PRACTICE EXAM 4: RED SEAL AUTOMOTIVE SERVICE TECHNICIAN SIMULATION (125 QUESTIONS)

1. A technician is grinding a weld on a vehicle frame. Sparks are landing on a nearby parts cleaning solvent tank that has its lid removed. What is the immediate priority?

A. Stop grinding immediately, move the solvent tank out of the spark path or replace its lid, and establish adequate separation before resuming work

B. Continue grinding while a co-worker holds a fire blanket between the grinder and the solvent tank to catch sparks before they reach the open tank

C. Reduce the grinder speed to minimize spark production, then continue with the work while monitoring the solvent tank surface for signs of ignition

D. Spray the exposed solvent surface with water to suppress any potential ignition from the incoming sparks and continue the grinding operation

2. A new employee asks what the difference is between a supplier label and a workplace label under WHMIS 2015. Which statement correctly describes the key difference?

A. Supplier labels are applied only to products used in automotive shops, while workplace labels apply to all other industries and work environments

B. Supplier labels are optional if a Safety Data Sheet is available on file, while workplace labels are mandatory on every container regardless of SDS availability

C. Supplier labels include the full set of WHMIS elements applied by the manufacturer, while workplace labels are simplified labels for secondary containers

D. Supplier labels use the old WHMIS 1988 symbols, while workplace labels use the new WHMIS 2015 GHS-aligned pictograms and signal word format

3. A vehicle on a four-post drive-on lift needs to have its front wheels removed for brake service. The lift does not have integrated jacking capability. What additional equipment is needed?

A. The vehicle can be driven off the lift with the wheels removed, since the four-post lift supports the vehicle through the tires on the runways at all times

B. A portable floor jack can be used to raise each corner off the runway, but no jack stands are needed because the lift itself supports the vehicle weight

C. A second two-post lift must be used instead, since four-post lifts are not suitable for any service that requires wheel removal under any conditions

D. A jack and jack stands or the lift's auxiliary jacking system must be used to raise the suspension off the runways so the wheels can hang free for removal

4. A technician needs to cut a seized bolt using an air-powered cut-off wheel. What safety equipment is required beyond standard safety glasses?

A. A full-face welding shield with shade 5 lens to protect against the intense light generated by the friction of the cutting wheel on metal surfaces

B. A face shield over safety glasses to protect the entire face from sparks, metal fragments, and the possibility of cut-off wheel disintegration during use

C. Only standard safety glasses are required for air-powered cut-off tool use since the tool's built-in guard provides adequate protection against all debris

D. Leather welding gloves rated for 500°C minimum temperature resistance to handle the cut bolt immediately after the cutting operation is completed

5. What is the correct procedure for disposing of used brake fluid collected during a brake system service?

A. Collect the fluid in an approved container and dispose of it through the shop's hazardous waste recycling program, since brake fluid is classified as hazardous

B. Pour the used brake fluid into the used engine oil collection tank, since both fluids are petroleum-based and processed together by the waste hauler

C. Flush the used brake fluid down the shop drain with running water to dilute it, since glycol-based brake fluid is water-soluble and biodegradable in sewer systems

D. Allow the brake fluid to evaporate in an open container in the parts washing area, since the small volume from a single service evaporates within twenty-four hours

6. A technician notices that the shop's fire extinguisher has a gauge reading in the red zone. What does this indicate?

A. The extinguisher has been recently recharged and is in optimal condition for use, with the red zone confirming full pressure status and ready availability

B. The extinguisher is currently above its rated pressure and must be carefully depressurized to the green zone before it can be safely stored or mounted

C. The extinguisher is partially discharged and still usable for small fires, though it should be scheduled for recharging at the next monthly inspection cycle

D. The extinguisher pressure is outside the normal operating range and it must be recharged or replaced immediately to ensure it will function in an emergency

7. A technician is removing a fuel tank from a vehicle. During the removal, residual fuel spills onto their clothing and the shop floor. What is the correct immediate response?

A. Continue the fuel tank removal to completion, then address the spill and clothing contamination after the tank is safely removed from the vehicle

B. Wipe the fuel from clothing with shop rags and continue working, since the small volume of fuel on clothing does not constitute a significant ignition hazard

C. Stop work immediately, move away from ignition sources, change the fuel-contaminated clothing, and clean the floor spill with approved absorbent material

D. Rinse the fuel from clothing and the floor using the shop's water hose to dilute and flush the fuel toward the nearest floor drain for quick removal

8. What information is found on the vehicle tire information placard typically located on the driver's door jamb or B-pillar?

A. The maximum tire pressure rating, which is the highest pressure the tires can safely sustain under any loading condition on the specific vehicle model

B. The manufacturer's recommended tire pressures, tire sizes, and maximum load ratings for the original equipment tires fitted to the specific vehicle

C. The tire tread depth minimum requirement and the date by which the tires must be replaced regardless of the remaining tread depth on the vehicle

D. The tire rotation schedule and the recommended alignment interval specific to the vehicle model based on the suspension design and tire specifications

9. A technician is assigned to work on a hybrid vehicle for the first time. Before beginning any service, what should the technician verify about their own qualifications?

A. That they have completed the manufacturer's basic vehicle familiarization course, which is sufficient for all service work on hybrid and electric vehicles

B. That they have the appropriate training and certification for high-voltage vehicle service before working on or near any HV components or orange-marked cables

C. That they have at least five years of general automotive service experience, which qualifies them by default for hybrid vehicle service in all Canadian provinces

D. That they have read the vehicle owner's manual section on hybrid operation, which provides all the technical information needed for safe hybrid vehicle servicing

10. A vehicle has a rough idle and the scan tool shows a P0301 code (Cylinder 1 Misfire Detected). The technician swaps the ignition coil from cylinder 1 to cylinder 3 and the spark plug from cylinder 1 to cylinder 4. After clearing codes and running the engine, the misfire remains on cylinder 1. What does this confirm?

A. The ignition coil and spark plug are both eliminated as the cause since the misfire stayed on cylinder 1, pointing to a fuel delivery or mechanical fault on that cylinder

B. The ignition coil is the cause because the misfire should have moved to cylinder 3 where the suspect coil was installed, but a wiring fault prevented the transfer

C. The spark plug is the cause because it was swapped to a different cylinder than the coil, creating a confusing diagnostic result that requires additional testing

D. The ECM driver circuit for cylinder 1 has failed, preventing any coil installed in that position from receiving the correct firing signal from the engine control module

11. An engine produces blue smoke from the exhaust primarily at startup after sitting overnight, and the smoke clears within the first minute of driving. This pattern repeats daily. What is the most likely cause?

A. Worn piston rings that allow oil to seep past during the extended idle period and burn off once the engine reaches operating temperature and ring seal improves

B. A leaking rear main seal that allows engine oil to contact the exhaust system during overnight sitting, producing smoke that burns off after the engine warms up

C. Excessive fuel enrichment during cold start that washes oil from the cylinder walls, creating a temporary oil burning condition that resolves as the engine warms

D. Worn valve stem seals that allow oil to seep past the guides into the combustion chambers while the engine sits overnight, burning off during the first startup

12. A technician needs to verify the installed height of a valve spring during a cylinder head rebuild. What does an installed height that exceeds the manufacturer's specification indicate?

A. The spring is too long and needs to be shortened by grinding the end coils to achieve the correct installed height for proper valve train geometry

B. The spring seat has been machined too deep during a previous rebuild, physically lowering the spring's starting position and increasing the measured height

C. The spring is operating at a lower preload than designed, which may allow valve float at high RPM, and requires a shim under the spring to correct the height

D. The valve guide has been installed too high in the head, raising the retainer position and artificially increasing the installed height measurement reading

13. An engine has a persistent ticking noise from the valve train area at operating temperature. Oil pressure is within specification and the oil is clean and at the correct level. The technician places a stethoscope on each valve cover and identifies the noise as loudest above cylinder 3's exhaust valve location. What is the most likely cause?

A. The exhaust manifold gasket on cylinder 3 is leaking, producing a ticking sound that resonates through the valve cover and mimics valve train noise

B. A worn or collapsed hydraulic lash adjuster on cylinder 3's exhaust valve that has failed internally and cannot maintain zero lash despite adequate oil supply

C. The timing chain tensioner is at its maximum extension and allows the chain to slap near the cylinder 3 area of the head, mimicking a localized valve train tick

D. The number 3 exhaust valve spring has a broken coil that allows the valve to buzz against the retainer at operating temperature as thermal expansion changes clearances

14. A four-cylinder engine has compression readings of 150, 148, 152, and 90 psi on cylinders 1 through 4 respectively. A wet test on cylinder 4 raises the reading to 140 psi. What additional test should be performed to identify the specific ring-related cause?

A. A cylinder leak-down test on cylinder 4 to determine the percentage of leakage and confirm whether the air escapes past the rings into the crankcase via the oil fill cap

B. A relative compression test using the scan tool's crankshaft acceleration data to verify that the compression test results are accurate before proceeding with disassembly

C. An exhaust gas analysis at idle to determine if the low compression on cylinder 4 is producing elevated hydrocarbon emissions detectable at the tailpipe during operation

D. A borescope inspection of cylinder 4 through the spark plug hole to visually examine the piston crown, rings, and cylinder wall for damage before any further testing

15. A common rail diesel engine has a rough idle with uneven cylinder contribution. The scan tool shows that the ECM is commanding different injection quantities to each cylinder to maintain a stable idle — cylinder 2 receives significantly more fuel than the others. What does this indicate?

A. The fuel filter is partially restricted, reducing the fuel supply to cylinder 2's injector and requiring the ECM to increase its pulse width to compensate for the deficit

B. The glow plug on cylinder 2 has failed, reducing the cylinder's combustion efficiency at idle and requiring additional fuel to produce equivalent power output

C. The ECM's idle roughness correction algorithm is masking a compression or injection fault on cylinder 2 by commanding extra fuel to equalize cylinder contribution

D. Cylinder 2 has a compression or injector delivery problem that reduces its power output at idle, and the ECM compensates by commanding more fuel to that cylinder

16. An engine with a MAP sensor-based fuel control system (speed-density) has a large vacuum leak at the intake manifold gasket. How would this leak affect the MAP sensor reading and fuel delivery at idle?

A. The MAP sensor would read higher manifold pressure (lower vacuum), causing the ECM to calculate more air entering the engine and deliver more fuel, creating a rich condition

B. The MAP sensor would read lower manifold pressure (higher vacuum), causing the ECM to calculate less air entering the engine and deliver less fuel, creating a lean condition

C. The MAP sensor would read higher manifold pressure (lower vacuum), causing the ECM to calculate more air entering the engine and deliver more fuel, but the actual air-fuel ratio would still be lean because the additional unmetered air exceeds the extra fuel

D. The MAP sensor reading would be unaffected by the vacuum leak because the sensor measures absolute pressure, which is independent of any leaks in the intake manifold

17. A vehicle with a port fuel injection system has a fuel pressure of 380 kPa (55 psi) at idle with the vacuum reference line connected to the regulator. When the vacuum line is disconnected from the regulator, the pressure rises to 420 kPa (61 psi). The specification is 350 kPa at idle with vacuum and 400 kPa without vacuum. What do these readings indicate?

A. Both readings are approximately 30 to 40 kPa above specification, indicating the fuel pressure regulator is set too high and is providing excessive fuel rail pressure

B. The difference between vacuum-connected and vacuum-disconnected readings proves the regulator is responding to vacuum, but both absolute pressures are too high

C. The fuel pump output is excessive and is overcoming the regulator's ability to maintain the correct pressure, requiring a fuel pump replacement to reduce the output

D. The readings are within an acceptable tolerance range of the specification and the fuel pressure regulator is functioning correctly within normal system parameters

18. A turbocharged engine has a P0299 code (Turbo/Supercharger Underboost Condition). During a test drive, the scan tool shows that commanded boost pressure is 14 psi but actual boost only reaches 8 psi. What should be investigated first?

A. The turbocharger's center section oil supply line for a restriction that is starving the bearings and reducing turbo rotational speed from bearing friction

B. The charge air system for boost leaks — intercooler pipe connections, intercooler hoses, charge pipe clamps, and the throttle body gasket — that allow pressurized air to escape before reaching the intake manifold

C. The turbocharger's compressor wheel for blade erosion or foreign object damage that reduces the compressor's ability to generate adequate air pressure

D. The exhaust manifold for cracks or leaks upstream of the turbocharger that reduce exhaust gas velocity and energy available to spin the turbine wheel

19. A V6 engine has a coolant leak at the front of the engine that appears to originate from behind the timing cover. What component behind the timing cover is the most common source of coolant leaks on engines where coolant passages route through the timing cover area?

A. The crankshaft front seal, which on some engines is designed with a coolant drain channel that leaks when the seal lip deteriorates from age and heat

B. The timing chain tensioner hydraulic feed line, which on some engines carries pressurized coolant rather than oil to the tensioner's hydraulic piston

C. The camshaft position sensor O-ring seal, which on some engines is mounted in a bore that passes through a coolant jacket in the front of the engine block

D. The water pump, which on many engines with timing-chain-driven water pumps is located behind the timing cover and leaks through its weep hole when the seal fails

20. A catalytic converter on a vehicle has a rattling noise from inside the converter housing when the engine is idling. Exhaust backpressure measured upstream of the converter is normal. What has happened?

A. The converter's internal substrate has melted from overheating and solidified into a mass that restricts exhaust flow and produces the rattle from loose fragments

B. The heat shield surrounding the converter has separated from its mounting welds and vibrates against the converter housing at specific engine RPM frequencies

C. The converter's ceramic substrate has broken apart internally, and the loose fragments rattle inside the housing while still allowing exhaust to pass through the gaps

D. The converter's oxygen storage material has crystallized and separated from the substrate surface, creating loose granules that produce the rattling sound at idle

21. A vehicle has a persistent P0172 code (System Too Rich, Bank 1). Long-term fuel trim is −18% at idle and −15% at cruise. What is the ECM doing with these negative fuel trim values?

A. The ECM is subtracting fuel from the base calculation because the oxygen sensor detects a persistently rich condition that requires the ECM to reduce fuel delivery to compensate

B. The ECM is adding fuel to the base calculation because the negative sign indicates a fuel deficiency that the ECM is correcting by increasing the injector pulse width

C. The ECM is retarding ignition timing by 18% and 15% respectively to compensate for the rich condition detected by the downstream oxygen sensor catalyst monitor

D. The ECM has reached its maximum correction limit and is storing the code because it cannot subtract enough fuel to bring the air-fuel ratio to the stoichiometric target

22. A diesel engine's DEF quality warning light illuminates. The scan tool reports that the DEF concentration is below the acceptable threshold. What could cause this condition?

A. The DEF heater element has failed, allowing the DEF to freeze and change its concentration as the water and urea separate during the freeze-thaw cycling process

B. The SCR catalyst has degraded and is no longer converting NOx efficiently, causing the NOx sensor to report a fault that the system attributes to poor DEF quality

C. The DEF pump is producing insufficient pressure to properly atomize the DEF during injection, causing the NOx sensor to detect reduced SCR efficiency from poor mixing

D. The DEF has been diluted with water, the wrong fluid was added to the DEF tank, or the DEF has degraded from age or heat exposure, reducing its urea concentration

23. A four-cylinder engine has a P0340 code (Camshaft Position Sensor Circuit Malfunction) and a no-start condition. The CKP sensor signal is confirmed good. What is the most likely operational consequence of a missing CMP sensor signal?

A. The engine cannot determine ignition timing because the CMP sensor is the primary timing reference that controls spark advance for all cylinders during operation

B. The engine loses the ability to identify which cylinder is on its compression stroke, preventing sequential fuel injection and potentially preventing the engine from starting

C. The engine cannot calculate vehicle speed because the CMP sensor signal is used by the ECM as a secondary input to the vehicle speed calculation algorithm

D. The engine loses its ability to control variable valve timing because the CMP sensor is the VVT system's sole reference for camshaft phaser position and control

24. An engine has a P0128 code and the scan tool shows the coolant temperature reaches only 72°C after twenty minutes of driving. The thermostat rated temperature is 90°C. In addition to poor fuel economy, what other symptom would the technician expect to observe?

A. The engine oil pressure would be dangerously low because the thin oil at the lower operating temperature cannot maintain adequate pressure at bearing surfaces

B. The exhaust system would produce an unusually loud rumble because the reduced temperature prevents the exhaust components from expanding to their normal sealing fit

C. The catalytic converter would overheat because the ECM increases ignition advance to compensate for the low temperature, creating higher exhaust gas temperatures

D. The cabin heater output would be reduced because the heater core receives coolant at 72°C instead of the 90°C+ needed for effective heat transfer to the cabin air

25. An engine's PCV valve is removed and inspected. The valve does not rattle when shaken and does not allow air to pass through in either direction. What condition does this indicate?

A. The PCV valve is stuck closed and must be replaced, because a functioning valve should rattle freely and allow metered airflow through it when shaken and tested

B. The PCV valve is functioning correctly, because a properly sealed PCV valve should not allow air to pass or rattle when removed from the engine and tested in isolation

C. The PCV valve has been installed backwards and the flow direction indicator must be checked before reinstallation to ensure correct orientation in the system

D. The PCV valve is a variable-flow electronic type that does not rattle because it uses a solenoid-controlled orifice rather than a spring-loaded mechanical plunger design

26. A five-gas exhaust analyzer shows the following readings at idle on a warm engine: HC = 450 ppm (high), CO = 0.3% (normal), CO_2 = 12% (low), O_2 = 4.5% (high). What condition do these readings indicate?

A. A rich air-fuel mixture that is providing excess fuel, as evidenced by the high HC and CO readings combined with the low CO_2 and O_2 levels in the exhaust stream

B. An engine misfire, because the high HC (unburned fuel) combined with high O_2 (unburned oxygen) and low CO_2 (incomplete combustion) indicates fuel that passed through a cylinder without burning

C. A lean air-fuel mixture that is not providing enough fuel, as evidenced by the high O_2 reading that indicates excess oxygen passing through the combustion chambers unburned

D. A catalytic converter that has failed, because the high HC at the tailpipe indicates the converter is not oxidizing the hydrocarbons that a functioning converter would reduce to normal

27. A vehicle has an intermittent stalling condition that occurs only during deceleration from highway speed to a stop. The engine restarts immediately with no difficulty. What is the most likely cause?

A. The mass airflow sensor is contaminated and underreporting airflow during the rapid throttle-close transition, causing the ECM to cut fuel excessively during deceleration

B. The fuel pump check valve is leaking, allowing fuel rail pressure to drop during the deceleration fuel-cut period, and the low pressure prevents reliable restart of fueling at idle

C. The crankshaft position sensor is losing its signal during the rapid RPM change of deceleration, causing the ECM to lose its timing reference and allowing the engine to stall

D. The idle air control system — throttle body carbon buildup, IAC valve fault, or electronic throttle motor sticking — cannot open fast enough to catch the engine at idle RPM during the rapid deceleration transition

28. A diesel engine has a fuel system that will not prime — the hand primer pump feels spongy and the engine cranks but will not start. Clear fuel (no air bubbles visible) eventually flows from the bleed point after extended priming. What does the spongy primer feel and difficulty priming indicate?

A. Air is entering the fuel system through a compromised seal, cracked fitting, or deteriorated fuel line between the tank and the injection pump, preventing the system from maintaining prime

B. The fuel filter element is saturated and disintegrating internally, releasing particles that are blocking the passages and preventing fuel from flowing through the filter housing

C. The fuel return line from the injectors is restricted, creating backpressure that prevents the primer pump from drawing fuel through the supply side of the system effectively

D. The fuel tank pickup tube has cracked below the fuel level, allowing the tube to draw air from above the fuel surface instead of pulling fuel from below the surface

29. A GDI engine with 85,000 km has rough idle, reduced power, and multiple random misfire codes. A borescope inspection through the intake ports shows heavy carbon buildup on the intake valves. What is the recommended service to address this condition?

A. Perform an intake valve carbon cleaning using walnut shell blasting, chemical soak treatment, or manual removal to restore proper airflow past the valves into the combustion chambers

B. Replace all intake valves with new components because carbon-contaminated valves cannot be cleaned to a condition that restores their original sealing and flow performance

C. Add a fuel system cleaning additive to the fuel tank and drive the vehicle for 500 km to allow the cleaning chemicals to dissolve the carbon deposits from the intake valve surfaces

D. Reprogram the ECM with an updated calibration that compensates for the intake restriction by adjusting the fuel delivery and ignition timing to the carbon-affected engine condition

30. A diesel engine's DPF pressure differential reading on the scan tool shows 0.0 kPa at all engine speeds and loads. The DPF was recently replaced. What is the most likely cause of the zero reading?

A. The new DPF is of a different design that does not produce a measurable pressure differential during normal operation because it uses a flow-through rather than wall-flow filtration

B. The DPF pressure differential sensor is reading correctly because a brand-new DPF has zero soot loading, and the pressure differential will increase gradually as soot accumulates over time

C. The DPF pressure differential sensor's sampling tubes are disconnected, kinked, or blocked — preventing the sensor from measuring the actual pressure difference across the DPF

D. The new DPF is defective with an internal bypass that allows exhaust gas to pass through without being filtered, creating zero backpressure and zero pressure differential reading

31. An engine has an intermittent check engine light with a P0420 code that sets only during extended highway driving and never during city driving. What driving condition during highway operation makes the catalyst monitor more likely to detect reduced converter efficiency?

A. Highway driving produces consistently high exhaust temperatures that cause the converter substrate to expand and temporarily lose its catalytic coating effectiveness

B. The sustained steady-state conditions of highway cruising allow the ECM's catalyst monitor to run its full diagnostic test, which requires stable speed and load conditions to complete

C. Highway driving produces higher exhaust flow volumes that exceed the degraded converter's reduced capacity, making its inefficiency more detectable to the downstream sensor

D. The ECM disables catalyst monitoring during city driving to prioritize misfire detection, and only activates the catalyst monitor algorithm during sustained highway speed conditions

32. A vehicle has a single U0121 code (Lost Communication with Anti-Lock Brake System Module) stored in the ECM. The scan tool can communicate with all other modules including the instrument cluster, BCM, and TCM. What is the most likely cause?

A. The high-speed CAN bus backbone has a wiring fault between the ECM and the ABS module that is blocking all data transmission on the entire bus segment

B. The ECM has a failed internal CAN transceiver that prevents it from receiving messages from the ABS module while still communicating with all other modules

C. The ABS module has a fault — either in its power supply, ground, CAN bus spur connection, or the module itself — that prevents it from communicating on the network

D. The scan tool is unable to access the ABS module because it uses a different communication protocol than the other modules and requires a specialized scan tool interface

33. After a minor fender-bender collision, a vehicle's airbag warning light is on and the instrument cluster shows several warning indicators. The scan tool reveals multiple U-codes from various modules. Physical inspection shows damage to the wiring harness in the front bumper area. What is the most likely explanation?

A. The collision damaged a section of the CAN bus backbone or a main connector in the front of the vehicle, disrupting communication between modules whose wiring routes through the damaged area

B. The collision triggered a partial airbag deployment that consumed the SRS backup capacitor energy and caused the ACM to disable all other module communication as a protective measure

C. The collision shifted the engine position on its mounts, putting tension on the wiring harness and pulling several module connectors partially out of their sockets throughout the vehicle

D. The collision damaged the vehicle's main battery ground cable at the front frame rail, dropping the system voltage below the minimum threshold for all modules to maintain communication

34. A technician is monitoring CAN bus data using a two-channel oscilloscope connected to DLC pins 6 and 14. The CAN-H trace shows pulses between 2.5V and 3.5V, but the CAN-L trace shows only a flat line at 2.5V with no pulses. What does this indicate?

A. The CAN bus is operating normally in a single-ended mode where only the CAN-H line carries active data and the CAN-L line serves as the voltage reference

B. The oscilloscope's channel 2 probe is faulty or improperly connected, and the reading should be verified by swapping the probe connections between channels

C. The CAN bus is in a degraded operating mode where some modules can still communicate using only the CAN-H signal, but the bus is not functioning correctly

D. The CAN-L line has a fault — either an open circuit, a short to the 2.5V bias voltage, or a driver fault in the module that normally generates the CAN-L complementary signal

35. A vehicle's scan tool shows that the transmission control module's software version is older than the current calibration available from the manufacturer. A TSB recommends updating the TCM software to address a shift quality concern. What equipment is essential for this procedure?

A. A factory-level diagnostic scan tool with internet access to the manufacturer's programming server, since aftermarket scan tools cannot perform module reprogramming

B. A battery charger or power supply maintainer connected to the vehicle battery to ensure stable voltage is maintained throughout the entire programming process

C. A dedicated programming harness that bypasses the vehicle's wiring and connects the scan tool directly to the TCM to prevent data corruption during the software transfer

D. A backup TCM module that can be installed if the programming fails, since a failed programming attempt permanently bricks the original module beyond any recovery

36. A vehicle has intermittent communication faults that correlate with wet weather — the warning lights and communication errors appear during rain or after car washes but clear after the vehicle dries. What is the most likely cause?

A. The alternator's voltage output fluctuates during wet conditions due to belt slippage, and the voltage variations disrupt module communication across the entire network

B. The vehicle's body grounds are corroded and lose their connection when wet conditions increase surface resistance between the ground points and the chassis metal

C. Water is intruding into a CAN bus connector, splice, or module housing, creating corrosion and intermittent contact that disrupts communication when moisture is present

D. The vehicle's antenna system is picking up radio frequency interference from the increased static electricity in the atmosphere during rainstorms, disrupting bus communication

37. What is the primary advantage of using a scan tool to perform bi-directional control tests during electrical system diagnosis?

A. Bi-directional tests allow the technician to measure the resistance of individual components without disconnecting them from the circuit, saving diagnostic time

B. Bi-directional tests allow the technician to read diagnostic trouble codes from modules that are not accessible through the standard OBD II generic scan tool interface

C. Bi-directional tests allow the technician to monitor live sensor data in real time while the vehicle is being driven, providing a record of intermittent fault conditions

D. Bi-directional tests allow the technician to command specific actuators on and off independently, isolating the actuator and its circuit from the module's normal control logic

38. A vehicle has a no-crank, no-start condition. The scan tool cannot communicate with any module. DLC pin 16 reads 12.4V and pins 4 and 5 have good ground. Termination resistance between pins 6 and 14 reads open (infinite). What does the open resistance reading indicate?

A. Both CAN bus terminating resistors are disconnected or their host modules are unpowered, and the bus backbone may have a complete open circuit preventing any communication

B. The CAN bus is functioning normally in a high-impedance idle state, and the open reading is expected when no modules are actively transmitting data on the network

C. The scan tool is not connected properly to the DLC and the infinite reading represents the meter's internal resistance rather than the actual bus termination resistance

D. The OBD II DLC has been damaged by a previously connected aftermarket device that has shorted and destroyed the internal pin connections for CAN-H and CAN-L

39. After installing an aftermarket alarm system, a vehicle develops a parasitic battery drain that flattens the battery within 48 hours. The technician disconnects the aftermarket alarm module and the drain drops to 30 milliamps. What does this confirm?

A. The vehicle's BCM has been damaged by the aftermarket alarm installation and is now drawing excess current even with the alarm module physically disconnected from the circuit

B. The aftermarket alarm system was the source of the excessive parasitic draw, either through its own standby current consumption or by preventing other modules from entering sleep mode

C. The vehicle's battery has been damaged by the repeated deep discharge cycles and must be replaced along with the alarm system removal to fully resolve the drain condition

D. The alternator's rectifier diodes were damaged during the alarm installation and are now allowing reverse current leakage that drains the battery through the charging circuit

40. A vehicle's TPMS warning light is flashing rather than illuminating steadily. According to the TPMS warning system, what does a flashing TPMS light indicate versus a steady light?

A. A flashing light indicates that one tire has a rapid pressure loss (active leak) that requires immediate attention, while a steady light indicates a slow gradual pressure decrease

B. A flashing light indicates the TPMS system has extremely low battery voltage in one or more sensors, while a steady light indicates the sensors are functioning but pressures are low

C. A flashing light indicates that the vehicle has been driven above the TPMS system's maximum speed rating, and the system cannot accurately measure pressures at that speed

D. A flashing light indicates a TPMS system malfunction (sensor, module, or communication fault), while a steady light indicates that actual tire pressure is below the warning threshold

44. A manual transmission makes a grinding noise only when shifting into reverse. Forward gear shifts are smooth and quiet. What is the most likely cause?

A. The reverse gear synchronizer blocking ring is worn and cannot match speeds before engagement, causing the grinding as the gear teeth clash during the shift

B. The clutch is not fully releasing, leaving the input shaft spinning when the driver attempts to engage the non-synchronized reverse gear against the still-rotating countershaft

C. The reverse idler gear bearing has seized, preventing the idler gear from freeing up and meshing properly with the reverse gear on the output shaft during engagement

D. The reverse gear set has developed excessive backlash from repeated harsh reverse engagement, and the grinding is caused by the gear teeth impacting at engagement speed

45. A front-wheel-drive vehicle with an automatic transaxle has a vibration that occurs only during light-throttle driving between 50 and 70 km/h. The vibration disappears completely when the torque converter clutch is electrically disabled using the scan tool. What does this confirm?

A. The engine has a misfire that is transmitted through the locked torque converter and is masked by the fluid coupling when the TCC is unlocked during normal operation

B. The transaxle has an internal bearing fault that is loaded only when the TCC locks the input shaft directly to the engine, and the load is removed when the TCC unlocks

C. The torque converter clutch is the source of the vibration — either the TCC friction material is contaminated, the apply pressure is erratic, or the converter has an internal balance issue

D. The drive axle CV joints are worn and produce vibration only when the drivetrain is directly coupled through the locked TCC, and the fluid coupling dampens the vibration when unlocked

46. On a vehicle with an electronically controlled automatic transmission, the scan tool shows that the transmission fluid temperature is 140°C. The normal operating range is 70°C to 100°C. What is the primary concern with this elevated temperature?

A. The elevated temperature accelerates chemical breakdown of the ATF, degrading its friction properties, lubricating ability, and seal compatibility, leading to accelerated internal wear and potential failure

B. The elevated temperature causes the transmission case to expand beyond its design tolerance, allowing the shaft bearings to develop excessive clearance and producing noise

C. The elevated temperature triggers the TCM to command a limp-mode gear selection that prevents all upshifts and locks the transmission in second gear until the fluid cools

D. The elevated temperature causes the torque converter lock-up clutch to engage prematurely, producing a harsh, direct coupling feel that the driver perceives as a transmission fault

47. A rear-wheel-drive vehicle has a two-piece drive shaft with a center support bearing. The vehicle has a vibration that increases with speed and is felt through the floor. The center support bearing rubber mounting is cracked and sagging. How does this affect the driveline?

A. The cracked center support bearing mount allows the rear section of the drive shaft to vibrate freely without dampening, creating a speed-dependent vibration transmitted to the floor

B. The sagging mount changes the drive shaft angles at the universal joints beyond their operating range, and the speed variation from the increased angles produces the vibration

C. The damaged mount allows the center bearing to overheat from friction, and the thermal expansion of the bearing housing is what creates the vibration felt through the vehicle floor

D. The cracked mount allows the drive shaft to shift forward and backward during acceleration and deceleration, and this fore-aft movement is what the driver perceives as a vibration

48. A technician is replacing a clutch on a vehicle with a concentric slave cylinder (CSC). The new CSC is being prepared for installation. Why must the CSC be bench-bled before installation?

A. The CSC's hydraulic chamber is sealed inside the bell housing after installation, and conventional bleeding through a bleeder valve is impossible because no bleeder is accessible

B. Bench bleeding the CSC pre-loads the release bearing against the pressure plate fingers, ensuring correct engagement depth when the transmission is bolted to the engine

C. The CSC contains a spring-loaded piston that must be hydraulically compressed and locked before installation, and bench bleeding provides the pressure to compress the spring

D. Bench bleeding removes manufacturing residue and test fluid from the CSC's internal bore, replacing it with the vehicle's DOT-rated brake fluid for compatibility with the master cylinder

49. A vehicle's automatic transmission has a P0700 code (Transmission Control System Malfunction) stored in the ECM, along with a P0730 code (Incorrect Gear Ratio) stored in the TCM. The vehicle drives normally in all gears except third, where the engine RPM does not match the expected ratio for the vehicle speed. What does the P0730 code indicate?

A. The transmission gear set has a mechanical failure in the third-gear planetary components that is preventing the correct speed ratio from being achieved

B. The output speed sensor is reporting an incorrect speed to the TCM, creating a calculated gear ratio error that does not reflect an actual mechanical transmission problem

C. The TCM has detected that the actual gear ratio (calculated from input and output speed sensors) does not match the commanded gear ratio, indicating internal slippage or mechanical fault

D. The input speed sensor has failed and is reading zero, causing the TCM to calculate an incorrect ratio for all gears, but the error is only significant enough to trigger a code in third gear

50. A customer reports that their AWD vehicle's steering feels tight during slow parking lot maneuvers on dry pavement, and they hear a binding noise from underneath. The vehicle was recently serviced with new tires — two tires on the front axle are one size larger than the two on the rear. What is causing the symptoms?

A. The mismatched tire sizes are causing a constant speed differential between the front and rear axles, and the AWD center coupling is binding as it tries to compensate for the difference

B. The new front tires have a higher sidewall that has raised the front ride height, changing the steering geometry and increasing the effort required for low-speed turns

C. The front wheel bearings are being overloaded by the larger tires' increased rolling resistance, creating the binding noise and tight steering feel during parking maneuvers

D. The power steering pump cannot generate enough pressure to overcome the increased scrub radius created by the larger front tires during low-speed, full-lock parking turns

51. A vehicle's clutch pedal has no resistance and drops to the floor when pressed. The clutch will not disengage. The fluid level in the clutch master cylinder reservoir is empty. What is the most likely cause?

A. The pressure plate diaphragm spring has broken, removing all spring tension from the clutch system and allowing the pedal to drop freely without engaging the release mechanism

B. The clutch release fork pivot ball has come loose, disconnecting the mechanical linkage between the hydraulic slave cylinder and the release bearing on the pressure plate

C. The flywheel has cracked and shifted, jamming the clutch disc between the flywheel and pressure plate and preventing the hydraulic system from overcoming the mechanical interference

D. A hydraulic leak — at the master cylinder, the slave cylinder, a line fitting, or a failed hose — has allowed the fluid to escape, leaving the system unable to generate hydraulic pressure

52. A four-wheel-drive truck shifts smoothly into 4WD High from 2WD while driving at 40 km/h, but the front axle engagement indicator light does not illuminate and the front wheels are not being driven. What is the most likely cause?

A. The transfer case has successfully shifted into 4WD, but the front axle disconnect mechanism (vacuum-actuated, cable-actuated, or electric motor-actuated) has failed to engage the front axle

B. The front differential has suffered complete internal failure and the ring and pinion gears cannot transmit torque from the front drive shaft to the front axle shafts

C. The transfer case shift motor has failed to complete the shift despite the driver's command, and the vehicle remains in 2WD while displaying a false shift confirmation

D. The front wheel hubs are locked-out in the free-wheeling position and must be manually locked at each wheel before the 4WD system can deliver torque to the front wheels

53. An automatic transmission shifts normally when cold but develops a harsh 3-4 upshift after reaching operating temperature. All other shifts remain smooth at operating temperature. What is the most likely cause?

A. The torque converter's internal damper springs have weakened from heat cycling and transmit engine pulses more harshly during the specific RPM range of the 3-4 shift at operating temperature

B. The transmission main line pressure regulator valve is sticking at operating temperature due to varnish buildup, causing a system-wide pressure increase that affects all shifts equally

C. The 3-4 shift accumulator piston seal has hardened or shrunk at operating temperature, losing its ability to cushion the apply pressure during that specific gear transition event

D. The electronic pressure control solenoid is overheating at operating temperature and commanding maximum line pressure during the 3-4 shift only due to an intermittent electrical fault

54. What maintenance practice is essential for extending the life of the center coupling or transfer case on an AWD vehicle?

A. Replacing all four tires as a matched set (same brand, model, size, and tread depth) to prevent constant speed differentials between axles that stress the coupling

B. Changing the center coupling fluid every 10,000 km regardless of the manufacturer's recommended interval to prevent thermal breakdown of the coupling lubricant

C. Engaging the AWD lock mode for at least ten minutes per month to exercise the coupling's internal clutch pack and prevent the plates from seizing together from disuse

D. Adjusting the center coupling preload every 50,000 km to compensate for the progressive wear of the internal clutch plates that reduces coupling engagement force over time

55. A rear-wheel-drive vehicle has a vibration at 100 km/h that was not present before a U-joint replacement. The new U-joints are confirmed to be properly phased and torqued. What is the most likely cause of the new vibration?

A. The replacement U-joints are a different brand than the originals and have slightly different bearing cap dimensions that alter the drive shaft's balance characteristics

B. The drive shaft was rotated to a different position relative to the differential yoke during reassembly, and the drive shaft must be index-marked and reinstalled in its original orientation

C. The U-joint retaining clips are the wrong size and are allowing the bearing caps to shift microscopically within the yoke bores, creating a vibration that was not present before

D. The replacement U-joints have stiffer needle bearings that have not yet broken in, creating resistance at each joint that produces a vibration until the bearings wear into their bores

56. A vehicle with a dual-clutch automated manual transmission (DCT) has a shudder during low-speed driving and parking lot maneuvers. The shudder feels similar to a manual transmission clutch chatter. What is the most likely cause?

A. The dual-clutch transmission's internal synchronizers have worn and cannot smoothly engage the low-speed gears during the frequent shifting of parking lot maneuvering

B. The DCT's mechatronic unit (the electro-hydraulic control unit) has a faulty pressure regulator that provides inconsistent clamping force to the clutches during slow-speed operation

C. The DCT's shift programming needs a software update because the original calibration does not account for the increased weight of aftermarket wheels installed on the vehicle

D. The DCT's clutch packs have worn or contaminated friction material that prevents smooth, progressive engagement at the low speeds where clutch modulation is most demanding

57. A manual transmission equipped vehicle has difficulty shifting into any gear. The clutch pedal feels normal with proper resistance. When the engine is off, all gears shift smoothly. When the engine is running, shifting into any gear produces grinding. What is the most likely cause?

A. The transmission's synchronizer blocking rings have all worn simultaneously from contaminated transmission fluid that degraded the friction material on every ring in the gearbox

B. The input shaft pilot bearing has seized, preventing the input shaft from decoupling from the crankshaft rotation even when the clutch is fully disengaged by the release system

C. The clutch is not fully releasing — despite normal pedal feel — due to a warped clutch disc, contaminated disc, or hydraulic system fault that limits the slave cylinder's full travel

D. The shift linkage has seized internally and is preventing the shift forks from moving the sliding sleeves into their engagement positions regardless of the clutch release condition

58. What is the primary purpose of the lock-up torque converter clutch (TCC) in an automatic transmission?

A. To create a direct mechanical connection between the engine and transmission at cruising speed, eliminating fluid coupling slippage and improving fuel efficiency by reducing parasitic energy loss

B. To multiply engine torque during acceleration from a stop by adding mechanical clamping force that supplements the fluid coupling's hydrodynamic torque multiplication effect

C. To provide engine braking during deceleration by locking the transmission input shaft to the engine, forcing the engine to absorb the vehicle's kinetic energy through compression braking

D. To prevent the torque converter from overheating during towing by bypassing the fluid coupling with a direct mechanical connection that eliminates the heat-generating fluid shearing action

59. A vehicle's automatic transmission has a delayed engagement into reverse gear only — there is a 3-to-4-second delay before the vehicle begins moving backward. The engagement into all forward gears is immediate. What is the most likely cause?

A. The torque converter's stator one-way clutch is freewheeling in both directions, reducing the converter's ability to multiply torque during the initial reverse engagement event

B. The reverse gear band servo has a leaking piston seal that requires additional time to build sufficient hydraulic pressure to fully apply the band and engage reverse gear

C. The transmission oil pump has worn to the point where it cannot generate adequate line pressure at idle RPM to quickly fill the reverse circuit's apply volume within normal time

D. The reverse band or clutch has a worn piston seal or leaking apply circuit that requires additional time to build enough pressure to fully engage the reverse friction element

60. A vehicle is equipped with an active on-demand AWD system that uses an electronically controlled rear differential coupling. Under what condition would the coupling disengage the rear axle entirely?

A. During highway cruising at constant speed where no wheel slip is detected, the rear axle can be disconnected to reduce parasitic losses and improve fuel economy by approximately two to five percent

B. During reverse gear operation, the coupling disconnects the rear axle because the AWD control algorithm does not support reverse gear torque distribution to the rear wheels in any condition

C. During ABS activation on the front wheels, the coupling disconnects the rear axle to prevent the rear wheels from continuing to receive torque while the front wheels are being braked

D. During high-speed cornering, the coupling disconnects the rear axle to prevent the rear wheels from pushing the vehicle into an understeer condition beyond the stability control's correction capability

61. A technician is performing a parasitic draw test. After connecting the milliamp meter in series with the battery negative cable and waiting 45 minutes, the reading shows 28 milliamps. The vehicle is a modern sedan with keyless entry, security system, and multiple modules. Is this reading acceptable?

A. The reading is dangerously high and indicates a significant parasitic draw that will flatten the battery within 24 hours if not diagnosed and repaired immediately

B. The reading exceeds the acceptable range because any modern vehicle should draw less than 10 milliamps in sleep mode, indicating a module fault

C. The reading is within the normal acceptable range of 25 to 50 milliamps for a modern vehicle with multiple modules maintaining keep-alive memory in sleep mode

D. The reading is marginally high and suggests that one module is drawing slightly more than expected, requiring further investigation to prevent eventual battery discharge

62. A vehicle's left headlamp does not illuminate on low beam. The right headlamp low beam works normally. The left headlamp's high beam works normally. The low beam bulb has been replaced with a known-good unit and the problem persists. What should be investigated?

A. The supply circuit for the left low beam — the fuse, relay contact, wiring, and connector specific to the left low-beam circuit — since the high beam working confirms the ground is good

B. The headlamp switch, since a single failed contact within the switch could prevent the left low beam from receiving power while allowing the right side to function normally

C. The BCM output driver for the left headlamp, since the BCM controls each headlamp independently through individual solid-state output switches on modern vehicles

D. The left headlamp housing ground, since a poor ground would prevent both the low beam and high beam from functioning, but the high beam working proves the ground is intact

63. A vehicle has a no-crank condition. The battery tests good and is fully charged at 12.6V. When the key is turned to the start position, all dash lights go out and nothing happens — no click, no crank. What is the most likely cause?

A. The starter motor has failed internally with an open circuit in the armature winding, preventing any current flow when the solenoid contacts close at the start signal

B. The ignition switch has a worn start contact that fails to send the start signal to the starter relay, and the dash lights dim because the switch draws power during the failed start attempt

C. The battery cables are corroded or loose at the battery terminals, causing such high resistance that the battery voltage collapses to near zero when the starter circuit demands high current

D. The battery cables have excellent connection at the battery terminals, but the cable-to-terminal connections appear clean despite having internal corrosion that is invisible from the outside

64. A vehicle's alternator has been replaced, but the battery warning light remains on with the engine running. The new alternator output measures 14.3V at the alternator B+ terminal. The battery measures 14.2V at its positive terminal. What is the most likely cause of the persistent warning light?

A. The alternator's output voltage of 14.3V is below the minimum threshold required to extinguish the battery warning light on this vehicle's instrument cluster

B. The battery warning light circuit uses a separate sense wire from the alternator that detects field current flow, and this wire was not reconnected during the alternator replacement

C. The new alternator has an incompatible internal voltage regulator that produces the correct voltage but generates a fault signal that the instrument cluster interprets as a charging fault

D. The battery's internal resistance has increased to the point where it cannot accept the alternator's charging current, and the instrument cluster detects the low charging current as a fault

65. A circuit is protected by a 15-amp fuse. The circuit contains a motor that normally draws 10 amps. The fuse blows repeatedly every time the motor is turned on. What is the most likely cause?

A. The fuse is the incorrect rating for the circuit and should be replaced with a 20-amp fuse to accommodate the motor's normal operating current plus an adequate safety margin

B. The motor is drawing normal current and the fuse is defective with a lower-than-rated internal element that opens at 10 amps instead of the marked 15-amp rating on the fuse

C. The motor is drawing more than 15 amps due to a seized bearing, shorted winding, or other internal fault that has increased its current draw beyond the fuse's rated capacity

D. The power supply wire to the motor is the incorrect gauge and cannot handle the 10-amp draw, causing it to heat up and induce a sympathetic failure in the fuse through thermal conduction

66. A technician measures 12.3 volts at the supply wire of a blower motor connector and 0.0 volts at the ground wire, both measured to chassis ground, with the blower commanded on. The motor does not run. What is the fault?

A. The blower motor has an internal open circuit — supply voltage is present and the ground is connected, but the motor cannot pass current because its winding or brush connection is broken internally

B. The blower motor ground wire is open — the 0.0V reading at the ground wire to chassis ground should read near battery voltage if the circuit were complete, indicating the motor ground is disconnected

C. The blower motor speed controller is commanding zero voltage to the motor because the HVAC module is in a fault mode that prevents blower operation regardless of the switch position

D. The blower motor relay is stuck in the open position and is not providing full battery voltage to the motor, despite the 12.3V reading which represents residual voltage from the relay's coil circuit

67. A vehicle's rear defroster timer activates the grid for its normal 10-minute cycle, but the rear window does not clear. The timer light on the dash illuminates normally. What should be checked first?

A. The HVAC control module for a fault code that indicates the defroster circuit is commanded on but the module is not providing the high-current output to the defroster grid

B. The voltage at the defroster grid connector while the system is activated to verify that full battery voltage is reaching the grid through the relay and wiring for the defroster circuit

C. The rear window glass for delamination of the defroster grid from the glass surface, which would make the grid visible but electrically disconnected from the bus bars at the edges

D. The fuse for the rear defroster circuit, which may have blown from an overcurrent condition while the timer relay still functions normally because it is powered from a different fuse

68. A vehicle's horn sounds continuously and cannot be stopped by pressing or releasing the horn button. Disconnecting the horn relay stops the noise. What is the most likely cause?

A. The horn button switch inside the steering wheel has failed in the closed position, continuously grounding the horn relay coil circuit and holding the relay energized

B. The horn relay has welded its internal contacts closed, and the relay is providing continuous power to the horns regardless of the horn button switch position or input signal

C. The clockspring has developed an internal short circuit between the horn wire and the airbag wire, creating a continuous ground signal to the horn relay through the airbag circuit

D. The horn relay has failed in the energized position due to an internal fault in the relay coil that causes it to remain magnetized even without current flowing through the coil windings

69. A vehicle with automatic headlamps has a complaint that the headlamps stay on for several minutes after the vehicle is parked and the ignition is turned off. Is this a fault?

A. No — this is a normal feature called "headlamp delay" or "follow-me-home" lighting, where the headlamps remain on for a programmed duration after the ignition is off to illuminate the driver's path

B. Yes — the headlamp control module has a faulty timer circuit that is not de-energizing the headlamp relay at the correct time after the ignition switch signals the off state

C. No — the headlamps are powered through a separate circuit that is not controlled by the ignition switch and requires the driver to manually turn them off using the headlamp switch

D. Yes — the BCM has lost its headlamp delay configuration during a previous software update and needs to be reprogrammed to disable the delay function that was accidentally enabled

70. A vehicle's A/C system has adequate cooling at the vents when the vehicle is moving at highway speed, but the cooling diminishes significantly at idle with the vehicle stationary. What is the most likely cause?

A. The compressor is weak and cannot maintain adequate system pressures at idle RPM because the reduced compressor speed limits the refrigerant circulation rate

B. The evaporator is partially restricted with debris, and the reduced airflow at idle allows frost to build on the restricted section, further reducing cooling capacity

C. The condenser airflow is insufficient at idle — the condenser fan is inoperative, operating at reduced speed, or the condenser face is blocked with debris, preventing adequate heat rejection

D. The refrigerant charge is slightly low, and the reduced compressor speed at idle cannot compensate for the charge deficit that is masked by higher compressor output at highway RPM

71. A vehicle's power windows all operate from the driver's master switch, but the passenger front window does not operate from its own door switch. All other individual door switches work normally. What is the most likely cause?

A. The BCM has a fault in the passenger front window output circuit that prevents it from processing commands from the individual door switch but allows master switch commands

B. The passenger front door window switch has failed, since the window operates from the master switch (proving the motor, regulator, and wiring are functional) and only the local switch is non-functional

C. The wiring between the passenger door switch and the driver's master switch has an open circuit that prevents the local switch signal from reaching the master switch logic for processing

D. The window motor has a fault that allows it to respond to the higher-voltage signal from the master switch but not the lower-voltage signal from the individual door switch

72. A technician is testing an engine coolant temperature sensor using a DVOM. With the engine cold (ambient temperature approximately 20°C), the sensor reads 3,000 ohms. After warming the engine to operating temperature (95°C), the sensor reads 200 ohms. The manufacturer's specifications are 2,500 ohms at 20°C and 250 ohms at 95°C. What is the conclusion?

A. The sensor is within acceptable tolerance at operating temperature but reads high at cold temperature, indicating it is near the end of its service life and should be replaced preventively

B. The sensor readings are close to specification but not exact, which is normal for thermistor-type sensors that have a tolerance range. The sensor should be compared to the ECM's expected values

C. The sensor has failed and is reading incorrectly at both temperatures, since the cold reading is 500 ohms above specification and the hot reading is 50 ohms below specification

D. Both readings deviate from specification by a consistent percentage, indicating the sensor has drifted from calibration and will produce inaccurate temperature data that affects ECM calculations

73. A vehicle's scan tool data shows that the A/C compressor is commanded off by the ECM even though the driver has selected A/C on the climate control panel. The ambient temperature is 35°C. What are the possible reasons the ECM would override the driver's A/C request?

A. The ambient temperature is too high for the A/C system to operate safely, and the ECM disables the compressor when the outside temperature exceeds 32°C to protect the system from overheating

B. The A/C system is fully charged but the evaporator temperature sensor is reading below freezing, and the ECM has disabled the compressor to prevent evaporator freeze-up and potential core damage

C. The ECM overrides the A/C command when system conditions are unfavorable — such as engine overheating, wide-open throttle, low idle RPM, low refrigerant pressure, or high compressor head pressure

D. The A/C refrigerant pressure is exactly at the specification level, and the ECM disables the compressor when the system is at optimal charge to prevent overcharging from the compressor's continued operation

74. A vehicle's ADAS forward collision warning system produces a "Sensor Blocked" message during heavy rain. The system returns to normal operation after the rain stops and the sensor area is dry. What is the explanation?

A. The radar or camera sensor's detection capability is temporarily degraded by heavy rain, snow, ice, or debris covering the sensor surface, and the system alerts the driver that it cannot function reliably

B. The ADAS control module has a moisture-sensitive circuit that malfunctions when humidity exceeds a threshold, and the module recovers automatically when the moisture level drops

C. The ADAS sensor heater has failed, allowing condensation to form on the sensor lens during temperature changes associated with rain, and the heater must be replaced to resolve the issue

D. The vehicle's windshield wiper speed sensor is sending a high-speed wiper signal to the ADAS module, which interprets heavy rain as a condition where forward visibility is too poor for the system

75. A vehicle with electronic power steering has a DTC for EPS motor overcurrent. The steering works but the technician notices that the steering wheel requires slightly more effort than normal. What is the most likely cause?

A. The EPS motor is aging and its internal winding resistance has increased, drawing more current than normal to produce the same assist force output against the steering load

B. A mechanical steering system issue — such as a binding tie rod end, a dry ball joint, or low tire pressure — is increasing the steering effort required, causing the EPS motor to draw more current to compensate

C. The PSCM's internal power transistors have degraded and are limiting the maximum current available to the EPS motor, reducing assist and triggering the overcurrent code simultaneously

D. The vehicle battery has a weak cell that drops voltage during EPS motor activation, causing the module to calculate higher-than-normal current draw from the reduced voltage during assist events

76. A customer reports that the vehicle's headlamps flicker rapidly when the engine is turned off and the ignition is in the accessory position. The headlamps work normally with the engine running. What is the most likely cause?

A. The headlamp relay has intermittent contact points that vibrate when the system voltage is lower in the accessory position, causing the relay to chatter and the lamps to flicker

B. The alternator's internal field coil is creating an electromagnetic pulse when the engine stops that interferes with the headlamp control module's output signal for several seconds

C. The headlamp bulbs are at the end of their service life and the reduced voltage in the accessory position is below the minimum threshold for stable filament illumination

D. The battery voltage in the accessory position is below the minimum input voltage for the headlamp control module, causing the module to cycle its output as it repeatedly attempts to start up

77. What is the correct interpretation when a DVOM reads "OL" (over limit) during a resistance measurement across a circuit component?

A. The component has an open circuit — infinite resistance — meaning no electrical path exists through the component, which could indicate a broken wire, burned fuse, or failed internal connection

B. The component has zero resistance — a dead short — meaning the meter cannot display the value because it exceeds the meter's maximum display capability at the selected range

C. The meter is connected to an energized circuit and the voltage present is overloading the ohmmeter function, which must be disconnected from power before resistance can be measured

D. The component resistance is above the meter's currently selected range but within normal limits, and the technician should switch to a higher ohm range to obtain an accurate reading

78. A vehicle's A/C system has been recharged to the correct weight after a leak repair. The system cools well at first but loses cooling capacity over several hours of operation. The compressor cycles normally. Manifold gauge pressures are slightly low. What is the most likely cause?

A. The evaporator temperature sensor has a calibration drift that gradually commands the compressor off for longer periods as the system stabilizes at operating temperature

B. The receiver-drier or accumulator was not replaced during the leak repair, and the saturated desiccant is releasing moisture into the system that is gradually freezing at the expansion device

C. The repair did not fully seal the original leak, and the system is slowly losing refrigerant through the residual leak during operation, progressively reducing the charge and cooling capacity

D. The new refrigerant charge is a slightly different formulation than the original, and the system's expansion device cannot properly meter the alternate refrigerant at the correct flow rate

79. A vehicle's heated seats work on the driver's side but not on the passenger's side. The passenger seat heater switch illuminates and appears to function. What should be checked first?

A. The heated seat control module for a fault code related to the passenger seat heater circuit that would indicate an electrical fault in the module's output driver for that seat

B. The passenger seat heater element's resistance using a DVOM to determine if the heating element has an open circuit that prevents current flow despite the switch commanding it on

C. The BCM for a software fault that prevents it from sending the correct activation signal to the passenger seat heater relay through the CAN bus communication network

D. The fuse for the passenger seat heater circuit, since individual seats often have separate fuses and a blown fuse would disable the heater while leaving the illuminated switch operational

80. A vehicle with a cabin air filter has a noticeable reduction in airflow from all vents at all blower speeds. The blower motor sounds normal. What is the most likely cause?

A. The blend door is stuck in a partially closed position that restricts airflow through both the heater core and evaporator paths simultaneously at all blower speed settings

B. The evaporator core is severely clogged with debris from an unfiltered period when the cabin air filter was missing, restricting airflow through the core at all fan speeds

C. The HVAC ductwork has collapsed from heat damage near the heater core, reducing the internal cross-sectional area of the ducts downstream of the blower motor

D. The cabin air filter is severely clogged with debris, restricting the airflow that the blower motor can draw through the filter before pushing it through the evaporator and heater core

81. A vehicle has an ADAS lane departure warning system that works correctly on highways with clear lane markings but does not function on rural roads without painted lane markings. Is this a system fault?

A. No — camera-based lane departure systems require visible lane markings (painted lines) to function, and the system correctly deactivates when markings are absent or not detectable

B. Yes — the ADAS camera has a calibration fault that prevents it from detecting road edges and shoulders, which should serve as lane boundaries when painted markings are absent

C. No — the system is designed to function only on highways and automatically disables when the vehicle speed drops below the highway speed threshold in rural areas

D. Yes — the ADAS control module has a software fault that limits its detection algorithm to high-contrast painted lines and cannot process lower-contrast road edge boundaries

82. A vehicle's power sunroof opens and closes but the express-close feature does not work — the driver must hold the switch continuously to close the roof. The express-open feature works normally. What is the most likely cause?

A. The sunroof motor is weakening and cannot generate enough force to close against the seal resistance without the driver holding the switch to provide a continuous power command

B. The sunroof limit switch for the closed position has failed, preventing the control module from knowing when the roof has reached full close, so it disables express-close as a safety measure

C. The express-close auto-reverse function has lost its calibration due to a battery disconnection or module reset and requires reinitialization to restore the express-close feature

D. The sunroof seal has expanded from heat or deteriorated from age, increasing the closing resistance beyond the motor's express-close force threshold and triggering the anti-pinch reversal

83. A technician performs a battery discharge test on a vehicle. The battery has a CCA rating of 600 amps. At what load and for how long should the battery be tested using a carbon pile load tester?

A. Load the battery at 300 amps (half the CCA rating) and hold the load for 30 seconds to evaluate the battery's ability to sustain voltage under extended load conditions

B. Load the battery at 300 amps (half the CCA rating) for 15 seconds — voltage should remain above 9.6 volts at the end of the test at a battery temperature of 21°C or above

C. Load the battery at 600 amps (full CCA rating) for 10 seconds to simulate the actual cranking load the battery must deliver during a real-world engine start event at full capacity

D. Load the battery at 150 amps (one-quarter of the CCA rating) for 60 seconds to evaluate the battery's sustained discharge capability under a moderate continuous load condition

84. A vehicle has a drift to the right that requires constant steering correction to maintain a straight path. Alignment is within specification on all four wheels. Tire pressures are equal on both sides. The road surface is flat and level. Swapping the front tires left-to-right does not change the drift direction. What should be investigated next?

A. The rear alignment thrust angle, which may be subtly off-specification and creating a directional bias that is not corrected by front alignment adjustments or tire swapping

B. The brake system for a caliper that is dragging on one side, creating an asymmetric braking force that pulls the vehicle in one direction during driving even without brake application

C. The steering gear for internal asymmetric assist that is providing more hydraulic pressure in one direction than the other due to worn internal valve lands or seal degradation

D. The suspension for sagging springs on one side that have lowered the ride height unevenly, changing the camber and caster geometry beyond what the alignment machine can detect

85. A vehicle has a clunking noise from the front end when driving over bumps at low speed. The noise occurs once per bump — a single clunk, not a rattle. The sound is on the driver's side. During inspection, the technician finds the upper strut mount is intact, the stabilizer bar end links are tight, and the lower ball joint has no detectable play. What else should be checked?

A. The strut itself for a broken internal piston rod or a failed internal valve that allows the strut to bottom out on compression, producing a single hard clunk with each bump impact

B. The brake caliper for loose mounting bolts that allow the caliper to shift on its bracket when the suspension compresses, producing a single clunk as it contacts the bracket's travel stop

C. The wheel lug nuts for proper torque, since a slightly loose wheel can produce a single clunk over bumps as the wheel shifts on the hub face before seating against the studs

D. The engine or transmission mounts on the driver's side for excessive movement that allows the powertrain to contact the subframe during suspension compression over bumps

86. A customer complains that the steering wheel is centered during straight driving but the vehicle wanders — it does not track straight and requires frequent minor corrections. Alignment angles are within specification. What is the most likely cause?

A. The tire tread depth is uneven between the left and right sides, creating asymmetric rolling resistance that causes the vehicle to drift randomly in response to varying road surface conditions

B. The power steering system has excessive internal leakage that creates inconsistent assist levels, causing the steering to feel vague and requiring constant correction by the driver

C. Worn steering and suspension components — tie rod ends, ball joints, control arm bushings, or rack mount bushings — that have play within specification but collectively create looseness

D. The steering column universal joints are worn, creating a dead zone in the steering where small inputs at the wheel are absorbed before reaching the rack and producing wheel movement

87. A brake pedal has a firm feel but the braking force seems disproportionately low — the vehicle takes longer to stop than expected despite firm pedal pressure. No warning lights are illuminated. What is the most likely cause?

A. The brake master cylinder bore has a scoring defect that creates friction between the piston seals and the bore, providing pedal resistance without generating proportional hydraulic pressure

B. The brake pads have glazed friction surfaces from overheating, providing a firm pedal feel (because the hydraulic system is functioning) but reduced stopping power from the degraded friction coefficient

C. The ABS hydraulic control unit has a restriction in one or more of its internal passages that limits the fluid flow to the caliper circuits and reduces the effective braking pressure at the wheels

D. The brake fluid has absorbed moisture and the water content has reduced the fluid's ability to transmit hydraulic pressure efficiently, creating a disparity between pedal feel and braking force

88. An alignment technician discovers that the right front camber cannot be adjusted to specification — the adjustment mechanism is at its limit. What does this indicate?

A. The alignment machine is miscalibrated on the right front sensor head and needs to be recalibrated before the alignment can be completed accurately on that corner of the vehicle

B. The right front tires are a different size than the left front, creating an apparent camber difference that is actually a tire size discrepancy rather than a true suspension geometry issue

C. The right front alignment adjustment hardware (cam bolts, eccentric bolts, or shims) has been incorrectly installed or has reached maximum adjustment, requiring replacement with the correct parts

D. A bent or damaged suspension component — such as a control arm, strut, knuckle, or subframe — has shifted the geometry beyond the range of the normal adjustment mechanism

89. A vehicle with four-wheel disc brakes has the parking brake adjusted through the rear caliper piston mechanism. When the parking brake is applied, the rear wheels lock. When the parking brake is released, the rear brakes drag noticeably and the rear wheels are difficult to spin by hand. What is the most likely cause?

A. The rear brake pads are contaminated with grease from a CV boot failure and the contamination is causing the pads to grab the rotors even when the parking brake is fully released

B. The rear brake rotor surface has become glazed from overheating and the glazed surface provides unpredictable friction that alternates between grabbing and releasing as the rotor rotates

C. The parking brake cable is over-adjusted or the cable mechanism is not fully releasing, keeping the caliper piston partially applied against the rotor even when the parking brake lever is down

D. The rear caliper piston seals have deteriorated and are not retracting the pistons when the parking brake is released, leaving the pads in contact with the rotors and creating the drag condition

90. A vehicle's tires were balanced on a static wheel balancer. The vehicle still has a vibration at highway speed that is felt through the steering wheel. What improvement in the balancing method could resolve this?

A. Rebalance the tires using a dynamic (spin) wheel balancer that detects and corrects both static and dynamic (couple) imbalance, which a static balancer cannot detect or correct

B. Rebalance the tires using heavier balance weights than the previous attempt to provide more counterforce against the imbalanced mass causing the highway speed vibration

C. Rebalance the tires using adhesive (tape) weights instead of clip-on weights, since adhesive weights are mounted on the inside of the wheel and provide more effective counterbalancing

D. Rebalance the tires on the vehicle using a portable on-car balancer that accounts for the hub, rotor, and brake components that a bench balancer cannot include in its measurement

91. A vehicle's electronic stability control system intervenes during a lane change on a dry highway. The intervention feels like a momentary brake application that slows the vehicle slightly. The ESC light flashes during the event. Is this normal?

A. No — ESC should not activate during a normal lane change on dry pavement, and the activation suggests a faulty yaw rate sensor or steering angle sensor that needs recalibration

B. It depends on the speed and abruptness of the lane change — ESC may intervene during an aggressive lane change if the system detects that the vehicle's actual path is deviating from the driver's intended path

C. No — the ESC system should only activate during hard braking events, not during steering maneuvers, indicating the system has a fault that is causing false activation during normal driving

D. Yes — ESC always activates during lane changes as a standard safety measure to ensure the vehicle maintains stable tracking throughout the lateral weight transfer of the direction change

92. A tire has a tread depth of 2/32" across the entire tread face. The tire wear indicators are level with the tread surface. What is the service recommendation?

A. The tire is approaching its minimum tread depth and should be monitored at each service visit for continued wear, with replacement recommended within the next 10,000 km of driving

B. The tire has adequate tread remaining for dry-weather driving but should be replaced before winter due to the reduced traction performance in wet and snowy conditions at this depth

C. The tire is at the legal minimum tread depth for safe vehicle operation and should be rotated to a rear position where reduced traction has less impact on vehicle steering and stability

D. The tire has reached its minimum legal tread depth and must be replaced — 2/32" is the legal minimum in Canada, and the visible wear indicators confirm the tire is at the replacement point

93. What causes the brake pedal to drop slightly when the ABS activates during a hard braking event on a slippery surface?

A. The ABS hydraulic pump motor vibrates the brake fluid lines, and the driver feels this vibration through the pedal as a pulsating pedal drop during the rapid cycling of the ABS system

B. The ABS dump valves release hydraulic pressure from the caliper circuits into the accumulator, momentarily reducing the pedal pressure, and the return pump restores the pressure cyclically

C. The ABS system activates the brake booster vacuum valve, increasing the boost ratio and allowing the pedal to travel further as the booster provides more assist during the ABS intervention

D. The master cylinder primary piston seal momentarily bypasses during the ABS pressure modulation, creating a brief internal leak that allows the pedal to drop before the seal re-seats

94. A vehicle with a rack-and-pinion steering system has a fluid leak from the driver's side inner tie rod boot. The boot is swollen and full of fluid. What is the source of the leak?

A. The rack's internal seal on the driver's side has failed, allowing power steering fluid to leak past the piston seal into the bellows boot rather than dripping on the ground externally

B. The inner tie rod end has a grease-filled joint that has ruptured its internal seal and released its factory grease fill into the boot, creating the appearance of a fluid leak from the rack

C. The power steering return line has a leak at a fitting above the rack that is dripping fluid onto the boot exterior, and the fluid is pooling inside the boot through a small hole in the rubber

D. The steering rack mount bushing is deteriorating and releasing its internal lubricant into the bellows boot area through a gap in the rack housing seal near the tie rod exit point

95. A vehicle has a pulsating brake pedal. The technician measures brake rotor thickness variation (DTV) on both front rotors. The left front rotor has 0.008 mm DTV and the right front rotor has 0.035 mm DTV. The maximum allowable DTV is 0.013 mm. What is the correct repair?

A. Resurface both front rotors to ensure both sides have identical thickness and surface finish, even though only the right rotor exceeds the specification for thickness variation

B. Resurface or replace the right front rotor only, since it exceeds the DTV specification at 0.035 mm, while the left rotor at 0.008 mm is within the 0.013 mm maximum specification

C. Replace both front rotors, since resurfacing removes material and may bring one or both rotors below the minimum thickness specification if excessive material must be removed

D. Replace the right front rotor only and perform a rotor runout check on the new rotor after installation to verify it does not exceed the runout specification that causes DTV development

96. A vehicle has a rear wheel bearing noise that becomes louder as vehicle speed increases. The technician raises the vehicle and spins each rear wheel by hand. Both rear wheels spin freely with no noise or roughness detectable. Why might the bearing noise not be reproducible on the lift?

A. The wheel bearing noise only occurs when the bearing is under the vertical load of the vehicle's weight, which is removed when the wheel is hanging freely off the ground on the lift

B. The wheel bearing noise is actually a tire noise caused by irregular tread wear that produces a sound similar to a bearing hum, and the tire noise disappears when the tire is not in contact with the road

C. The wheel bearing noise is speed-dependent and the hand-spin speed is too low to reproduce the frequency at which the damaged bearing produces its characteristic noise during driving

D. The wheel bearing noise is actually being produced by the differential ring and pinion gears, which are loaded during driving but unloaded when the wheels are spinning freely on the lift

97. A customer requests that the tire pressure be set to 44 psi (the maximum pressure listed on the tire sidewall) for improved fuel economy. The door jamb placard specifies 35 psi. What is the correct response?

A. Explain that the placard pressure is the manufacturer's recommended setting for optimal ride, handling, traction, and wear, and that overinflation reduces the contact patch and compromises safety

B. Inflate to 44 psi as requested, since the customer has the right to specify their preferred tire pressure as long as it does not exceed the tire's maximum rating printed on the sidewall

C. Inflate to 39 psi as a compromise between the placard pressure and the sidewall maximum, providing a balance between fuel economy improvement and ride quality degradation

D. Inflate to 35 psi as specified on the placard and refuse to change it, explaining that the shop's liability insurance prohibits inflating tires to any pressure other than the placard specification

98. A vehicle has a vibration that occurs only at speeds between 90 and 110 km/h and is felt primarily in the seat and floor — not the steering wheel. The vibration is unaffected by braking. What is the most likely source?

A. An unbalanced front tire and wheel assembly that produces the vibration at the rotational frequency corresponding to the 90-110 km/h vehicle speed range and transmits it through the steering

B. An exhaust system component contacting the underside of the vehicle body at a resonant frequency that corresponds to engine RPM in the 90-110 km/h vehicle speed and gear range

C. A rear tire and wheel balance or runout issue, since rear tire vibrations are transmitted through the vehicle body and are felt in the seat and floor rather than through the steering wheel

D. A front brake rotor with excessive runout that pushes the brake pad at the rotational frequency corresponding to 90-110 km/h, creating a vibration that is present even without brake application

99. During a brake inspection, a technician measures brake pad thickness on all four corners. The inboard pad on the right front caliper is worn to 2 mm while the outboard pad on the same caliper is at 6 mm. All other corners show approximately even wear between inboard and outboard pads. What does this pattern indicate?

A. The right front brake rotor has excessive runout that causes the inboard pad to contact the rotor more frequently than the outboard pad during each wheel revolution while driving

B. The right front caliper slide pins are seized, preventing the caliper from floating and equalizing the pad pressure between the inboard and outboard pads on that corner

C. The right front caliper piston seal is defective and is not retracting the piston after each brake application, leaving the inboard pad in constant contact with the rotor between stops

D. The right front brake rotor is thinner on the inboard side than the outboard side, causing the inboard pad to contact a smaller-diameter surface and wear faster from the increased friction

100. A vehicle's steering feels normal at parking speed but becomes excessively light and over-responsive at highway speed. The power steering system is hydraulic. What could cause this speed-variable steering feel issue?

A. The steering gear has a faulty variable-effort control valve or solenoid that normally reduces assist at higher speeds but is stuck in the full-assist position for all driving conditions

B. The power steering pump is producing excessive pressure at all speeds, and the over-assist is only noticeable at highway speed where the driver expects firmer steering feel from road feedback

C. The steering rack has worn internal seals that reduce the gear's resistance to movement, making the steering feel light at all speeds but more noticeably light at highway speed where precision matters

D. The power steering fluid is overheated and has thinned beyond its normal viscosity range, reducing the hydraulic resistance in the system and making the steering feel lighter than designed

101. A vehicle's SRS system has multiple DTCs including one for the driver's frontal airbag circuit resistance out of range. The clockspring was recently replaced. What is the most likely cause of the DTC?

A. The new clockspring has a different electrical resistance than the original, or the clockspring connector is not fully seated, creating a circuit resistance that falls outside the ACM's expected range

B. The driver's airbag module has a manufacturing defect that was coincidentally discovered during the clockspring replacement and is unrelated to the clockspring service

C. The SRS system requires a full reset and relearn procedure after any component replacement that the technician failed to perform before clearing the DTC and test-driving the vehicle

D. The ACM has detected that the steering wheel was turned while the clockspring was disconnected and has set a precautionary code that requires ACM replacement to clear permanently

102. A body panel on a vehicle has corrosion developing at the base of the rear quarter panel near the wheel well. What is the underlying cause of this type of corrosion pattern?

A. The vehicle was manufactured with a substandard primer that failed to provide adequate corrosion protection on the quarter panel during the initial factory coating application process

B. A previous collision repair used incompatible body filler that absorbed moisture and created a galvanic corrosion cell between the filler compounds and the steel panel surface underneath

C. Road debris, salt, and moisture accumulate in the wheel well area where they are trapped against the panel surface, breaking down the protective coating and initiating corrosion from the outside

D. The quarter panel's interior cavity foam has deteriorated, allowing moisture to condense on the inner panel surface and corrode the panel from the inside out through the seam sealer joints

103. A vehicle's rear window washer sprays weakly compared to when it was new. The front washers work normally with good spray force. Both systems share the same washer fluid reservoir but use separate pumps. What should be checked?

A. The shared reservoir's fluid level, since a low level may allow the front pump (mounted lower in the reservoir) to draw fluid while the rear pump (mounted higher) draws air instead of fluid

B. The front washer pump for excessive current draw that is robbing voltage from the shared circuit and reducing the power available to the rear pump during simultaneous operation

C. The rear washer fluid line for kinks, cracks, or partial blockage, and the rear washer nozzle for mineral deposit buildup that restricts the spray pattern and reduces the output force

D. The rear washer pump for wear, as the separate pump for the rear system may have degraded independently while the front pump continues to function at full capacity on the same reservoir

104. A vehicle's power door lock actuator on the driver's door clicks when commanded to lock and unlock, but the door does not lock or unlock. The lock can be operated manually with the key. What is the most likely cause?

A. The door lock mechanism's latch assembly has failed internally and cannot respond to either electrical or manual commands despite the actuator operating correctly

B. The actuator's internal gear or linkage connection to the door lock rod has stripped or disconnected, allowing the motor to run (producing the click) without transmitting motion to the lock mechanism

C. The BCM is sending an incomplete lock command signal that energizes the actuator briefly but does not hold it long enough to complete the full lock or unlock travel of the mechanism

D. The door lock cylinder has seized from corrosion inside the door, mechanically preventing the lock mechanism from moving even though the actuator is generating sufficient force to drive it

105. What is the purpose of the crumple zones designed into the front and rear of a unibody vehicle?

A. Crumple zones provide additional interior cabin space that can be reduced during a collision to absorb energy, and the lost space is restored when the vehicle is repaired after the collision

B. Crumple zones reduce the vehicle's overall weight by using thinner metal in the non-structural front and rear sections compared to the reinforced passenger cabin safety cell structure

C. Crumple zones progressively deform during a collision, absorbing and dissipating kinetic energy over a longer time period, which reduces the peak deceleration forces transmitted to the occupants

D. Crumple zones direct collision forces around the passenger compartment by channeling the impact energy along predetermined paths that bypass the occupant survival space entirely

106. A vehicle's rear hatch struts (gas springs) can no longer hold the hatch open — it slowly closes under its own weight after being opened. What is the correct repair?

A. Replace the gas struts in pairs, since both sides have likely degraded equally and replacing only one creates an imbalanced opening force that stresses the hinge and latch mechanism

B. Recharge the existing gas struts with nitrogen using an aftermarket recharging kit that restores the internal gas pressure to the original specification for full extension force

C. Install a mechanical prop rod as a permanent replacement for the gas struts, which is the manufacturer-recommended alternative when the original struts reach the end of their service life

D. Lubricate the gas strut piston seals with silicone spray to reduce the internal friction that is preventing the compressed gas from fully extending the strut to its open-hold position

107. A hybrid vehicle's regenerative braking system is providing noticeably less deceleration force than it did when the vehicle was newer. The friction brakes are compensating by engaging earlier and more aggressively. What is the most likely cause?

A. The electric drive motor's permanent magnets have partially demagnetized from thermal cycling, reducing the motor's ability to generate back-EMF during regenerative braking events

B. The HV battery has degraded over time, and the BMS is limiting regenerative braking current because the battery's reduced capacity cannot safely accept energy at the original charging rate

C. The friction brake system's hydraulic modulator has shifted its blending algorithm to prioritize friction braking over regenerative braking as a result of a software update during a recent service visit

D. The regenerative braking motor's resolver sensor has drifted from calibration, causing the inverter to command less regenerative torque than the brake controller is requesting during deceleration

108. A plug-in hybrid vehicle's electric-only range has decreased from the original 55 km to 35 km. The vehicle has 90,000 km on the odometer. The BMS reports all cell voltages within 0.02V of each other and no fault codes are stored. What does this indicate?

A. The vehicle's tire pressure is lower than the manufacturer's specification, increasing rolling resistance and reducing the electric-only range by a proportional amount per tire deflation

B. The vehicle's HVAC system has a refrigerant leak that is causing the compressor to run continuously in EV mode, consuming the battery energy that would otherwise be available for propulsion

C. A faulty onboard charger is not fully charging the HV battery to its maximum state of charge, causing the apparent range loss even though the battery cells themselves are healthy and balanced

D. Normal battery capacity degradation from aging and cycling has reduced the total energy storage capacity, which directly reduces the distance the vehicle can travel on a full electric charge

109. A battery electric vehicle displays a "12V Battery Service Required" warning. The vehicle still drives and the HV system appears to operate normally. Why is this warning important even though the vehicle still functions?

A. The 12V warning is a cosmetic reminder that the 12V battery has reached its calendar age replacement interval and does not indicate any functional concern with the vehicle's operation

B. The 12V battery is redundant in a BEV and serves only as a backup for the HV system, so the warning can be safely ignored until the next scheduled maintenance visit without risk

C. The 12V system powers the HV contactor control circuits, and a failed 12V battery could prevent the HV system from activating, potentially leaving the vehicle unable to start or drive

D. The 12V warning indicates that the DC-DC converter has failed and is no longer charging the 12V battery from the HV system, which will eventually cause all 12V accessories to stop functioning

110. A technician is preparing to service a hybrid vehicle's A/C compressor, which is an electrically driven high-voltage compressor. What must be done before disconnecting any HV A/C compressor connections?

A. The HV system must be fully de-energized following the manufacturer's complete de-energization procedure, since the HV compressor is powered by lethal high-voltage DC from the HV battery

B. Only the A/C system refrigerant must be recovered; the HV electrical connections can be disconnected while the system is energized as long as standard automotive insulated tools are used

C. The A/C compressor can be disconnected while the HV system is energized because the compressor has its own internal safety disconnect that isolates it from the HV bus automatically

D. Only the 12V control circuit to the compressor must be disconnected; the HV power connections are internally fused and will not pose a shock hazard if accidentally contacted during service

111. What is the primary reason that many BEV manufacturers recommend against routine brake fluid replacement at the same interval as conventional vehicles?

A. BEV brake systems use a silicone-based fluid that does not absorb moisture and therefore does not degrade over time the way glycol-based fluid does in conventional brake systems

B. BEV brake systems operate at lower temperatures because regenerative braking handles most deceleration, so the fluid is exposed to less heat and moisture absorption occurs more slowly

C. BEV brake systems use a sealed, pressurized fluid circuit that prevents any atmospheric moisture from entering the system, eliminating the hygroscopic degradation mechanism entirely

D. BEV brake fluid is a specialized formulation with a higher boiling point than conventional DOT 3 or DOT 4 fluid, and it is designed to maintain its properties for the lifetime of the vehicle

112. A hybrid vehicle has a DTC for an insulation resistance fault on the HV negative bus. The vehicle limits power output to 50% and displays a warning. After proper de-energization and verification of zero voltage, what should the technician do?

A. Clear the DTC, re-energize the system, and monitor the insulation resistance value on the scan tool to see if the fault returns during operation before proceeding with further diagnosis

B. Systematically disconnect HV components one at a time and measure insulation resistance at each step to isolate which component or cable has the compromised insulation path to chassis

C. Replace the HV battery pack, since the battery is the most common source of insulation resistance faults and replacement is the only reliable repair for an internal insulation breakdown

D. Inspect all visible orange HV cables for external damage first, since physical damage to cable insulation from road debris or routing contact is the most common and accessible cause

113. A battery electric vehicle's onboard charger has a DTC for "Charger Output Current Limited." The vehicle charges but takes significantly longer than normal to reach full charge from a Level 2 station. What is the most likely cause?

A. The Level 2 charging station (EVSE) is providing reduced current due to an internal fault, a shared circuit with other chargers, or an undersized electrical circuit feeding the station

B. The HV battery temperature is outside the optimal range (too hot or too cold), causing the BMS to command the onboard charger to reduce its output current to protect the battery cells

C. The onboard charger has an internal fault — such as a degraded power semiconductor, a faulty cooling circuit, or a failed input filter — that is limiting its maximum output current capacity

D. The vehicle's 12V auxiliary battery is weak, and the reduced 12V system voltage is limiting the onboard charger's control electronics from commanding the full charging current output rate

114. On a hybrid vehicle, what component replaces the conventional engine-driven A/C compressor?

A. An electric A/C compressor powered by the HV battery through an inverter, allowing the A/C to operate without the engine running during electric-only driving and start-stop events

B. A belt-driven A/C compressor with an electromagnetic clutch that is connected to the electric motor output shaft rather than the engine crankshaft for operation during EV mode driving

C. A thermoelectric cooling module mounted in the dashboard that uses the Peltier effect to cool cabin air without any mechanical compressor or refrigerant circulation system required

D. A secondary low-voltage electric compressor powered by the 12V system that provides cabin cooling during brief engine-off periods and supplements the conventional compressor during driving

115. A battery electric vehicle has reduced maximum power output during a sustained highway hill climb. The driver notices the power limitation gradually increases over several minutes. The vehicle is not overheating and the battery SOC is at 55%. What is the most likely cause?

A. The electric motor has reached its continuous thermal rating limit, and the inverter is progressively reducing current to the motor to prevent the stator windings from overheating under sustained load

B. The HV battery cells are reaching their maximum continuous discharge current limit, and the BMS is reducing the available power to prevent cell damage from sustained high-current draw

C. The vehicle's regenerative braking system is consuming a portion of the motor's output to charge the battery during the uphill climb, reducing the net power available for propulsion

D. The vehicle's aerodynamic drag at highway speed is consuming more power than the motor can produce at its maximum efficiency point, creating the gradual power limitation feeling

116. A customer asks whether a battery electric vehicle can be safely driven through a car wash that uses undercarriage spray jets. What is the correct answer?

A. No — the high-pressure undercarriage spray can force water past the HV battery pack seals and create an insulation resistance fault that disables the HV system or creates a shock hazard

B. No — the car wash chemicals can corrode the HV battery pack housing and the exposed copper charging contacts, creating a long-term degradation that leads to eventual system failure

C. Yes, but only if the vehicle is placed in a specific "car wash mode" that fully de-energizes the HV system and seals all charging ports before the vehicle enters the wash bay for the cycle

D. Yes — BEV HV battery packs and electrical systems are sealed and rated for water exposure, and normal car wash operations including undercarriage spray do not pose a risk to the HV system

117. A hybrid vehicle's instrument panel displays "Ready" but the internal combustion engine is not running. The customer is concerned the vehicle is broken because it is silent. What should the technician explain?

A. The vehicle has an engine fault that is preventing the ICE from starting, and the "Ready" indicator is a default display that appears regardless of whether the engine is operational

B. The vehicle is operating normally in electric-only mode — the "Ready" indicator confirms the HV system is active and the vehicle can be driven, with the engine starting automatically when needed

C. The vehicle's starter motor has failed silently and the HV system has taken over propulsion as an emergency backup mode that allows limited driving until the starter is repaired

D. The vehicle is in a diagnostic mode that disables the engine for emissions testing purposes and must be reset by the dealer before the engine will start during normal driving operations

118. A technician needs to measure the voltage of a hybrid vehicle's high-voltage battery pack. The pack consists of 168 cells connected in series, each producing a nominal 1.2 volts. What is the approximate expected pack voltage?

A. Approximately 120 volts DC, calculated by dividing the number of cells by the standard automotive voltage conversion factor for nickel-metal hydride chemistry

B. Approximately 86 volts DC, calculated by multiplying the cell count by 0.5 volts to account for the voltage loss across the series connections between each individual cell

C. Approximately 202 volts DC, calculated by multiplying the number of cells (168) by the nominal voltage per cell (1.2V) to determine the total series string voltage

D. Approximately 336 volts DC, calculated by multiplying the cell count by twice the nominal cell voltage to account for the voltage doubling effect of series-connected cells

119. A battery electric vehicle owner reports that the regenerative braking feels significantly weaker than normal. The ambient temperature is 25°C and the battery SOC is at 40%. No warning lights or messages are displayed. What should the technician check first?

A. The brake system for a condition where the friction brakes are partially applied, reducing the vehicle's deceleration rate available for regenerative braking to contribute its normal share

B. The HV battery temperature sensor for a fault that is falsely reporting a high temperature, causing the BMS to limit regenerative braking current to protect the battery from perceived overheating

C. The inverter cooling system for a restriction that is causing the power electronics to overheat, triggering the thermal derating that reduces the motor's regenerative braking torque capacity

D. The vehicle's tire pressure, which if significantly overinflated would reduce the rolling resistance and make the regenerative braking deceleration feel weaker than normal to the driver

120. During a high-voltage battery pack inspection on a hybrid vehicle, the technician finds that one cell module has a voltage of 6.8 volts while all other modules read between 7.4 and 7.6 volts. What does this voltage deviation indicate?

A. The low-voltage module is within the normal acceptable range of cell variation for a hybrid battery pack and does not require any corrective action during this routine inspection

B. The low-voltage module indicates the battery is due for a routine equalization charge that the dealer performs at each major service interval to rebalance all modules in the pack

C. The low-voltage module has not been affected by the cell degradation yet, and the higher-voltage modules are actually overcharged and need to be individually discharged to match the lower reading

D. The low-voltage module has a weaker cell or cells that are degrading faster than the rest of the pack, reducing that module's capacity and voltage relative to the healthy modules around it

121. A plug-in hybrid vehicle charges normally from a home Level 1 outlet (120V) but will not initiate charging from a Level 2 station (240V). The charge port light does not illuminate when the Level 2 connector is inserted. What should be checked?

A. The vehicle's onboard charger for a fault in its 240-volt input stage that prevents it from accepting the higher voltage while the 120-volt input stage continues to function independently

B. The HV battery management system for a software fault that blocks Level 2 charging while allowing Level 1, since both charging levels use the same physical charge port and onboard charger

C. The charge port connector, locking mechanism, and pilot signal circuit for physical damage or an electrical fault that prevents the vehicle from establishing communication with the Level 2 EVSE

D. The home electrical panel for a tripped breaker on the Level 2 circuit, since the charge port light is powered by the EVSE and a de-energized station would produce the observed no-light condition

122. What is the primary function of the battery management system (BMS) in a hybrid or electric vehicle?

A. The BMS controls the vehicle's regenerative braking force distribution between the electric motor and the friction brakes based on the driver's brake pedal input pressure

B. The BMS manages the vehicle's thermal comfort system by routing waste heat from the battery pack into the cabin heating circuit to supplement the HVAC system during cold weather

C. The BMS monitors individual cell voltages, temperatures, and state of charge, manages cell balancing, and controls the charging and discharging limits to protect battery health and safety

D. The BMS provides the gateway communication interface between the HV battery pack's internal monitoring sensors and the vehicle's CAN bus network for diagnostic scan tool access

123. A hybrid vehicle has a warning light indicating a fault in the hybrid powertrain. The scan tool reveals a DTC for "Motor Generator Resolver Signal Lost." What component has failed?

A. The high-voltage battery's internal current sensor that measures the discharge rate from the battery pack to the motor through the inverter during both propulsion and regenerative braking

B. The resolver sensor on the motor/generator, which provides the inverter with the precise rotational position and speed data needed to correctly commutate the motor's phase windings

C. The transmission's internal speed sensor that measures the output shaft RPM and provides the hybrid control module with the vehicle speed data needed for motor torque calculations

D. The battery management system's state-of-charge estimation module that calculates the remaining battery energy based on the resolver signal from the motor during regenerative braking

124. A customer asks about the expected lifespan of the HV battery in their hybrid vehicle. The vehicle has 180,000 km on the odometer. What is the most accurate general information about hybrid battery longevity?

A. Most hybrid HV batteries are designed to last the useful life of the vehicle, and many manufacturers warranty the battery for 8 to 10 years or 160,000 km, though batteries often exceed this with gradual capacity reduction rather than sudden failure

B. Hybrid batteries typically require replacement every 80,000 km regardless of driving conditions, and the cost is comparable to a major engine overhaul on a conventional vehicle of similar displacement

C. Hybrid batteries are maintenance items that require annual reconditioning at the dealership to maintain their capacity, and failure to perform this annual service voids the battery warranty entirely

D. Hybrid batteries have a fixed calendar life of exactly five years from the date of manufacture regardless of mileage, and the battery management system will disable the vehicle when this date arrives

125. A technician is replacing a 12-volt auxiliary battery on a hybrid vehicle. After installing the new battery, the hybrid system "Ready" light will not illuminate and the vehicle will not enter Ready mode. What is the most likely cause?

A. The replacement 12V battery has a lower CCA rating than the original, and the hybrid control module requires a minimum CCA threshold before it will close the HV contactors and enable Ready mode

B. The hybrid system requires a specific initialization or reboot procedure after 12V battery replacement to re-establish communication between the 12V system and the HV control modules

C. The replacement battery's voltage is slightly higher than the original due to its full factory charge, and the hybrid control module interprets the higher voltage as a charging system fault condition

D. The 12V battery replacement has triggered the vehicle's anti-theft immobilizer, and the system requires the key fob to be re-paired with the vehicle before the hybrid system will authorize Ready mode

Practice Exam 4: Answer Key and Explanations

1. A — An open solvent tank near an active grinding operation creates an immediate fire and explosion hazard. The priority is to stop the ignition source, secure the flammable material by replacing the lid or moving the tank, and establish safe separation before any further work. Continuing to grind while relying on a fire blanket or water to prevent ignition is unacceptable risk management.

2. C — Supplier labels are applied by the product manufacturer before the product reaches the workplace and include the full set of WHMIS elements — product identifier, supplier information, pictograms, signal word, hazard and precautionary statements, and SDS reference. Workplace labels are simplified versions required when a product is transferred to a secondary container, requiring only the product identifier, safe handling precautions, and SDS reference.

3. D — A four-post drive-on lift supports the vehicle through the tires resting on the runways. To remove wheels for brake service, the suspension must be raised off the runways so the wheels hang free. This requires the lift's auxiliary jacking system (if equipped) or a portable jack and jack stands to support the vehicle's frame or suspension while the wheels are removed.

4. B — A face shield worn over safety glasses provides complete facial protection from sparks, metal fragments, and the potential catastrophic disintegration of a cut-off wheel during use. Cut-off wheels spin at high RPM and can fracture without warning — the fragments become high-velocity projectiles that safety glasses alone cannot fully protect against across the entire face.

5. A — Brake fluid (glycol-based DOT 3, 4, and 5.1) is classified as hazardous waste in most jurisdictions. It must be collected in an approved container separate from other waste fluids and disposed of through the shop's licensed hazardous waste recycling program. Brake fluid is not petroleum-based (eliminating mixing with waste oil), is toxic to aquatic life (eliminating drain disposal), and does not evaporate safely.

6. D — A fire extinguisher gauge reading in the red zone indicates the internal pressure is outside the normal operating range — either undercharged (most common) or overcharged. In either case, the extinguisher cannot be relied upon to function properly in an emergency. It must be serviced, recharged, or replaced immediately to ensure the shop maintains adequate fire protection.

7. C — Gasoline on clothing creates an immediate and sustained fire hazard — fuel-soaked fabric can ignite from any spark, static discharge, or heat source in the shop. The technician must stop work immediately, move away from ignition sources, change the contaminated clothing, and clean the floor spill with approved absorbent. Continuing to work with fuel on clothing is never acceptable.

8. B — The tire information placard on the door jamb provides the vehicle manufacturer's recommended tire pressures (front and rear), the original equipment tire sizes, and the vehicle's maximum load ratings. This information is specific to the vehicle and represents the manufacturer's engineered balance of ride comfort, handling, traction, tread wear, and fuel economy for that specific model.

9. B — High-voltage hybrid and EV service requires specific training and certification beyond general automotive service competency. Working on or near HV components (identified by orange insulation) without proper training creates a risk of fatal electrocution. The technician must verify they have completed the appropriate HV safety and service training before beginning any work on or near HV systems.

10. A — The coil swap (to cylinder 3) and plug swap (to cylinder 4) both moved to different cylinders, yet the misfire remained on cylinder 1. This eliminates both the coil and the plug as the cause — if either were faulty, the misfire would have followed it to its new location. The fault is specific to cylinder 1's position — either the fuel injector, the wiring, or a mechanical condition on that cylinder.

11. D — Blue smoke at cold startup that clears within the first minute is the classic presentation of worn valve stem seals. While the engine sits overnight, oil seeps past the hardened or worn seals and pools on top of the closed intake valves and in the combustion chambers. When the engine starts, this accumulated oil burns off quickly, producing the visible blue smoke that clears once the pooled oil is consumed.

12. C — Valve spring installed height is the distance from the spring seat to the retainer underside with the valve closed. If this height exceeds specification (from valve seat recession, face grinding, or seat wear), the spring operates at reduced preload — less force than designed to close the valve and maintain cam follower contact. A shim placed under the spring restores the correct height and preload.

13. B — A localized valve train tick at operating temperature with adequate oil pressure and clean oil points to a failed hydraulic lash adjuster. The specific adjuster on cylinder 3's exhaust valve has failed internally — a worn plunger, collapsed check ball, or scored bore prevents it from maintaining its oil charge and taking up the valve lash, producing the persistent tick at that specific location.

14. A — The wet test confirmed rings as the leak source (compression rose significantly with oil added). A leak-down test is the next logical step because it quantifies the severity of the ring leakage as a percentage and confirms the leak path by checking for air escaping from the oil fill cap or dipstick tube (crankcase), which definitively confirms the rings as the failure point.

15. D — The ECM's idle roughness correction (cylinder balancing) feature adjusts individual cylinder fuel delivery to equalize contribution. When one cylinder requires significantly more fuel to produce the same power output, that cylinder has a deficiency — either a compression loss that reduces combustion efficiency or an injector that is delivering less fuel than commanded. Both conditions require extra fuel to compensate.

16. C — A vacuum leak allows unmetered air into the manifold, raising the manifold pressure (reducing vacuum). The MAP sensor correctly reads this higher pressure and reports it to the ECM. The ECM interprets the higher pressure as more air entering the engine and adds more fuel — but the actual air entering includes both the metered air and the unmetered leak air, so the ratio is still lean despite the extra fuel.

17. A — Both readings are approximately 30 kPa above the specified values (380 vs. 350, and 420 vs. 400). The fact that the pressure changes correctly when vacuum is applied/removed proves the regulator responds to vacuum — but its calibration set point is too high. The regulator is maintaining a correct pressure differential relative to manifold vacuum but at an offset above the specified range, indicating a faulty regulator.

18. B — Underboost with the turbo spinning and producing some pressure (8 psi instead of 14 psi) most commonly results from pressurized air escaping before reaching the intake manifold. Charge pipe connections, intercooler hose clamps, and intercooler end tank seals are the most frequent leak sources. A boost leak is far more common and accessible to diagnose than internal turbo damage.

19. D — On many engines with timing-chain-driven water pumps, the pump is located behind the timing cover, sealed by a gasket and a shaft seal. When the pump's shaft seal fails, coolant weeps from the weep hole (designed to drain externally through the timing cover rather than contaminating the engine oil). This presents as a coolant leak from the front of the engine behind the timing cover.

20. C — A rattling noise from inside a catalytic converter housing with normal exhaust backpressure indicates the ceramic substrate has fractured into pieces that are loose inside the housing but have not yet created a significant blockage. The fragments rattle at idle when exhaust pulses are distinct enough to move them. This converter has failed structurally and must be replaced.

21. A — Negative fuel trim values mean the ECM is subtracting fuel from the base calculation. A −18% LTFT at idle means the ECM has learned it must deliver 18% less fuel than its base map commands to maintain stoichiometric ratio — indicating something is causing a persistent rich condition (leaking injector, excessive fuel pressure, stuck-open purge valve, or faulty sensor input).

22. D — The DEF quality sensor detects the urea concentration in the DEF solution. The correct concentration is 32.5% urea in deionized water. Dilution with water, addition of the wrong fluid (windshield washer fluid is a common mistake due to similar blue color), or degradation from age or heat exposure reduces the urea concentration below the acceptable threshold, triggering the quality warning.

23. B — The CMP sensor identifies which cylinder is on its compression stroke versus its exhaust stroke (since both TDC events look identical to the CKP sensor). Without the CMP signal, the ECM cannot determine cylinder phase, preventing sequential fuel injection (which requires knowing each cylinder's position in the four-stroke cycle) and potentially preventing the engine from starting on some systems.

24. D — A thermostat stuck open causes the engine to stabilize at a temperature well below design (72°C vs. 90°C). At this reduced temperature, the heater core receives coolant that is 18°C+ cooler than designed, significantly reducing its ability to transfer heat to the cabin air. The resulting poor heater output is especially noticeable in Canadian winter conditions where cabin heating demand is highest.

25. A — A functioning PCV valve contains a spring-loaded plunger that should rattle when shaken and allow metered airflow through it. A valve that does not rattle and allows no airflow is stuck closed — the plunger is seized in the closed position from sludge, varnish, or corrosion. A stuck-closed PCV valve causes crankcase pressure buildup, oil leaks, and potential seal failures.

26. B — High HC (unburned fuel) combined with high O_2 (unburned oxygen) and low CO_2 (incomplete combustion) is the signature of a misfire. In a misfiring cylinder, the air-fuel charge passes through without burning — both the fuel (HC) and the oxygen (O_2) exit the exhaust unconsumed, while CO_2 (the product of successful combustion) is reduced because fewer cylinders are combusting.

27. D — Stalling specifically during deceleration from highway speed suggests the idle speed control system cannot catch the engine RPM as it drops rapidly from cruising speed to idle. Carbon buildup in the throttle body restricting the idle air passage, a sticking electronic throttle motor, or a faulty idle air control valve prevents the system from opening the throttle fast enough to sustain idle RPM during the transition.

28. A — A spongy primer pump that eventually produces clear fuel (no visible air bubbles at the bleed point) suggests air is entering the fuel system through a compromised seal, cracked fitting, or deteriorated line between the tank and the injection pump. The air intrusion breaks the fuel column, making priming difficult and preventing the system from maintaining prime during extended shutdown periods.

29. A — GDI intake valve carbon buildup is a mechanical contamination problem that must be physically removed. Walnut shell blasting (using a specialized tool to direct crushed walnut shells against the valve surfaces), chemical soak treatments, or manual scraping are the effective methods. Fuel tank additives cannot reach the intake valves on GDI engines because the fuel is injected directly into the cylinder, bypassing the intake ports.

30. C — A brand-new, clean DPF will have some measurable pressure differential even with zero soot loading because the exhaust gas must pass through the porous ceramic wall structure, which creates inherent flow resistance. A reading of exactly 0.0 kPa indicates the pressure sensor is not receiving the pressure signal — the sampling tubes that connect the sensor to the upstream and downstream sides of the DPF are disconnected, kinked, or blocked.

31. B — The catalyst efficiency monitor requires sustained, stable operating conditions — steady engine speed, consistent load, and stable exhaust temperature — to complete its diagnostic evaluation of the converter's oxygen storage capacity. Highway cruising provides these stable conditions. City driving with its frequent acceleration, deceleration, and idle periods interrupts the monitor's test conditions, preventing the diagnostic from completing.

32. C — A single U0121 code with all other modules communicating normally isolates the fault to the ABS module or its individual connection to the bus. The backbone is healthy (proven by all other modules communicating), and the ECM is functioning (it stored the code). The ABS module's power supply, ground, CAN bus spur wiring, connector, or the module itself has a fault preventing it from participating on the network.

33. A — Physical damage to the wiring harness in the front bumper area from the collision has disrupted the CAN bus backbone or a main connector through which multiple modules communicate. When the physical wire path is broken or shorted at the damage point, all modules whose wiring routes through that area lose communication, triggering U-codes throughout the network.

34. C — A healthy CAN bus shows both CAN-H and CAN-L pulsing in complementary patterns — CAN-H between 2.5V and 3.5V, CAN-L between 2.5V and 1.5V. When CAN-L shows a flat line at

2.5V with no pulses while CAN-H is active, the CAN-L line has a fault — an open circuit, a short to the bias voltage, or a failed CAN transceiver driver in one module that is clamping CAN-L.

35. B — Module programming (flashing) requires sustained, stable voltage throughout the entire process, which can take several minutes to over an hour. The programming data transfer is voltage-sensitive — a drop below the minimum threshold corrupts the data being written to the module's memory, potentially rendering it inoperative. A battery charger or power supply maintainer is essential equipment for every programming event.

36. C — Communication faults that correlate with wet weather and resolve when dry point directly to moisture intrusion. Water entering a CAN bus connector, splice, or module housing creates corrosion and intermittent electrical contact that disrupts the differential signal. The corrosion worsens with each wet cycle, and the fault becomes more frequent over time as the corrosion progresses.

37. D — Bi-directional control allows the technician to command specific actuators (relays, solenoids, motors, injectors) on and off through the scan tool independently of the module's normal control logic. This isolates the actuator and its wiring from the module's decision-making — if the commanded actuator responds, the actuator and circuit are good, and the diagnosis shifts to why the module isn't commanding it during normal operation.

38. A — An open (infinite) resistance reading between CAN-H and CAN-L at the DLC means there is no electrical path between the two bus wires. Since the terminating resistors and all module transceivers normally provide parallel resistance paths between CAN-H and CAN-L, an open reading indicates both terminators are disconnected, the bus backbone has a complete break, or no modules are powered to contribute their transceiver impedance.

39. B — The aftermarket alarm module was identified as the source through a direct cause-and-effect test: disconnecting it dropped the draw from 450 mA to an acceptable 30 mA. The alarm was either consuming excessive standby current itself or keeping other modules awake through continuous CAN bus activity. Removing the aftermarket device resolves the drain completely.

40. D — The TPMS system uses two distinct warning modes: a steady (continuously illuminated) light indicates that one or more tires have pressure below the warning threshold — an actual pressure problem. A flashing light indicates a system malfunction — a failed sensor, a sensor with a dying battery, a communication fault, or a module error — that prevents the system from monitoring pressure accurately.

41. C — A non-synchronized reverse gear is common on many manual transmissions. The reverse idler gear must mesh with the output gear and countershaft gear simultaneously while both are spinning (driven by the still-rotating input shaft via the clutch disc). If the clutch does not fully release — leaving the input shaft partially spinning — the gear teeth clash during the attempted mesh, producing the grinding noise.

42. A — When the scan tool electrically disables the TCC, the torque converter returns to full fluid coupling mode. The vibration disappearing confirms the TCC was the source. The TCC friction surface is contaminated or the apply pressure is inconsistent, causing the locked converter to transmit a shudder through the drivetrain. A transmission fluid change with the correct specification often resolves TCC shudder.

43. B — ATF at 140°C is 40°C above the normal operating range and is actively destroying itself. Transmission fluid life halves for approximately every 10°C increase above the normal range. At 140°C, the fluid's friction modifiers, anti-wear additives, and seal conditioners are degrading rapidly, and the clutch friction material is being damaged by the heat — leading to accelerated internal wear and eventual failure.

44. D — The vibration is speed-dependent (increases with speed), felt in the seat and floor (not steering wheel), and cannot be reproduced with the wheels off the ground — this eliminates the drivetrain. A tire and wheel balance issue creates vibration only when the tire is in contact with a surface and rotating at speed. Off the ground, there is no road contact force, so the imbalance cannot produce the vibration.

45. C — The clutch disc must be centered on the flywheel before the pressure plate is bolted down. A pilot alignment tool (simulating the input shaft) holds the disc in the centered position during pressure plate installation. Without centering, the disc shifts off-axis, and the transmission input shaft cannot pass through the disc hub splines during reassembly — the transmission will not mate to the engine.

46. B — A humming noise that increases with speed and gets louder during right turns (weight transferring to the left side, loading the left bearing more heavily) is the signature of a worn left front wheel bearing. The directional noise change under cornering load is the most reliable diagnostic indicator for identifying which side has the worn bearing.

47. C — Each gear in an automatic transmission is produced by a specific combination of clutch packs, bands, and one-way clutches. Slipping in only one gear isolates the fault to the friction element unique to that gear transition. The specific clutch or band that applies for the 2-3 shift has worn friction material or a leaking apply circuit that cannot generate sufficient clamping force.

48. A — The CSC is sealed inside the bell housing after the transmission is bolted to the engine. No external bleeder valve is accessible once assembled. If the CSC contains air when installed, it produces a spongy pedal and incomplete clutch release that cannot be corrected without removing the transmission to access the CSC again. Bench bleeding before installation purges all air from the hydraulic chamber.

49. C — P0730 is set when the TCM calculates the actual gear ratio (from the input and output speed sensors) and finds it does not match the commanded gear ratio. In third gear, the input-to-output speed relationship should follow a fixed mathematical ratio. When the actual ratio deviates (from clutch slippage, band slippage, or mechanical failure), the TCM detects the discrepancy and stores the code.

50. A — Mismatched tire sizes on opposite axles create a constant speed differential between the front and rear axles that the AWD center coupling must continuously absorb. The coupling heats up, the differential forces create mechanical resistance felt as tight steering and binding, and the audible noise comes from the coupling's clutch pack alternately grabbing and slipping as it tries to manage the speed difference.

51. D — A clutch pedal that drops to the floor with zero resistance and an empty master cylinder reservoir confirms a hydraulic fluid loss. Without fluid, the master cylinder piston pushes against air instead of incompressible fluid, producing no pressure at the slave cylinder and no clutch release. The leak source — master cylinder, slave cylinder, line, fitting, or hose — must be identified and repaired.

52. A — The transfer case has shifted into 4WD (confirmed by the internal shift completing), but the front axle is not receiving torque because the front axle disconnect mechanism has not engaged. Many 4WD trucks use a separate mechanism (vacuum-operated, cable-operated, or electric motor-operated) to connect the front axle to the front drive shaft. If this disconnect fails to engage, the front wheels remain freewheeling.

53. C — A harsh shift in one specific gear that appears only at operating temperature points to a thermal-sensitive seal or accumulator piston. The 3-4 accumulator cushions the clutch application for that shift. At operating temperature, a hardened or shrunken seal loses its ability to contain the hydraulic pressure, allowing the apply pressure to spike instead of rising gradually — producing the harsh engagement.

54. A — The single most important maintenance practice for AWD coupling longevity is maintaining matched tires. Tires with different circumferences (from different brands, sizes, or tread depths) create constant speed differentials between axles that force the center coupling, transfer case, or center differential to work continuously — generating heat and wear that dramatically shortens component life.

55. B — Drive shafts are factory-balanced as an assembly — the tube, the yokes, and the balance weights are all in specific rotational positions relative to each other. If the drive shaft is reinstalled in a different rotational orientation relative to the differential yoke (rotated from its original index position), the balance is disrupted. Marking the shaft and yoke positions before disassembly and reinstalling in the same orientation prevents this.

56. D — DCT transmissions use clutch packs similar to those in a conventional manual transmission, but they are actuated by the mechatronic unit rather than a driver-operated pedal. At low speeds where clutch modulation is most demanding (parking lot creeping, hill starts), worn or contaminated friction material cannot engage progressively — it grabs and releases, producing the shudder that mimics manual clutch chatter.

57. C — All gears shift smoothly with the engine off (no input shaft rotation to resist), but all gears grind with the engine running. This means the input shaft continues to rotate even when the clutch pedal is fully depressed — the clutch is not fully releasing. Despite normal pedal feel, the slave cylinder may not be achieving full travel, the clutch disc may be warped, or the disc may be sticking on the input shaft splines.

58. A — The TCC creates a direct mechanical link between the engine crankshaft and the transmission input shaft, eliminating the inherent 2-5% fluid slippage of the hydrodynamic torque converter coupling. This direct connection reduces fuel consumption by preventing the engine from spinning faster than necessary at cruising speed and eliminates the heat generated by the fluid shearing in the converter.

59. D — A delayed engagement only in reverse with immediate forward engagement isolates the fault to the reverse-specific hydraulic circuit. The reverse band or clutch apply piston seal is leaking, requiring extra time for the pump to fill the enlarged clearance volume and build sufficient pressure to fully clamp the friction element. Forward circuits have intact seals and apply immediately.

60. A — On-demand AWD systems with electronically controlled rear couplings can fully disengage the rear axle during conditions where AWD is unnecessary — such as constant-speed highway cruising with no detected wheel slip. Disconnecting the rear axle eliminates the parasitic drag of spinning the rear drive shaft, differential gears, and coupling internals, improving fuel economy by 2-5%.

61. C — A parasitic draw of 28 milliamps after a 45-minute module sleep wait falls within the generally accepted range of 25 to 50 milliamps for a modern vehicle with multiple modules maintaining keep-alive memory (radio presets, seat memory, security system standby, keyless entry receiver, clock). This level of draw will sustain a healthy battery for weeks without driving.

62. A — The right low beam works (eliminating the fuse, headlamp switch, and relay as common-circuit causes), and the left high beam works (eliminating the left headlamp ground, since the high beam uses the same ground). The fault is isolated to the circuit path specific to the left low beam — its individual fuse (if separate), its relay contact, its dedicated wiring, or its connector.

63. D — All dash lights going completely dark when the key is turned to start indicates the battery voltage is collapsing to near zero under the attempted cranking load. This happens when the battery cable connections have such high resistance that even the small current for the dash lights cannot pass once the starter circuit demands high current. The connections appear to work at low current (lights on) but fail completely under the high-current starting demand.

64. B — The alternator output (14.3V) is correct and reaching the battery (14.2V — minimal voltage drop). Yet the warning light remains on. Many vehicles use a separate sense wire from the alternator that detects field current flow to control the warning light — not the B+ output voltage. If this sense wire was not reconnected during the alternator replacement, the warning light circuit remains open and the light stays illuminated.

65. C — The fuse is rated at 15 amps and the motor normally draws 10 amps — adequate headroom under normal conditions. A fuse that blows repeatedly every time the motor activates indicates the motor is drawing more than 15 amps — the motor has developed an internal fault (seized bearing, shorted winding, jammed impeller) that has increased its current draw beyond the fuse's capacity.

66. A — Supply voltage of 12.3V is present at the motor's power terminal, and the ground wire reads 0.0V to chassis ground (confirming the ground path is intact — if it were open, it would read battery voltage, not zero). With both supply and ground confirmed good, the motor itself has an internal fault — an open winding, a failed brush-to-commutator connection, or an internal thermal fuse that has opened.

67. B — The timer relay and dash indicator work (confirming the control circuit is functional), but the window does not clear. Before assuming grid damage or internal faults, verify that full battery voltage is actually reaching the defroster grid through the high-current relay and wiring. A failed defroster relay, a blown high-current fuse, or a corroded connector can prevent power delivery despite the timer functioning normally.

68. D — A horn that sounds continuously regardless of the horn button position has a stuck-closed circuit in the horn relay or the horn button circuit. Since disconnecting the horn relay stops the noise, the relay's contacts have welded shut from arcing — the relay passes current to the horns continuously regardless of whether the coil circuit (horn button/clockspring) is commanding it.

69. A — Headlamp delay (also marketed as "follow-me-home" or "escort lighting") is an intentional feature on many modern vehicles. The headlamps remain illuminated for a manufacturer-programmed duration (typically 30 seconds to several minutes) after the ignition is turned off, providing illumination for the driver walking from the vehicle to a building entrance. This is normal programmed behavior, not a fault.

70. C — Adequate cooling at highway speed but poor cooling at idle is the hallmark of a condenser airflow problem. At highway speed, ram airflow through the condenser provides adequate heat rejection. At idle, the vehicle is stationary and only the condenser fan provides airflow — if the fan is inoperative, running at reduced speed, or the condenser face is blocked with debris, heat rejection drops and cooling diminishes.

71. B — The window operates from the master switch (proving the motor, regulator, wiring, and ground are all functional) but not from its own door switch. The common element that differs between the two control paths is the switch itself. The passenger door switch has failed — either an internal contact fault, a cracked circuit board, or a mechanical button failure that prevents it from completing the circuit.

72. C — Both readings deviate from specification — the cold reading is 500 ohms high (3,000 vs. 2,500) and the hot reading is 50 ohms low (200 vs. 250). While thermistors have some tolerance, the combined deviation at both temperature extremes indicates the sensor has drifted from calibration. The ECM will calculate incorrect temperatures at both operating points, affecting cold-start enrichment and operating temperature fuel control.

73. C — The ECM can override the driver's A/C request for several protective or operational reasons: engine overheating (protecting the engine by removing the compressor load), wide-open throttle (providing maximum acceleration power), low idle RPM (preventing stall from compressor load), low refrigerant pressure (protecting the compressor from running without lubricant), or high head pressure (preventing compressor damage).

74. A — ADAS sensors — particularly radar and cameras mounted behind the bumper or windshield — can be temporarily degraded by heavy rain, snow, ice, mud, or debris covering the sensor surface. The system correctly identifies that its detection capability is compromised and alerts the driver with a "Sensor Blocked" message. The system returns to normal operation when the obstruction is cleared, confirming this is a temporary environmental condition.

75. B — The EPS motor overcurrent DTC means the motor is drawing more current than its normal operating range. The most common cause is an increased mechanical steering load that forces the motor

to work harder — a binding tie rod end, a dry ball joint, low tire pressure, or a seized steering rack that creates physical resistance the motor must overcome. Fixing the mechanical cause reduces the motor current to normal.

76. D — In the accessory position with the engine off, the alternator is not producing output and the battery alone powers all systems at its resting voltage (approximately 12.0–12.4V). If the headlamp control module's minimum operating voltage is near this threshold, the reduced voltage causes the module to repeatedly power up, attempt to activate the headlamps, brown out from the current draw, reset, and restart — producing the observed flicker cycle.

77. A — "OL" on a resistance measurement means the meter cannot detect any current flow through the component — the resistance is effectively infinite, indicating an open circuit. This means there is no complete electrical path through the component being tested — a broken wire, a burned-out fuse, an open winding, or a failed internal connection. The component or wire is electrically interrupted.

78. C — Cooling that degrades gradually over hours of operation with progressively declining gauge pressures indicates the system is slowly losing refrigerant through an active leak that was not fully sealed during the repair. The system cools well initially when the charge is near specification, but as refrigerant escapes through the residual leak, the charge drops and cooling diminishes proportionally.

79. B — The driver's side heater works (confirming the fuse, relay, and BCM output logic are functional for the heated seat system). The passenger side switch illuminates (confirming it has power). The most likely single-point failure is the passenger seat heating element itself — an open circuit in the resistance wire prevents current from flowing despite the command to heat, and a DVOM resistance check across the element terminals confirms or eliminates this cause quickly.

80. D — A severely clogged cabin air filter restricts the total airflow that the blower motor can draw through the HVAC system. The motor runs at normal speed and sounds normal (eliminating the motor and its circuit), but the physical airflow restriction prevents adequate air volume from reaching the vents. Replacing the clogged filter restores normal airflow immediately.

81. A — Camera-based lane departure warning systems require visible painted lane markings (solid or dashed lines) to detect the lane boundaries. Without clear markings, the camera has no reference to determine where the lane edges are, and the system correctly deactivates or indicates "Lane Departure Unavailable." This is a designed operational limitation, not a system fault.

82. C — The express-close auto-reverse feature requires learned endpoint data to know where the closed position is and what force level indicates an obstruction versus normal seal resistance. A battery disconnection or module reset erases this learned data. Without it, the module disables express-close as a safety precaution (since it cannot distinguish obstruction from normal closing). The reinitialization procedure restores the endpoints.

83. B — The standard carbon pile load test procedure is to load the battery at half its CCA rating (600 ÷ 2 = 300 amps) for 15 seconds and observe the voltage at the end of the 15-second period. At a battery temperature of 21°C (70°F) or above, the voltage should remain above 9.6 volts. A reading below 9.6 volts at the end of the test indicates the battery has insufficient capacity and should be replaced.

84. D — Alignment is within specification, pressures are equal, and swapping front tires didn't change the drift direction (eliminating tire pull). The remaining suspects are less common causes: a dragging brake caliper on one side creating an asymmetric drag, a worn suspension component that has introduced a geometry shift not detected by the alignment machine, or a body/subframe alignment issue that shifts the suspension geometry beyond what wheel alignment can correct.

85. A — After eliminating the three most common causes of a single clunk over bumps (strut mount, end links, and ball joint), the next suspects include the strut body itself, loose caliper or bracket bolts, or a worn bushing elsewhere in the suspension. A strut with a failed internal piston or valve can bottom out during compression, producing a single hard mechanical impact with each bump.

86. C — Centered steering with constant wandering that requires frequent correction, despite alignment within specification, indicates mechanical looseness in the steering and suspension linkage. Individual components may be within their wear specification, but the cumulative free play of multiple components at their wear limits creates a loose, imprecise feel that allows the vehicle to wander.

87. B — A firm pedal with reduced stopping power indicates the hydraulic system is generating pressure normally (the pedal isn't spongy or sinking), but the friction surfaces are not converting that hydraulic pressure into proportional braking force. Glazed brake pads — where the friction surface has been overheated and hardened into a smooth, glassy surface — provide firm pedal resistance but a dramatically reduced coefficient of friction.

88. D — When the adjustment mechanism is at its limit and cannot achieve the specified camber, the geometry has shifted beyond the normal adjustment range. This indicates a bent or damaged structural component — a control arm, strut, steering knuckle, subframe, or cradle — that has displaced the wheel position beyond what the adjustment hardware can compensate for. The damaged component must be identified and replaced.

89. C — The parking brake locks the wheels when applied (proving the mechanism can fully apply) but the wheels drag when released (proving the mechanism is not fully releasing). An over-adjusted parking brake cable or a cable mechanism that is not returning to its fully released position keeps the caliper piston partially applied against the rotor even with the parking brake lever or pedal in the released position.

90. A — A static balancer detects only static imbalance (heavy spot on one side) and corrects it with a single weight placement. It cannot detect dynamic (couple) imbalance — where the heavy spots are at different positions along the wheel's axis, creating a wobble rather than a hop. A dynamic spin balancer detects and corrects both static and dynamic imbalance, resolving vibrations that a static balance cannot.

91. B — ESC monitors the difference between the driver's intended path (from steering angle and speed) and the vehicle's actual path (from yaw rate). During an aggressive lane change, the vehicle may momentarily exceed the ESC's stability threshold — the yaw rate deviates from the expected path. The ESC correctly intervenes by braking individual wheels to bring the vehicle back in line. The flashing ESC light confirms active intervention.

92. D — A tire with 2/32" of tread depth, where the wear indicators are level with the remaining tread surface, has reached the legal minimum tread depth in Canada. The visible wear bars confirm the tire is at the discard point. The tire must be replaced — it no longer provides adequate wet traction, hydroplaning resistance, or winter performance to be considered safe for continued driving.

93. B — When ABS activates, the dump valves open to release hydraulic pressure from the caliper circuits into the accumulator. This momentary pressure release allows the locked or near-locked wheel to resume rotation. The driver feels this as a pedal drop or pulsation because the pressure in the master cylinder circuit drops briefly. The ABS return pump then restores the pressure, and the cycle repeats rapidly.

94. A — A swollen inner tie rod boot full of power steering fluid on a rack-and-pinion system confirms that the rack's internal seal has failed. The piston seal inside the rack housing is leaking hydraulic fluid past the piston and into the bellows boot area. The boot contains the fluid, preventing external drips, which is why the leak may go undetected until the boot is inspected during routine service.

95. B — The left rotor's DTV of 0.008 mm is within the 0.013 mm maximum specification — it is not causing pulsation. The right rotor's DTV of 0.035 mm exceeds the specification by nearly three times — it is the source of the pulsation. Only the right rotor requires resurfacing (if sufficient material remains above minimum thickness) or replacement. The left rotor passes and needs no service.

96. A — Wheel bearing noise is typically load-dependent. During driving, the vehicle's full weight (and dynamic cornering/braking forces) loads the bearing, amplifying any roughness or play in the damaged rolling elements. On a lift with the wheel hanging free, the bearing is unloaded and may spin smoothly because the damaged surfaces are not being pressed together with sufficient force to produce noise.

97. A — The vehicle manufacturer's recommended tire pressure on the door jamb placard (35 psi) represents the engineered optimum for the vehicle's ride, handling, braking, traction, and tire wear characteristics. The sidewall maximum (44 psi) is the tire's structural pressure limit, not a recommended operating pressure. Overinflation to 44 psi reduces the contact patch, compromises traction, hardens the ride, and causes accelerated center-tread wear.

98. C — A vibration felt in the seat and floor but not the steering wheel, unaffected by braking, at a specific speed range points to a rear tire and wheel issue. Rear tire imbalance or runout transmits vibration through the rear suspension into the vehicle body, felt through the seat and floor. Front tire issues transmit primarily through the steering system to the steering wheel.

99. B — Severely uneven pad wear on one caliper (2 mm inboard vs. 6 mm outboard) indicates the caliper cannot float freely on its slide pins to equalize pressure. A seized slide pin holds the caliper body in a fixed position, forcing only the piston side (inboard) to do the braking work. The outboard pad barely contacts the rotor because the caliper cannot pull it inward during application.

100. A — A faulty variable-effort control valve or its speed-sensing solenoid is stuck in the maximum-assist position. Normal hydraulic power steering systems with variable effort reduce assist at higher speeds (by restricting flow or reducing pressure) to provide the driver with road feedback and precise control. If the valve is stuck at full assist, the steering remains effortless at highway speed — dangerously over-responsive.

101. A — The clockspring connector or the replacement clockspring itself is introducing a circuit resistance that falls outside the ACM's expected range for the driver's airbag firing circuit. The ACM continuously monitors the firing circuit resistance as a readiness check. If the connector is not fully seated or the replacement clockspring has slightly different internal wiring resistance, the ACM detects the deviation and stores the fault.

102. C — Corrosion at the base of the rear quarter panel near the wheel well is caused by the accumulation of road debris, salt, sand, and moisture that is thrown up by the tire and trapped against the panel surface. This material holds moisture against the metal, attacks the protective coating, and initiates

corrosion from the outside in. This location is one of the most common corrosion areas on vehicles in Canadian climates.

103. D — The front washers work normally (confirming the reservoir has fluid and the shared supply is adequate). The rear washer sprays weakly, indicating a problem specific to the rear circuit. Since the pumps are separate, the rear pump itself may have worn internally, reducing its output pressure. The rear line (which runs a long distance through the vehicle) or the rear nozzle may also be partially blocked.

104. B — The actuator clicks (confirming the motor energizes and runs), but the door does not lock or unlock (confirming the motion is not reaching the latch mechanism). The actuator's internal gear set has stripped or the linkage rod connecting the actuator to the lock mechanism has disconnected, allowing the motor to run without transmitting its rotary motion to the lock rod.

105. C — Crumple zones are engineered to deform progressively during a collision, absorbing kinetic energy through the controlled crush of the metal structure. By extending the deformation over a longer distance and time, the crumple zones reduce the peak deceleration forces that reach the passenger compartment. Lower peak forces mean lower injury risk for occupants restrained by seatbelts and airbags.

106. A — Gas struts (gas springs) are sealed, pressurized units that lose their charge over time as the internal nitrogen gas slowly leaks past the piston seal. Once the gas pressure drops below the level needed to support the hatch weight, the strut can no longer hold the hatch open. Gas struts should be replaced in pairs to ensure equal support force on both sides of the hatch.

107. B — As the HV battery ages and its total capacity decreases, the BMS reduces the maximum allowable regenerative charging current to protect the degraded cells from being overcharged at a rate they can no longer safely absorb. Less regenerative braking current means less deceleration force from the motor/generator, and the friction brakes must compensate by engaging earlier and more forcefully.

108. D — Cell voltages balanced within 0.02V with no fault codes indicates the battery pack is healthy and well-balanced — there is no single failed module or BMS calibration error. The range reduction from 55 km to 35 km (approximately 36% loss) at 90,000 km represents normal, gradual, permanent capacity degradation from charge-discharge cycling and calendar aging of the lithium-ion cells.

109. C — The 12V auxiliary battery powers the HV contactor control circuits, the vehicle's control modules, the charging system communication circuits, and all conventional 12V accessories. If the 12V

battery fails completely, the control modules cannot operate, the HV contactors cannot close (no power to energize the relay coils), and the vehicle cannot enter Ready mode — effectively stranding the vehicle despite a fully charged HV battery.

110. A — The HV A/C compressor is powered directly by the high-voltage battery at lethal voltage levels (200–400V DC or higher). Before any connections to the HV compressor are disturbed — power cables, refrigerant lines that pass near HV components, or mounting hardware — the complete HV de-energization procedure must be performed: vehicle off, key removed, 12V disconnected, HV service disconnect removed, capacitor discharge waited, and zero voltage verified.

111. B — Regenerative braking in BEVs handles 70-90% of normal deceleration, meaning the friction brakes are used far less frequently than on conventional vehicles. This reduced usage means the brake fluid is exposed to significantly less heat, and the moisture absorption rate is correspondingly slower. Many BEV manufacturers extend the brake fluid replacement interval or base it on moisture testing rather than fixed mileage.

112. B — An insulation resistance fault must be traced to its source through systematic isolation. After proper de-energization and zero voltage verification, the technician disconnects HV components one at a time, measuring insulation resistance after each disconnection. When removing a specific component causes the insulation resistance to return to normal, that component (or its cable) is the source of the fault.

113. C — The onboard charger is the component that converts external AC power to DC for battery charging. An internal fault — such as a degraded power transistor, a cooling circuit failure causing thermal derating, or a failed input filter — limits the charger's maximum output current. The charger still functions (the vehicle charges) but at reduced power, taking proportionally longer to deliver the same total energy to the battery.

114. A — Hybrid vehicles use an electrically driven HV A/C compressor powered by the high-voltage battery through an inverter. This allows the A/C to operate without the engine running — essential for maintaining cabin comfort during electric-only driving, start-stop idle events, and plug-in EV mode operation. A belt-driven compressor would only work when the engine is running.

115. B — Sustained high-power output during a highway hill climb draws large continuous current from the HV battery. Each cell has a maximum continuous discharge current rating that is lower than its peak (short-duration) rating. As the sustained discharge continues, the cells approach their continuous thermal

limit, and the BMS progressively reduces the allowable current to prevent cell overheating and degradation.

116. D — BEV battery packs and HV electrical systems are designed to meet stringent ingress protection (IP) ratings — typically IP67 or IP68 — that certify the system against water intrusion from submersion, splashing, and pressure washing. Normal car wash operations, including undercarriage spray, fall well within these ratings. BEVs are engineered to operate safely in rain, puddles, and car washes.

117. B — The "Ready" indicator on a hybrid vehicle confirms the high-voltage system is active and the vehicle is prepared to drive. In electric-only mode, the engine remains off and the vehicle operates silently on the electric motor. The ICE starts automatically when the battery SOC drops, cabin heating is demanded, or the driver's acceleration request exceeds the motor's maximum output.

118. C — Cells connected in series have their voltages added together. With 168 cells at 1.2 volts nominal each, the total pack voltage is 168 × 1.2V = 201.6V, approximately 202 volts DC. This is a common voltage range for nickel-metal hydride hybrid battery packs. Lithium-ion packs use fewer cells at higher individual cell voltage (3.6–3.7V nominal) to achieve similar or higher pack voltages.

119. A — With normal ambient temperature (25°C), moderate SOC (40%), and no warning indicators, the BMS is not limiting regenerative braking for thermal or SOC protection reasons. The most likely cause of reduced perceived regen deceleration is a friction brake issue — a dragging caliper, a seized parking brake, or contaminated pads — that is consuming some of the vehicle's deceleration independently, reducing the proportion available from the regenerative system.

120. D — In a series-connected battery pack, each module should read within a narrow voltage range of the others (typically within 0.1–0.2V). A module reading 0.6–0.8V below the rest has one or more cells that have degraded — reduced capacity, increased internal resistance, or an internal defect — causing that module to discharge deeper under load and charge to a lower level during regeneration than the healthy modules surrounding it.

121. C — Level 1 (120V) and Level 2 (240V) charging both use the same physical charge port and the same onboard charger. The charge port light illuminating confirms the EVSE is communicating with the vehicle. No light illumination with the Level 2 connector suggests the charge port's connector interface, locking mechanism, or pilot signal circuit has a physical or electrical fault that prevents the initial communication handshake with the Level 2 station.

122. C — The BMS is the central intelligence of the HV battery system. It continuously monitors each cell's voltage, temperature, and estimated state of charge. It manages cell balancing to equalize voltages across the pack. It controls the maximum allowable charge and discharge current limits to prevent cell damage from overcharging, over-discharging, excessive current, or thermal extremes. It is the primary safety guardian of the battery pack.

123. B — A "Motor Generator Resolver Signal Lost" DTC specifically identifies the resolver sensor — the electromagnetic position sensor mounted on the motor/generator that provides precise rotor position and speed data to the inverter. Without this data, the inverter cannot correctly time the switching of current between the motor's phase windings, and the motor cannot be operated safely or efficiently.

124. A — Modern hybrid HV batteries are designed for durability over the vehicle's useful service life. Most manufacturers provide warranties of 8 to 10 years or 160,000 km (some jurisdictions require longer coverage). Batteries degrade gradually rather than failing suddenly — capacity and power output decrease slowly over time. At 180,000 km, many hybrid batteries still retain 70–80% of their original capacity.

125. B — Many hybrid vehicles require a specific initialization, reboot, or system reset procedure after the 12-volt auxiliary battery is disconnected and replaced. The 12V system powers the control modules that manage the HV contactors. After a power interruption, these modules may need to complete a startup sequence, re-establish communication with the HV battery's BMS, or perform a self-test before they will authorize the HV contactors to close and enable Ready mode. The procedure varies by manufacturer.