the temperature display circuit, gauge driver, or stepper motor.

34. C — Aftermarket installations that splice into or connect to the CAN bus wiring can introduce signal disruption through improper connections, damaged insulation, or added capacitance and resistance on the bus. These intermittent disruptions cause brief communication dropouts that trigger U-codes and

warning lights. Disconnecting the aftermarket device and monitoring for recurrence confirms or eliminates it as the source.

35. D — Twisting the CAN-H and CAN-L wires together ensures that any electromagnetic interference from ignition coils, motors, or solenoids induces equal noise on both wires simultaneously. Since the CAN receiver reads only the differential voltage between the two wires, the equal noise on both cancels out, leaving only the clean data signal. This is the fundamental principle of differential signaling.

36. A — Reprogramming the ECM installs new software that resets all learned adaptive values — idle air correction, fuel trim adaptations, throttle position learning, and other parameters — to their factory default values. The module must accumulate driving time to relearn these values for the specific engine's characteristics, which is why the idle and fuel trims are unstable initially and stabilize after driving.

37. B — A DTC that does not return after clearing, with a functional component confirmed by testing, most likely resulted from a momentary fault condition that has since resolved — such as a connector that was briefly loose from vibration, corrosion that intermittently increased resistance, or a terminal that reseated itself. These intermittent connection faults are among the most common causes of single-occurrence, non-repeating DTCs.

38. C — A module that does not appear in the scan tool's module list means the module is not communicating on the bus. Since the parking sensors were recently functional, the module hardware likely exists but has lost its ability to communicate — the power supply fuse, ground connection, or CAN bus spur wiring should be checked for faults that would prevent the module from powering up and joining the network.

39. A — If the replacement sensor has a different number of pulses per revolution (designed for a different tone ring or application), the ABS module receives more or fewer pulses per wheel revolution than expected. More pulses per revolution makes the module calculate a higher wheel speed than actual, causing the speedometer (which derives its reading from wheel speed data) to read higher than true vehicle speed.

40. A — Start-stop systems require a healthy, adequately charged battery to guarantee reliable restarts. If the battery's state of charge drops below the minimum threshold or the battery health monitoring system detects reduced capacity, the system disables automatic stopping to prevent a situation where the engine cannot restart reliably. This is the most common cause of "Start-Stop Unavailable" messages.

41. D — Normal CAN bus termination is 60 ohms (two 120-ohm resistors in parallel). A reading of 40 ohms means there is an additional parallel resistance path on the bus — from an aftermarket device with its own termination, a module with an internal short that adds resistance to the bus, or a wiring fault creating a parallel path. The extra parallel resistance reduces the total below the normal 60-ohm specification.

42. C — Reduced keyless entry range with fresh batteries in the fob points to the vehicle-side receiver. A corroded antenna connection or damaged antenna wire reduces the receiver's sensitivity, requiring the fob to be much closer before the signal is strong enough to be detected. Aftermarket window tinting with metallic particles can also attenuate RF signals passing through the glass.

43. B — Modern vehicle modules draw significantly more current when awake (active mode) than when in sleep mode — often 200 to 500+ milliamps awake versus 5 to 20 milliamps asleep. If the technician measures parasitic draw before all modules have completed their sleep-entry sequence (which can take 30 to 60+ minutes on some vehicles), the reading will be falsely high and will misrepresent normal module behavior as an excessive drain.

44. A — A vibration under acceleration from a stop that disappears at cruising speed and is felt through the steering wheel on a FWD vehicle points to a worn inner CV joint (tripod joint). The inner joint accommodates both plunge (length changes) and angle as the half-shaft is loaded under acceleration torque. A worn tripod roller or tulip housing produces vibration under this loading that subsides at steady speed.

45. C — Shift hunting (repeated upshift/downshift cycling) during steady cruising indicates the transmission is operating near the calibrated boundary between two gears. Minor fluctuations in throttle position, vehicle speed, or road grade push the operating point back and forth across the shift threshold. This is a calibration sensitivity issue, not a hardware failure, and may be resolved by a TCM software update.

46. D — A whine that is present in both 2WD and 4WD modes eliminates the transfer case and front axle (which are only engaged in 4WD). The noise increases with vehicle speed (not engine RPM), which eliminates the transmission and engine accessories. The rear differential ring and pinion gear set is the common component active in both drive modes that produces speed-dependent noise from gear mesh.

47. A — The pilot bearing supports the transmission input shaft tip inside the crankshaft bore, providing precise centering and allowing the two to rotate at different speeds when the clutch is disengaged.

Without the pilot bearing, the input shaft would whip and vibrate inside the crankshaft, and the shaft could not maintain its alignment with the clutch disc hub splines.

48. D — A clutch pack that holds when cold but slips when hot indicates a seal or piston that leaks only when the fluid thins at operating temperature. Cold, thick fluid provides enough viscosity to maintain the seal even with worn components. As the fluid warms and thins, it flows past the worn seal more easily, reducing the apply pressure below the clamping force needed to hold the clutch under load.

49. C — One-way clutches (sprags or roller clutches) lock in one rotational direction and freewheel in the other. In automatic transmissions, they provide smooth gear transitions by holding a component against rotation during one shift while allowing it to freewheel during another, eliminating the need for precise timing between two separate clutch applications during the shift sequence.

50. D — A single clunk during one specific shift indicates driveline backlash that is taken up during the torque change associated with that shift. The 1-2 shift involves a significant torque reversal in the driveline components. Excessive U-joint play or ring-and-pinion backlash allows a momentary free-play gap that closes with an audible clunk when the torque direction changes during the shift.

51. B — As the clutch disc friction material wears thinner, the pressure plate clamping surface moves closer to the flywheel. This means the release bearing needs less travel to disengage the pressure plate from the disc. With less travel required, the clutch pedal doesn't need to be depressed as far to achieve disengagement — effectively raising the engagement point higher in the pedal arc.

52. A — Shifting from 4WD High to 4WD Low involves engaging a different gear set within the transfer case that provides a mechanical reduction ratio. This engagement requires the internal gears to mesh, and a worn synchronizer or sliding gear cannot smoothly match the speeds of the two gear sets. The grinding occurs as the unmated teeth clash during the engagement attempt.

53. C — A harsh engagement only in reverse, with smooth forward shifts, points to the reverse-specific friction element. The reverse clutch or band has worn friction material that has lost its progressive engagement capability — instead of gripping gradually as pressure builds, the worn material grabs abruptly once sufficient pressure overcomes the reduced friction, producing the harsh slam.

54. D — A constant whine at all speeds from a differential with correct fluid level and no contamination indicates wear in the ring and pinion gear set itself. The gear teeth have developed wear patterns, pitting,

or surface defects that produce noise proportional to rotational speed. A fluid change cannot repair mechanical wear on the gear tooth surfaces.

55. A — A concentric slave cylinder is located inside the bell housing and cannot be conventionally bled once installed because no bleeder valve is accessible. The CSC must be filled with fluid and pre-bled on the bench before installation to ensure all air is purged from the internal hydraulic chamber. Installing an air-filled CSC results in a spongy clutch pedal that cannot be corrected without removing the transmission.

56. A — The electronic coupling's multi-plate clutch pack provides the variable torque transfer in a torque-on-demand AWD system. Worn friction material on the clutch plates causes the coupling to transition from disengaged to fully locked abruptly rather than progressively — the clutch either slips completely or grabs suddenly, producing the noticeable jerk during rear axle engagement under hard acceleration.

57. A — Tires with significantly different tread depths on opposite axles create a constant rotational speed difference between the front and rear axles. The AWD system's wheel speed sensors detect this speed difference and the control module may interpret it as a system fault, storing a DTC and illuminating the check engine light through the AWD or drivetrain fault monitoring circuit.

58. C — The input shaft bearing supports the transmission input shaft, which rotates at engine speed whenever the clutch is engaged. In all forward gears, the bearing is loaded by gear mesh forces and produces the growling noise. In neutral with the clutch engaged, the shaft spins freely without gear mesh loading, so the noise is absent. When the clutch is depressed in neutral, the decelerating input shaft loads the bearing differently, revealing the noise as the worn bearing surfaces generate friction during the speed change.

59. A — An RPM flare during the overdrive shift with no completion indicates the overdrive clutch pack or band cannot hold under load. The hydraulic pressure is commanding the shift (the RPM flare shows the releasing element has released), but the applying element — the specific clutch or band unique to the overdrive gear — cannot clamp with sufficient force to engage the gear, and the engine RPM rises without a corresponding vehicle speed increase.

60. B — A clutch that engages smoothly but cannot transmit full torque under heavy load is slipping — the friction surfaces are sliding rather than gripping. Worn friction material or oil contamination on the disc surfaces reduces the friction coefficient below the level needed to transmit the engine's full torque

output under the high-demand conditions of towing, even though the reduced torque of normal driving may be transmitted without noticeable slip.

61. C — Resistors in series add directly: $3\Omega + 5\Omega = 8\Omega$ total resistance. Applying Ohm's Law: $I = V \div R = 12V \div 8\Omega = 1.5$ amps. In a series circuit, the same current flows through every component because there is only one path for current to travel. This is the fundamental rule of series circuit analysis.

62. D — A voltage drop of 0.15 volts across the positive battery cable during cranking (which draws 200+ amps) is within the acceptable limit of 0.5 volts for the total supply side. This confirms the cable and its connections have low resistance and are passing current efficiently from the battery to the starter solenoid.

63. B — Applying 12 volts directly to the horn bypasses everything in the circuit except the horn and its ground. The horn sounding confirms both the horn and its ground connection are functional. The fault must be upstream of the horn — in the horn relay, the clockspring, the horn switch in the steering wheel, or the wiring connecting these components.

64. C — AGM batteries have a lower maximum charge voltage threshold (typically 14.4V) compared to flooded batteries (which can tolerate up to 14.8V or higher). Applying flooded-battery charging voltages to an AGM battery can cause overheating, electrolyte dry-out, and permanent damage. The voltage regulator or charging system calibration may need adjustment to limit maximum voltage to the AGM-safe range.

65. D — Supply voltage of 12.2V is present at the socket, confirming the fuse, switch, relay, and supply wiring are all functional. But the bulb doesn't illuminate despite having a good bulb and adequate supply voltage. The only remaining possibility is the ground circuit — a poor ground prevents current from flowing through the bulb even though voltage is available at the supply terminal.

66. A — The alternator is producing a healthy 14.4V at its output, but 2.1V is being consumed by resistance in the wire between the alternator and the battery. Only 12.3V ($14.4 - 2.1$) reaches the battery — insufficient to fully charge it. The resistance source could be a corroded fusible link, a loose terminal, or a damaged wire that must be found by voltage drop testing along the charging path.

67. C — The motor running but producing a grinding noise without window movement indicates the motor is spinning but not mechanically connected to the glass. The window regulator's drive mechanism

— either the cable, the gear, or the drive coupling — has failed, allowing the motor to spin freely without moving the glass along its track.

68. B — Pulling the interior lights fuse identified the circuit containing the excessive draw. The next step is to investigate the individual components on that circuit — dome lights, map lights, courtesy lights, vanity mirror lights, and their associated switches and wiring — to identify which specific component is drawing the excess 415 milliamps. Common culprits include a stuck door jamb switch, a trunk light with a failed switch, or a glove box light remaining on.

69. C — The scan tool confirms the ECM is commanding the compressor on, but 0 volts at the clutch connector means voltage is not reaching the clutch. The fault is between the ECM's command output and the compressor connector — the A/C clutch relay (which switches the high-current supply), its control circuit, or the wiring from the relay to the compressor. The relay, its fuse, control signal, and the connecting wiring must be tested systematically.

70. D — Headlamp flicker at idle that disappears at higher RPM is characteristic of a failing alternator diode producing excessive AC ripple. At idle, alternator output is at its lowest, and the AC ripple component is a larger percentage of the total output — enough to modulate the headlamp voltage visibly. At higher RPM, increased alternator output overwhelms the ripple, and the flicker becomes imperceptible.

71. D — Airflow stuck in defrost mode regardless of the selected mode means the mode door — which directs air between the floor, panel, and defrost ducts — is not moving from the defrost position. The mode door actuator has failed, lost its calibration, or the door itself is mechanically stuck. On many vehicles, the default (failsafe) position for the mode door is defrost to maintain windshield visibility.

72. C — Normal high-side pressure with an abnormally high low-side reading indicates that the restriction between the high and low sides is insufficient — the expansion device is not creating the necessary pressure drop. A TXV stuck open or an orifice tube that has been bypassed allows excessive refrigerant flow into the evaporator without proper metering, flooding the evaporator and raising the low-side pressure.

73. D — The DC volts setting measures the potential difference (voltage) between the two points where the meter leads are placed, with the circuit energized and the meter connected in parallel. This is the correct setting for checking whether voltage is present at a connector, measuring available voltage at a component, and performing voltage drop tests across connections.

74. B — The relay works when tested directly and the scan tool confirms 108°C coolant temperature. If the ECM is commanding the relay but the fans don't run, the relay control output circuit must be verified — the ECM provides the ground signal that energizes the relay coil. If the ECM ground output is present at the relay, then the fan motors themselves (seized bearings, open windings, or damaged wiring to the motors) are the remaining suspects.

75. B — Exposed conductors in a wiring harness create multiple immediate hazards: wires can short to each other (causing circuits to interact unpredictably), short to the vehicle body (ground fault causing blown fuses, circuit damage, or fire), or short to a power source (causing immediate overcurrent and potential fire). Melted insulation near the exhaust manifold is a particularly dangerous condition that requires immediate repair.

76. D — An overcharged system has too much refrigerant mass. The excess liquid in the condenser reduces the effective condensing area, raising high-side pressure. The excess liquid reaching the evaporator cannot fully evaporate, raising low-side pressure. The compressor works harder against higher head pressure, consuming more power while producing less cooling effect — the system runs inefficiently with reduced cooling performance.

77. A — A warm suction line with the compressor running indicates the evaporator is not absorbing heat — because it has no liquid refrigerant to evaporate. A TXV stuck closed or severely restricted blocks refrigerant from entering the evaporator. With no refrigerant evaporating inside the evaporator, no heat is absorbed from the cabin air, and the suction line returns warm gas rather than cool gas to the compressor.

78. C — Mold and mildew thrive on the evaporator surface because moisture from condensation remains on the fins in the warm, dark HVAC case after the A/C is turned off. The organisms produce the musty odor that is released when the blower pushes air across the contaminated surface. Treatment involves applying an antimicrobial HVAC cleaner to the evaporator surface and ensuring the condensate drain is clear.

79. A — DRLs are controlled by a dedicated module or BCM function that uses specific inputs — ignition state, parking brake status, ambient light level, and transmission position — to determine when to activate the DRLs. Since the headlamps work correctly when manually switched, the bulbs and wiring are functional. The fault is in the DRL activation logic — the control module, its inputs (ambient light sensor), or the switch position (not set to AUTO).

80. B — A battery can test "Good" on a conductance tester at room temperature but still struggle in extreme cold. The battery's CCA rating decreases as it ages and accumulates sulfation, even though the internal plate structure remains sufficient to test "Good." In borderline cold conditions, the combination of reduced CCA from aging and increased engine cranking resistance from cold oil produces the slow cranking.

81. A — LED chips generate heat during operation that must be managed to prevent premature degradation of the semiconductor junction. Unlike halogen bulbs where the heat radiates forward and is dissipated by airflow, LED heat is conducted rearward into the housing. Modern LED headlamp assemblies include integrated cooling fans, heat sinks, or heat pipes to manage this thermal load and maintain LED longevity.

82. C — The rear window defroster grid consists of individual heating elements (thin conductive lines) printed on the glass. Each line is an independent current path from one bus bar to the other. When one or more lines are broken (from scratching, impact, or manufacturing defects), the current cannot flow through those specific elements, leaving the corresponding area of the glass unheated while the rest of the grid functions normally.

83. A — Static ADAS calibration requires precise environmental conditions: the floor must be level, the vehicle's tire pressures must be at specification (affecting ride height and camera angle), the vehicle must be unloaded, and no reflective objects, vehicles, or visual clutter can be within the camera's field of view. Any of these conditions being incorrect can cause repeated calibration failures even with the target correctly positioned.

84. B — When swapping the front tires left-to-right causes the pull to switch direction, the tire is confirmed as the cause. Internal construction defects — ply steer (where the internal cord plies generate a lateral force) or radial pull (from shifted belts) — create a directional bias built into the tire itself. This pull is independent of alignment and follows the tire to whichever side of the vehicle it is mounted on.

85. C — Steering vibration only during braking at highway speed is caused by rotor thickness variation (DTV). The thick and thin spots rotate past the caliper pads during each wheel revolution, pushing the pads in and out and creating pulsating hydraulic pressure transmitted through the steering linkage. DTV is confirmed by measuring the rotor thickness with a micrometer at eight equally spaced points around its circumference.

86. C — On rack-and-pinion steering systems, the rack seals (which seal the hydraulic assist piston) can leak fluid into the bellows boots that cover each end of the rack. The boots contain the leaked fluid

without any external drip reaching the ground. The fluid level drops progressively but no puddle is ever found — until the boot is inspected and found full of power steering fluid.

87. B — On a suspension where the spring is on the lower control arm, the lower ball joint carries the vehicle's weight. To inspect a loaded ball joint for wear, the joint must be unloaded — a jack placed under the lower control arm lifts the vehicle weight off the joint while keeping the arm at approximately ride height. With the joint unloaded, vertical play at the 12 and 6 o'clock positions can be detected.

88. A — Incorrect rear toe on one side produces several simultaneous effects: feathered-edge wear on the affected tire (from being dragged sideways), a thrust angle deviation (because the rear wheels no longer point straight ahead along the vehicle centerline), and an off-center steering wheel (because the front wheels must compensate for the rear misalignment to track straight).

89. D — ESC compares the driver's intended path (from steering angle and speed) with the vehicle's actual path (from yaw rate and wheel speeds). A faulty sensor providing incorrect data makes the module perceive instability that doesn't exist, triggering corrective brake applications during normal driving. Wheel speed sensor faults, yaw rate sensor drift, and uncalibrated steering angle sensors are the most common causes.

90. C — A spongy brake pedal with excessive travel, full fluid level, no leaks, and adequate pads points to air in the hydraulic system. Air is compressible — when the pedal is pressed, the trapped air compresses before the hydraulic fluid can transmit force to the caliper pistons, absorbing pedal travel and creating the spongy feel. Bleeding the system to remove the air restores firm pedal feel.

91. A — Vibration under hard acceleration from a stop, felt through the steering wheel on a FWD vehicle, points to a worn inner CV joint. The inner tripod joint must accommodate both angle changes and plunge (length changes) simultaneously under the high torque loading of hard acceleration. A worn tripod roller or housing produces vibration that subsides when the torque demand decreases at steady cruising speed.

92. B — If all four tires display correct pressure but the TPMS warning light remains on, the fault is in the TPMS system itself rather than the tire pressures. Common causes include a sensor with a dying battery that cannot transmit reliably, a sensor communication fault, or a TPMS module error. The light serves dual purpose — it indicates both low pressure conditions and system malfunctions.

93. A — The vehicle pulls toward the side with stronger braking force — in this case, the left. The left rear shoes have more friction material remaining because the right rear shoes have been doing more work historically, but the current condition shows the left side braking harder. This indicates the right rear is now underperforming — a sticking wheel cylinder, maladjusted shoes, or contaminated linings on the right side are reducing its braking force.

94. D — The tire pressure on the door jamb placard is the vehicle manufacturer's recommended pressure for optimal balance of ride comfort, handling, traction, tread wear, and fuel economy for that specific vehicle. The sidewall maximum is the tire's structural limit — not a recommended operating pressure. Inflating to the sidewall maximum reduces the contact patch, decreases traction, hardens the ride, and causes accelerated center-tread wear.

95. B — A worn strut mount bearing produces a clunking or popping noise when the steering is turned because the bearing cannot provide smooth rotational movement for the strut assembly. The noise is most noticeable at low speed (parking lot maneuvers) where the full weight of the vehicle loads the bearing while the steering rotates it. A binding sensation in the steering may also be present.

96. A — The thrust angle represents the direction the rear wheels are actually pointing relative to the vehicle's geometric centerline. On a vehicle with a non-adjustable rear axle (solid axle), a non-zero thrust angle means the axle itself is misaligned — from shifted leaf spring mounting points, a bent axle housing, or body/frame damage. The axle cannot be adjusted, so the root cause must be identified and repaired.

97. D — ABS activation at very low speed on dry pavement where lockup should not occur indicates the ABS module is receiving incorrect wheel speed data. A sensor producing erratic signals or dropouts at low speed (from a cracked tone ring, contaminated sensor, excessive air gap, or damaged wiring) causes the module to perceive a speed difference between wheels that mimics incipient lockup.

98. C — Smooth, even wear on the inner edge of both front tires with full tread on the outer edges is caused by excessive negative camber on both wheels. Negative camber tilts the top of each wheel inward, placing disproportionate load on the inner portion of the tire contact patch. Over time, this concentrated loading wears the inner tread significantly faster than the outer tread.

99. B — Simultaneous illumination of both the brake warning light and the ABS light typically indicates a fault in the ABS system that is severe enough to affect the standard braking system. The most common cause is a fault in the ABS hydraulic control unit (which modulates pressure for both ABS and standard braking functions) or a shared circuit that both systems depend on.

100. A — Rotating the wheel while tightening the spindle nut seats the tapered roller bearings fully against their races, eliminating any looseness between the rollers and the race surfaces. It also distributes the fresh grease evenly between the rollers and races, ensuring consistent lubrication across all bearing contact surfaces before the final adjustment is set.

101. D — Electronic brake force distribution dynamically adjusts the braking force ratio between the front and rear axles based on real-time conditions — vehicle loading (empty vs. loaded), deceleration rate, and dynamic weight transfer during braking. EBD replaces the mechanical proportioning valve used on older vehicles with more precise, continuously variable electronic control through the ABS hydraulic unit.

102. C — A floating caliper relies on its slide pins to allow the caliper body to move laterally, pressing both the inboard and outboard pads against the rotor with equal force. When a slide pin seizes, the caliper cannot float, and only one pad (the one pushed by the piston) contacts the rotor fully. The pad on the piston side wears rapidly while the opposite pad shows minimal wear, creating a pronounced thickness difference.

103. C — The thinnest reading is 24.99 mm and the thickest is 25.03 mm, giving a thickness variation of 0.04 mm. The maximum allowable DTV is 0.013 mm, so the 0.04 mm variation exceeds the specification by more than three times. All readings are well above the 24.50 mm minimum thickness, so the rotor has adequate material — but the thickness variation is confirmed as the cause of the brake pulsation.

104. A — If front wheel balancing does not resolve a steering wheel vibration at 100 km/h, the front brake rotors should be checked for excessive lateral runout. Rotor runout pushes the pads apart and pulls them back with each revolution, transmitting a vibration through the caliper mount to the steering knuckle and into the steering system — even without the brakes being applied.

105. D — A puncture in the center of the tread (the repairable zone) on an otherwise healthy tire with no previous repairs can be safely repaired using an internal patch-plug combination. The tire must be dismounted and the interior inspected for damage before the repair. External-only plugs are not considered a permanent repair, and punctures in the sidewall or shoulder are not repairable.

106. C — The torque sensor tells the EPS control module what the driver is requesting — the direction and magnitude of the steering input. Without a valid torque sensor signal, the module cannot determine whether the driver is turning left, right, or holding straight, making it impossible to apply the correct

assist. As a safety measure, the module disables all power assist entirely rather than risk applying assist in the wrong direction.

107. A — A deployed airbag module no longer contains the active pyrotechnic charge — it has already fired. While it should still be handled respectfully and disposed of properly, it does not carry the same explosive deployment risk as an undeployed module. The primary concerns are chemical residue from the deployment (sodium hydroxide powder) and proper disposal as hazardous waste.

108. B — Modern trim panels are secured by a combination of screw fasteners and plastic push-type retaining clips. Non-marring plastic trim tools release the clips without damaging the panel surface, the clips, or the mounting holes. Starting from the correct edge and working progressively around the panel prevents clip breakage that would require replacement clips during reinstallation.

109. C — The occupant classification sensor determines whether the passenger seat is occupied and estimates the occupant's weight category. When the sensor has a fault, the system cannot classify the passenger, so as a safety precaution, the passenger frontal airbag may be disabled or set to a reduced deployment force to prevent injury to a potentially small occupant or child seat.

110. A — The door mirror assembly has electrical connections for the heated element, the turn signal repeater, and the adjustment motors. The mirror wiring passes through the door and connects via a harness connector inside the door cavity. This connector must be disconnected before the mirror is unbolted to prevent pulling and damaging the wiring as the mirror is removed from the door.

111. A — A small stone chip in laminated glass that does not penetrate the inner PVB layer can be repaired with a windshield repair resin that fills the chip and prevents it from spreading into a crack. If the vehicle is ADAS-equipped, the technician should verify whether a repair-only service (without full windshield replacement) requires camera recalibration — manufacturer procedures vary.

112. B — The power liftgate's anti-pinch feature, like the power window express-up feature, relies on learned travel endpoints to detect obstructions. Battery disconnection erases these learned values, causing the motor control to lose its reference for normal force levels. Without the reference, the motor cannot distinguish between normal resistance and an obstruction, so it triggers the anti-pinch reversal prematurely.

113. C — The child safety lock disables the interior door handle mechanism on the rear doors so the door can only be opened from the outside. This prevents a child in the rear seat from opening the door

while the vehicle is in motion. The lock is typically a small lever or switch accessible on the door edge when the door is open.

114. D — The automatic headlamp system uses an ambient light sensor (usually a small photodiode mounted on the top of the dashboard) to detect the transition from daylight to darkness. If the headlamp switch is not in the AUTO position, or if the light sensor is dirty, obstructed, covered by an aftermarket dashboard mat, or electrically faulty, the system cannot detect the light level change to trigger automatic activation.

115. A — Moisture condensation is normal inside headlamp housings due to temperature cycling. However, a cracked housing, failed seal, missing drain vent, or improperly sealed bulb access cover allows excessive moisture to enter and remain trapped. The moisture condenses on the cooler inner lens surface, creating visible fogging or droplet formation that doesn't clear with normal lamp operation.

116. C — Automotive body side mouldings attached with adhesive tape should be repaired by cleaning both surfaces thoroughly (removing old adhesive residue, grease, and contamination), applying new automotive-grade double-sided adhesive tape rated for exterior use, and pressing the moulding firmly into position. Proper surface preparation and correct adhesive selection ensure a durable bond.

117. B — Cold temperatures significantly impact hybrid operation in two ways: the lithium-ion battery's internal resistance increases in cold conditions, reducing its power output and efficiency, and the cabin heater draws substantial energy from the HV battery (since there is no engine waste heat during EV-only driving). The BMS starts the engine earlier to supplement both propulsion and heating demands.

118. D — A "High Voltage System Fault" warning with speed limitation indicates the HV system has detected a potentially dangerous condition but is allowing limited operation to reach a safe location. Before connecting diagnostic equipment, the technician must ensure HV safety equipment is available and worn. The scan tool can be connected through the OBD II DLC without de-energizing the HV system, since the DLC is a 12-volt interface.

119. A — A heat pump uses the refrigeration cycle in reverse — extracting thermal energy from the outside air (even cold air contains heat energy above absolute zero) and transferring it into the cabin. This process moves existing heat rather than generating it, achieving a coefficient of performance (COP) of 2 to 3 — meaning it delivers 2 to 3 times more heat energy than the electrical energy it consumes.

120. C — When the HV battery SOC is at 95%, the battery is nearly full and has very limited capacity to accept additional charging energy. Regenerative braking converts kinetic energy into electrical energy for battery storage, but if the battery cannot accept the energy, the BMS must limit regeneration to prevent overcharging. The friction brakes compensate for the reduced regenerative braking to maintain the driver's expected deceleration rate.

121. B — HV connectors have robust locking mechanisms, environmental seals, and often interlock circuits (switches that detect whether the connector is fully mated). These must be released in the correct sequence to avoid damaging the connector housing, the interlock switch, or the terminal pins. Forcing a connector or releasing locks out of sequence can damage the precision mating surfaces and trigger false DTCs.

122. D — The insulation resistance test (performed by the insulation monitoring device or a dedicated tester) measures the resistance between the entire HV circuit and the vehicle's conductive chassis. High resistance (typically $>100\text{ k}\Omega$ for a 400V system) confirms that no current leakage path exists between the lethal HV system and the vehicle body that occupants and technicians contact.

123. A — Many plug-in hybrid vehicles (particularly those with smaller battery packs) are designed for Level 1 and Level 2 AC charging only and do not include a DC fast charging inlet or the internal components needed to accept DC fast charging. The vehicle charges normally from AC sources because its onboard AC charger functions correctly, but it physically cannot connect to or accept DC fast charging.

124. D — Lithium-ion battery cells degrade gradually and permanently through normal charge-discharge cycling, calendar aging, and cumulative thermal exposure. At 120,000 km, a reduction from 64 kWh to 56 kWh (approximately 12.5% capacity loss) represents normal aging. The BMS tracks this degradation as state of health (SOH) and adjusts range estimates and power limits accordingly.

125. C — After tire rotation on a BEV, the TPMS system must be relearned so the module knows which sensor is at which wheel position — this is the same as any vehicle with direct TPMS. Additionally, BEVs are significantly heavier than comparable conventional vehicles due to the battery pack, which may result in higher wheel fastener torque specifications that the technician must verify and follow during the rotation service.