

# PRACTICE EXAM 12: RED SEAL 310S

## SIMULATION (125 QUESTIONS)

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1. A WHMIS 2015 supplier label on a hazardous product container must contain six specific pieces of information. Which of the following is NOT a required element of the supplier label?

- A. Product identifier (chemical name or trade name)
- B. Initial supplier identifier (name, address, telephone)
- C. Pictograms, signal word, and hazard statements
- D. Lot number, batch code, and date of manufacture

2. Before lifting a vehicle on a frame-contact hoist, the technician should position the hoist arms:

- A. At the manufacturer's designated lift points (marked on the vehicle's pinch welds, sub-frame, or labelled in the owner's manual)
- B. Wherever the arms reach the underbody, as long as the vehicle balances during the lift
- C. Centered on the frame regardless of vehicle weight distribution
- D. As far apart as possible to maximize the lifting span

3. A technician working alone after hours in the shop must follow the workplace's "working alone" procedure, which typically requires:

- A. Wearing a personal locator beacon at all times
- B. A check-in protocol with a designated contact at scheduled intervals, so an emergency can be detected if a check-in is missed
- C. Posting a written note on the shop door indicating the technician's location
- D. Carrying a portable defibrillator throughout the shift

4. Precision measuring tools (torque wrenches, micrometers, etc.) require periodic calibration to maintain accuracy. The shop's calibration records should be:

- A. Stored in the technician's personal tool box for quick reference
- B. Maintained as a verbal record between technicians
- C. Documented in writing with date of last calibration, calibration source, and next calibration due date, traceable to a recognized standard
- D. Updated only when a customer complaint reveals a measurement error

5. A technician gets battery acid splashed in their eye. The FIRST response should be:

- A. Immediately flush the eye with copious clean water (or eyewash station fluid) for at least 15 minutes, then seek medical attention
- B. Wipe the eye dry with a clean towel to absorb the chemical, then drive to the hospital
- C. Apply eye drops to neutralize the acid before flushing with water
- D. Pour battery acid neutralizer (sodium bicarbonate solution) directly into the eye

6. When using a portable fire extinguisher, the technique known by the acronym "PASS" stands for:

- A. Pull, Aim, Spray, Stand back from the fire while operating the extinguisher
- B. Position, Activate, Spray, Stand by until the fire is fully out
- C. Prepare, Aim, Stand, Sweep across the fire base from a safe distance
- D. Pull the pin, Aim at the base of the fire, Squeeze the handle, Sweep side to side

7. A flat-rate repair manual lists 4.5 hours of labor for a timing belt replacement. The shop's labor rate is \$120 per hour. The customer's labor charge for this repair is:

- A. \$480 (4 hours at \$120)
- B. \$540 (4.5 hours at \$120)
- C. \$600 (5 hours at \$120, rounded up)
- D. \$720 (6 hours at \$120, including a 1.5-hour shop supply charge)

8. A repair order must include certain mandatory information to be valid under provincial consumer protection legislation. Required information typically includes:

- A. The technician's social insurance number for tax purposes only
- B. The customer's full credit history with the shop
- C. Customer name and contact, vehicle identification (VIN, year, make, model, odometer), description of complaint, authorized work scope, parts and labor charges, and the customer's signature
- D. Only the customer's name and the total amount charged

9. Centering a vehicle on a hoist before lifting is important because:

- A. An off-center vehicle shifts the center of gravity, can overload one side of the hoist beyond rated capacity, and may cause the vehicle to fall during operation
- B. Off-center vehicles damage the hoist's hydraulic seals during operation
- C. The hoist's electrical safety interlocks require a centered vehicle to operate
- D. Off-center vehicles produce excessive noise during the lift

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## MWA B: Engine and Engine Support Systems (Questions 10–31)

10. A vehicle has DTC P0301 stored. This code indicates:

- A. Random misfire detected across all cylinders during operation
- B. Cylinder 1 has a stored knock sensor signal that exceeded the threshold
- C. The first ignition cycle of the day has not yet completed monitor testing
- D. Misfire detected in cylinder 1 (P03xx codes are the misfire family; the last two digits identify the affected cylinder)

11. A vehicle has stored DTCs P0171 (System Too Lean, Bank 1) and P0174 (System Too Lean, Bank 2). Both banks running lean simultaneously most likely indicates:

- A. A failed Bank 1 oxygen sensor reading incorrectly during operation
- B. A failed Bank 2 oxygen sensor reading incorrectly during operation
- C. A vacuum leak, low fuel pressure, restricted fuel filter, or failing MAF sensor that affects both banks equally
- D. A failed catalytic converter on Bank 1 only

12. A compression test on a healthy engine should show cylinder-to-cylinder variation within approximately:

- A. 25 percent of the highest cylinder reading is acceptable
- B. 10 percent of the highest cylinder reading is the typical limit; variation above this indicates a cylinder problem requiring further investigation
- C. 50 percent variation is acceptable on older high-mileage engines
- D. Any variation is unacceptable and requires immediate engine rebuild

13. A scan tool shows Short-Term Fuel Trim (STFT) of +15% and Long-Term Fuel Trim (LTFT) of +20% at idle on Bank 1. This indicates:

- A. The PCM is reducing fuel because the system is running rich
- B. The system is operating normally with no fuel trim corrections needed
- C. The system is running too cold to enter closed-loop operation
- D. The system is running lean; the PCM is adding fuel to compensate, suggesting a vacuum leak, low fuel pressure, or unmetered air

14. At idle on a 2.0L engine, a properly functioning MAF sensor with a 5V reference typically reads:

- A. Approximately 0.8-1.2 V (corresponding to approximately 3-7 g/s of airflow at idle, depending on engine displacement)

- B. Approximately 0.0 V at idle and rising to 5.0 V at WOT
- C. Approximately 5.0 V at idle, dropping to 0.0 V at WOT
- D. Approximately 2.5 V at idle, with no variation across the RPM range

15. An upstream zirconia O<sub>2</sub> sensor on a healthy engine in closed-loop operation produces a voltage signal that:

- A. Remains constantly at approximately 0.45 V regardless of operating condition
- B. Sweeps slowly between 0 V and 5 V over a 30-second cycle
- C. Switches rapidly between approximately 0.1 V (lean) and 0.9 V (rich), typically 0.5-1 cycle per second at idle, more frequently at higher engine speeds
- D. Produces a steady DC voltage that increases linearly with engine RPM

16. An Engine Coolant Temperature (ECT) sensor that is "stuck cold" — reporting -40°C regardless of actual engine temperature — causes the PCM to:

- A. Disable the fuel pump as a protective measure
- B. Operate in extended open-loop with excessive fuel enrichment, producing rich exhaust, poor fuel economy, possible black smoke, and accelerated catalyst aging
- C. Reduce ignition timing to the minimum advance setting
- D. Set DTC P0420 for catalyst efficiency immediately

17. A vehicle has DTC P0325 stored (Knock Sensor 1 Circuit). The most likely cause is:

- A. A failed catalyst with excessive backpressure during operation
- B. A loose gas cap on the EVAP system
- C. A failed MAP sensor reading inaccurately during operation
- D. An open or shorted knock sensor circuit, failed knock sensor, or wiring/connector fault between the sensor and PCM

18. A vacuum gauge connected to a running engine shows a needle that fluctuates rhythmically between 14-18 in-Hg at idle. The most likely cause is:

- A. A burned exhaust or intake valve in one cylinder causing periodic pressure loss
- B. A clogged catalytic converter causing exhaust backpressure
- C. Late ignition timing causing low average vacuum
- D. A vacuum leak causing constant low vacuum

19. A vehicle has DTC P0455 stored (Evaporative Emission System Large Leak). The most likely cause is:

- A. A failed downstream oxygen sensor showing slow switching activity
- B. A failed knock sensor that has shifted ignition timing
- C. A loose, missing, or damaged fuel filler cap, or a large leak in the EVAP system (broken hose, cracked canister, missing seal)
- D. Excessive fuel rail pressure causing injector overflow

20. A returnless port-injection fuel system specification reads "fuel pressure: 380-420 kPa key on engine off." The measured pressure is 250 kPa with the pump running. The most likely cause is:

- A. A failed fuel pressure regulator stuck closed at maximum pressure
- B. A failing fuel pump, restricted fuel filter, or excessive return flow through a leaking regulator
- C. Normal operation at the start of the diagnostic test
- D. A failed PCM commanding excessive injector pulse width

21. A vehicle with an Idle Air Control (IAC) valve has rough idle that improves slightly when the engine warms up. The PCM commands the IAC valve position progressively higher (more open) compared to a healthy engine. The most likely cause is:

- A. Carbon deposits in the throttle body bypass passage, forcing the IAC valve to open further to maintain idle airflow

- B. A failed IAC motor that has stuck in the fully closed position
- C. A vacuum leak on the intake manifold producing excessive airflow at idle
- D. A failed thermostat keeping the engine cold during operation

22. A diesel engine's "injector balance test" (or injector contribution test) uses the scan tool to:

- A. Verify the fuel pressure at each injector matches the rail pressure
- B. Measure the resistance of each injector solenoid individually
- C. Disable each injector in sequence to identify the cylinder with the most contribution
- D. Compare each injector's fuel delivery contribution (typically by RPM contribution, fuel correction, or short-term injector trim) to identify imbalanced or weak injectors

23. A turbocharged 2.0L gasoline engine's boost pressure specification reads "max 18 psi at 2,500 RPM under full load." A scan tool shows actual boost of 8 psi under the same conditions. The most likely cause is:

- A. A failed knock sensor causing the PCM to disable boost
- B. A boost leak in the intake tract, a failed wastegate stuck open, or a failing turbocharger (worn bearings, damaged compressor wheel)
- C. Excessive intake air temperature reducing maximum possible boost
- D. Normal operation under light throttle conditions

24. A diesel DPF differential pressure sensor measures the pressure difference between the upstream and downstream sides of the filter. A reading of 80 kPa (12 psi) at idle (vs. spec of 0.5-2 kPa at idle) indicates:

- A. A failed differential pressure sensor reading incorrectly
- B. Normal operation during DPF active regeneration
- C. A severely loaded or plugged DPF that has not regenerated properly; the high pressure differential indicates restricted exhaust flow
- D. A failed downstream oxygen sensor causing PCM confusion

25. A MAP sensor on a naturally aspirated engine produces a voltage signal that varies with absolute manifold pressure. At wide-open throttle (manifold pressure near atmospheric, approximately 100 kPa), the MAP sensor typically reads:

- A. Approximately 4.5-4.8 V (near the upper end of the 0-5V signal range)
- B. Approximately 1.0 V (low voltage corresponds to high pressure)
- C. 0.0 V (no signal at WOT)
- D. 2.5 V (mid-range regardless of operating condition)

26. A cooling system pressure test holds at 15 psi for 1 minute, then suddenly drops to 5 psi over 5 seconds. The technician hears no audible leak. The most likely cause is:

- A. A failed thermostat stuck in the open position
- B. An intermittent internal leak (head gasket) that opens during the test, allowing pressure to bleed into the combustion chamber or oil galley
- C. A failed water pump weeping coolant past the shaft seal
- D. Normal pressure decay over the test duration

27. A vehicle has DTC P0401 (Exhaust Gas Recirculation Flow Insufficient). The most likely cause is:

- A. A failed catalytic converter with excessive efficiency
- B. A failed MAF sensor causing fuel control issues
- C. A vacuum leak causing excessive intake air
- D. A clogged EGR passage (carbon buildup), failed EGR valve (stuck closed or weak operation), or failed EGR position sensor

28. A PCV valve that is stuck in the open (full flow) position typically produces:

- A. A rich exhaust due to crankcase fumes overloading the intake
- B. Excessive crankcase pressure causing oil leaks past gaskets

C. A vacuum leak through the PCV system, often producing rough idle, lean condition, and possible P0171/P0174 codes

D. A complete blockage of crankcase ventilation

29. A vehicle with VVT has DTC P0011 (Camshaft Position A - Timing Over-Advanced or System Performance, Bank 1). After verifying the engine has good oil pressure and the oil control valve (OCV) is receiving the correct PWM command from the PCM, the most likely cause is:

A. A blocked or restricted oil control valve, sludge in the cam phaser, or a failed cam phaser mechanical component

B. A vacuum leak affecting fuel trim

C. A failed crankshaft position sensor that has shifted its timing reference

D. Excessive ignition timing advance from a knock sensor failure

30. A vehicle has DTC P0521 (Engine Oil Pressure Sensor/Switch Range/Performance). The technician's first diagnostic step should be:

A. Replace the oil pump as a preventive measure

B. Verify actual engine oil pressure with a mechanical gauge installed at the oil pressure sender port; compare to specification before condemning electronic components

C. Replace the oil pressure sensor without further testing

D. Add a quart of oil to bring the level above the maximum mark

31. A vehicle has rough idle that smooths out under any throttle, positive Long-Term Fuel Trim (+15-20%) at idle, normal LTFT at higher RPM, and a slight whistling under the hood near the intake area. The most likely cause is:

A. A failed fuel pressure regulator causing low pressure at idle

B. A failed catalytic converter causing exhaust restriction

C. A failed throttle position sensor reading inaccurately

D. A vacuum leak (cracked intake hose, failed gasket, broken vacuum line) — unmetered air admitted at idle is significant relative to total airflow but small at higher RPM

32. DTC U0100 stored in multiple modules indicates:

A. Lost communication with the engine control module (PCM/ECM); U-codes are network communication codes, and U0100 specifically reports loss of communication with the engine control module

B. Random network errors that resolve themselves automatically

C. A failed Bluetooth connection between the vehicle and a smartphone

D. Normal network operation during a battery disconnect event

33. A scan tool reports U0100 (Lost Communication with ECM/PCM) in the TCM, BCM, and ABS modules. The most likely cause is:

A. A failed transmission control module that has stopped network communication

B. A failed body control module that has stopped network communication

C. A failed PCM or its power/ground/network connection — multiple modules losing communication with PCM isolates the fault to PCM

D. A failed instrument cluster causing all other modules to lose communication

34. To measure CAN-H and CAN-L voltages on a high-speed CAN network with the vehicle key on and engine off, the technician should:

A. Disconnect the vehicle battery before measuring to prevent damage

B. Use a multimeter or scope with one lead on CAN-H (or CAN-L) and the other on chassis ground; measure each wire separately against ground to determine the recessive and dominant levels

C. Connect both meter leads to the same wire to measure resistance

D. Use a 1,000 V DC megger to test the network insulation

35. During an attempted module reprogramming, the battery voltage drops below 12 V momentarily and the flash fails. The module no longer communicates on the network. The technician should:

- A. Replace the module immediately since it cannot be recovered
- B. Continue trying the flash from the start; modules are always recoverable
- C. Reboot the scan tool and try the same flash file at the next opportunity
- D. Connect a stable battery support device, retry the flash using the OEM's recovery procedure (which may require a different file or boot-mode entry), and replace the module only if recovery fails

36. A modern Body Control Module (BCM) typically controls:

- A. Body functions like exterior lighting, interior lighting, power windows, central locking, wipers, climate control inputs, and security features
- B. Engine ignition timing and fuel injection
- C. Transmission shift solenoids during operation
- D. HV battery contactor opening on hybrid vehicles only

37. When a DTC matures and sets, the PCM captures "freeze frame" data, which includes:

- A. A photograph of the technician's diagnostic procedure during the fault
- B. The vehicle's GPS coordinates at the time of the fault
- C. The key data PIDs (engine RPM, vehicle speed, ECT, fuel trim, MAP, throttle position, etc.) at the moment the DTC set, useful for diagnosing conditions that triggered the fault
- D. The exact second-by-second timestamp of every fault occurrence in the past 30 days

38. A direct TPMS sensor is activated for diagnostic communication using a:

- A. Specific scan tool command sent through the OBD-II port to wake the sensor
- B. Low-frequency (LF) activation tool (typically 125 kHz) that triggers the sensor to transmit its data, after which the technician reads the sensor data with the scan tool or activation tool

- C. Battery jumper wire connected to the sensor's terminals
- D. Magnetic tool that opens the sensor's reed switch during activation

39. A typical modern vehicle's parasitic (sleep) current draw after all modules have entered sleep mode is approximately:

- A. 1.0 amp (1,000 mA) of continuous draw during sleep
- B. 500 mA of continuous draw during sleep
- C. 250 mA of continuous draw during sleep
- D. 30-80 mA (0.030-0.080 amp) of continuous draw during sleep, varying by manufacturer

40. Compared to a generic OBD-II scan tool, an OEM-specific (or comprehensive aftermarket) scan tool provides:

- A. Access to manufacturer-specific (enhanced) DTCs, bidirectional control, OEM data PIDs, programming/configuration, and TSB integration
- B. Faster network communication speeds during operation
- C. Higher voltage capability for module reprogramming
- D. No advantage over a generic scan tool for any function

41. A wiring diagram shows a module connector labelled "C137" with pins identified as "Pin 14: BCM CAN-H output." The technician needs to verify CAN signal at this pin and should:

- A. Disconnect the module before testing the pin during operation
- B. Test the pin with a multimeter set to AC voltage mode at any time
- C. Back-probe pin 14 of connector C137 with the module connected and the system operational, using a multimeter or scope to verify CAN signal presence and integrity
- D. Cut into the wire's insulation with a probe to measure the signal

42. A Technical Service Bulletin (TSB) for the vehicle being diagnosed typically:

- A. Replaces the manufacturer's warranty for the affected component
- B. Describes a known issue, the affected vehicle range (year, make, model, sometimes VIN range or production date), the recommended diagnostic procedure, and the corrective action authorized by the manufacturer
- C. Provides only marketing information about new vehicle features
- D. Is generated by aftermarket parts suppliers without manufacturer involvement

43. Modern vehicles include cybersecurity measures that limit certain diagnostic functions. To perform reprogramming or security-sensitive operations, the technician typically requires:

- A. Only a generic OBD-II scan tool with no additional authorization
- B. A separate physical key from the customer
- C. Removal of the OBD-II connector cover during operation
- D. Authentication credentials (OEM-specific login, J2534 secure access codes, or an authorized service portal account), which prevent unauthorized parties from reprogramming or unlocking secured functions

44. A vehicle has DTC P0700 stored. This code indicates:

- A. A transmission control system fault detected; P0700 is a "request MIL" code that prompts retrieval of TCM-specific DTCs for the actual fault
- B. The transmission has overheated and entered protection mode
- C. The transmission control module has failed completely
- D. The vehicle's odometer reading has reached 700 hours of operation

45. To perform a torque converter stall test, the technician should:

- A. Drive the vehicle at highway speed and apply maximum throttle while monitoring engine RPM
- B. Disconnect the torque converter from the engine and rotate by hand
- C. Apply parking brake and service brake firmly, place transmission in drive, apply full throttle for max 5 seconds, record maximum engine RPM and compare to specification

D. Disable the fuel pump and crank the engine for 5 seconds to measure converter resistance

46. During a road test, a scan tool shows ATF temperature climbing from 80°C to 120°C and continuing to rise during normal highway driving. The vehicle is towing within its rated capacity. The most likely cause is:

- A. Normal operation under towing conditions, no action required
- B. Restricted transmission cooler (debris, internal blockage), low ATF level, or failed cooler thermostat; the rising temperature indicates inadequate cooling
- C. A failed PCM commanding excessive line pressure
- D. A failed engine cooling system reducing overall vehicle cooling

47. A scan tool shows transmission line pressure of 50 psi at idle in Park (spec 80-110 psi at idle in Park). The most likely cause is:

- A. Normal operation; line pressure should always be low at idle
- B. Excessive transmission solenoid duty cycle commanded by the TCM
- C. A vacuum leak in the transmission modulator
- D. A failing transmission pump, low ATF level, internal hydraulic leak (valve body, sealing rings), or stuck pressure regulator valve

48. On a modern automatic transmission, a Pressure Control Solenoid (PCS) is commanded by the TCM using a PWM signal. A duty cycle of 50% with a 12V supply produces an effective output voltage of approximately:

- A. 6.0 V (50% of 12 V); PWM duty cycle controls the effective average voltage on the solenoid, producing proportional hydraulic pressure
- B. 12 V (full battery voltage regardless of duty cycle)
- C. 0 V (the solenoid is off at 50% duty cycle)
- D. 24 V (twice the battery voltage from the inductive kick)

49. During differential gear setup, the technician applies marking compound to the ring gear teeth and rotates the gears under load. The resulting wear pattern is concentrated on the heel (outer/larger) end of the tooth. This indicates:

- A. The pinion gear is set too deep into the ring gear
- B. The pinion gear is set too shallow (too far out from the ring gear)
- C. Backlash is too loose (ring gear too far from pinion) — heel pattern indicates excess backlash; reposition the carrier to move the ring gear toward the pinion
- D. Normal operation with no adjustment needed

50. Driveshaft U-joint angles are typically measured with:

- A. A torque wrench at each U-joint to determine the angle
- B. A magnetic inclinometer (or smartphone app) placed on each yoke surface; the angle difference between the driveshaft and the differential pinion yoke is the operating angle at that U-joint
- C. A laser alignment system designed for the differential pinion
- D. Visual estimation based on the driveshaft's apparent slope under the vehicle

51. A FWD vehicle clicks loudly when turning sharply in either direction; the noise is louder when turning right than when turning left, and disappears during straight-ahead driving. The most likely cause is:

- A. Worn outer CV joints, with one side slightly more worn — clicking on sharp turns is the classic outer CV joint symptom, and asymmetric noise suggests asymmetric wear
- B. Worn wheel bearings on both front wheels
- C. Failed power steering pump losing pressure during sharp turns
- D. Worn brake pads contacting the rotor during turns

52. A vehicle with a Haldex AWD coupling has stored DTC "P1842 - AWD Coupling Open/Short Circuit." The most likely cause is:

- A. Normal operation during cold start before fluid warms up
- B. A failed transmission valve body causing AWD engagement issues
- C. An electrical fault (open or short) in the Haldex coupling's electric clutch actuator circuit, or a failed actuator coil
- D. A loose fuel cap triggering an EVAP fault unrelated to AWD

53. A vehicle with an automatic transmission shows scan data: torque converter slip ratio of 30% in 4th gear during steady cruise (spec <5% with TCC commanded on). The most likely cause is:

- A. A failed crankshaft position sensor reading inaccurate engine speed
- B. A worn torque converter lockup clutch friction surface or failed TCC solenoid not applying the clutch
- C. A failed wheel speed sensor reading inaccurate vehicle speed
- D. Normal operation in 4th gear before TCC is commanded on

54. During a transmission service, the technician notices the ATF on the dipstick is bright pink/red with a fresh smell. This indicates:

- A. The fluid is severely overheated and the transmission needs immediate disassembly
- B. The fluid has been contaminated with engine coolant from a failed cooler
- C. The fluid is mixed with metal debris and requires immediate filtration
- D. The fluid is in good condition; healthy ATF is typically bright pink or red with a sweet/fresh smell, while degraded fluid darkens and smells burned

55. A shift solenoid coil specification reads "12-30 ohms at 20°C." The measured resistance is 0.5 ohms. The most likely cause is:

- A. A shorted solenoid coil (internal turn-to-turn short or short-to-ground), drawing excessive current and unable to produce normal magnetic force; the solenoid should be replaced
- B. Normal cold operation with no fault
- C. A failed PCM commanding the solenoid incorrectly

D. A normal reading; the spec is for hot operation only

56. A manual transmission produces a whining noise that varies with engine RPM but disappears when the clutch is depressed. The most likely cause is:

A. Worn output shaft bearing producing noise that varies with vehicle speed

B. Worn synchronizer producing noise during operation

C. Worn input shaft bearing or front bearing in the transmission case; noise stops when the clutch is depressed because the input shaft stops rotating

D. Failed pilot bearing producing noise only when the clutch is depressed

57. A 4WD vehicle's transfer case fluid is drained and shows a milky brown color. The most likely cause is:

A. Normal aging of transfer case fluid

B. Water contamination — fluid mixed with water (often through a damaged vent or driving through deep water), creating an emulsion that compromises lubrication; inspect for damage before refilling

C. Mixing with engine oil from a failed seal in the transfer case

D. Excessive heat causing the fluid to caramelize

58. On a modern automatic transmission, the Torque Converter Clutch (TCC) is engaged by the TCM to:

A. Increase torque multiplication during heavy acceleration

B. Disconnect the engine from the transmission during shifts

C. Operate the transmission's parking pawl mechanism

D. Mechanically lock the torque converter, eliminating the fluid-coupling slip that occurs at cruise speeds; this improves fuel economy and reduces ATF heat generation

59. An electronic vibration analyzer reports a driveshaft imbalance of 1.5 ounces at 0 degrees (the 12 o'clock position) at 95 km/h. The technician should:

- A. Apply 1.5 ounces at the 6 o'clock position (180° opposite the imbalance) on the driveshaft, then verify by re-running the analysis
- B. Apply a balance weight of 1.5 ounces at the 0° (12 o'clock) position on the driveshaft
- C. Apply a balance weight of 3.0 ounces at the 90° position
- D. Replace the driveshaft because vibrations cannot be corrected by balancing

60. A vehicle with a CVT exhibits a sudden RPM flare when accelerating from a stop, with sluggish forward motion. The transmission fluid is the correct type and at proper level. The most likely cause is:

- A. A failed driver's seat sensor causing improper TCM commands
- B. Normal CVT operation during cold start conditions
- C. CVT pulley or belt wear/contamination causing belt slip; engine RPM rises without proportional acceleration, typically requiring CVT inspection or replacement
- D. A failed power steering pump affecting CVT engagement

61. A modern battery tester applies a brief test load and measures the battery's internal resistance to estimate its condition. A typical fully-charged 12V automotive battery in good condition has an internal resistance of:

- A. Over 100 milliohms (very high resistance indicating a healthy battery)
- B. Approximately 3-10 milliohms (low internal resistance indicates good current delivery capability)
- C. Approximately 1-2 ohms (a moderate resistance for a healthy battery)
- D. Exactly 12 ohms (matching the battery's voltage rating)

62. To verify alternator diode integrity, the technician measures AC ripple at the battery with the engine running and electrical load applied. A healthy alternator should produce AC ripple of less than:

- A. 5.0 V AC at the battery terminals
- B. 2.5 V AC at the battery terminals
- C. 1.0 V AC at the battery terminals

D. 0.5 V AC at the battery terminals; ripple above this level indicates one or more failed diodes in the rectifier bridge

63. A vehicle with a healthy starting system should show cranking voltage at the battery (during the actual crank, not at rest) above:

A. 9.6 V (a common minimum; voltage below this indicates a weak battery, excessive starter current draw, or high resistance in the cranking circuit)

B. 12.0 V (full battery voltage during cranking)

C. 14.0 V (charging voltage applied during cranking)

D. 6.0 V (acceptable minimum cranking voltage)

64. A voltage drop test on the starter cable measured during cranking should show:

A. More than 1.0 V drop on the positive cable (typical for healthy circuits)

B. More than 2.0 V drop on the positive cable (normal cable resistance)

C. Less than 0.5 V drop on the positive cable, and less than 0.2 V drop on the ground cable (low voltage drop indicates clean, low-resistance connections throughout the cranking circuit)

D. Voltage drop is not measured during starter circuit diagnosis

65. A vehicle has a parasitic draw of 250 mA (spec <80 mA) after the modules have entered sleep mode. To identify the offending circuit, the technician should:

A. Disconnect the battery and observe which interior lights stay illuminated

B. With the meter connected in series with the battery negative cable, pull individual fuses one at a time while observing the meter; the offending circuit is the fuse whose removal causes the current draw to drop to within specification

C. Replace the battery first to eliminate it as a cause of excessive draw

D. Disconnect the alternator and check for current flowing back through the alternator regulator

66. A vehicle has DTC B2456 (Headlamp High Beam Output Failure - Left). The most likely cause is:

- A. A failed headlamp switch causing both high beam circuits to fail
- B. A failed BCM causing the high beam command not to reach the headlamp
- C. Normal operation; this code is set only during the low beam test cycle
- D. Burned-out left high beam bulb, open circuit in the left wiring/socket, or failed high beam relay specific to the left side

67. A vehicle's climate control is set to "MAX HEAT" but only cool air comes from the vents. The scan tool shows the temperature blend door actuator commanded to "100% hot" but reports actual position at "5%." The most likely cause is:

- A. A failed temperature blend door actuator (worn gears, broken motor) — the actuator cannot reach the commanded position, leaving the door near the cold position
- B. A failed cabin temperature sensor
- C. Low engine coolant level preventing the heater core from warming
- D. A failed compressor clutch unrelated to heating

68. On a hot day (35°C ambient), an A/C system shows: Low side: 50 psi, High side: 150 psi (specs: Low ~40-50 psi, High ~250-300 psi). The most likely cause is:

- A. Overcharged refrigerant in the system
- B. A failed evaporator allowing internal refrigerant leak
- C. A failing compressor (worn internal components, weak compression) — both sides converge to middle pressures because the compressor cannot create the normal differential
- D. A clogged orifice tube preventing refrigerant flow to the evaporator

69. On the same hot day (35°C ambient), another vehicle shows: Low side: 30 psi (low end of spec), High side: 450 psi (spec ~250-300 psi). The most likely cause is:

- A. Overcharged refrigerant in the system
- B. A failed compressor with weak output
- C. Low refrigerant charge limiting cooling capability

D. Restricted condenser airflow (failed fan, debris in condenser fins), an overcharged system, or non-condensable gases in the system; high-side pressure is excessive because heat is not being released at the condenser

70. To recover and recharge an A/C system to the manufacturer's weight specification (e.g., 600 g), the technician uses:

- A. A graduated cylinder under the recovery hose to measure refrigerant volume in litres
- B. A recovery/recharge machine with built-in electronic scale that measures mass of refrigerant recovered and dispensed, plus an integrated vacuum pump
- C. A weight scale under the recovery tank during operation
- D. A pressure gauge calibrated for refrigerant mass at standard temperature

71. A heater core flow test is performed by:

- A. Feeling the heater core inlet and outlet hoses with the engine warm and the heater control set to maximum heat; both hoses should be hot to the touch, indicating coolant flow (a cold or only-warm outlet suggests restriction)
- B. Disconnecting the heater hoses and pouring water through the core to measure flow rate
- C. Measuring the heater core's electrical resistance with the engine off
- D. Inspecting the heater core's appearance through the cabin air vents

72. On a typical modern vehicle, the cabin air filter is most commonly accessed by:

- A. Removing the engine air intake duct under the hood
- B. Lifting a panel in the trunk near the rear bumper
- C. Releasing the glove box from its stops (typically removing screws or stops, then dropping the glove box down), revealing the filter housing in the HVAC case
- D. Removing the dashboard center console for HVAC access

73. A modern automatic climate control system controls blower motor speed using:

- A. A series of resistors of different values, one for each speed setting, switched by the blower motor switch
- B. A PWM module that varies effective voltage to the blower by switching on/off at high frequency with variable duty cycle; this allows infinite speed control with less heat than a resistor pack
- C. A mechanical governor inside the blower motor itself
- D. A variable-speed transmission gearbox between the motor and the blower wheel

74. To locate a break in a rear defroster grid line, the technician:

- A. Visually inspects the grid for visible damage only
- B. Measures the resistance of the entire grid with an ohmmeter
- C. Disconnects the rear defroster and inspects each line individually
- D. With the defroster activated and DMM in DC voltage, places one lead on ground and probes along each grid line; voltage drops to zero at the break point

75. A typical power door lock actuator (DC motor with internal cam) draws current:

- A. Continuously while the door is locked, maintaining the lock position
- B. Continuously at low current (50-100 mA) when at rest
- C. At full battery current for as long as the door switch is held
- D. Briefly (0.5-1 second) at 0.5-2 amps during the lock/unlock motion, then zero current at rest; the motor drives a cam and stalls when the cam reaches its end

76. After replacing a power window motor, the auto-up feature must be calibrated. The typical procedure is:

- A. Disconnect the battery for 30 minutes, then the system will self-calibrate
- B. Lower the window fully, hold the switch for several seconds, then raise fully and hold up for several seconds (the BCM learns travel limits and pinch-protection threshold)
- C. Drive the vehicle for 100 km before the system will auto-calibrate

D. The auto-up feature cannot be recalibrated after motor replacement

77. A direct TPMS sensor's internal battery typically lasts:

A. Approximately 1-2 years before requiring replacement

B. Approximately 3-4 years before requiring replacement

C. Approximately 100,000 km before requiring replacement

D. Approximately 5-10 years; when the battery dies, the entire TPMS sensor must be replaced because the battery is not separately serviceable

78. A heated seat cushion element is tested by measuring its resistance at the connector. A typical heated seat element has a resistance of:

A. Approximately 1-5 ohms (low resistance allows the element to dissipate significant heat through I<sup>2</sup>R losses); a reading of open (infinite) indicates a broken element wire

B. Approximately 100 ohms (similar to a sensor circuit)

C. Approximately 1,000 ohms (similar to a thermistor)

D. Several megohms (similar to an open circuit)

79. A vehicle's low-beam headlights do not illuminate, but high beams work normally. The technician should first:

A. Replace both headlight bulbs as a preventive measure

B. Replace the entire headlamp assembly because the unit has failed

C. Test the low-beam relay (often by swap), verify voltage at the relay's switched output, and check power and ground at the headlamp connector with the switch in low position

D. Replace the BCM because the lighting control has failed

80. To check the ground integrity of an electrical load (e.g., headlamp), the technician should measure:

- A. The resistance of the ground wire with the load disconnected
- B. Voltage drop between the load's ground terminal and battery negative post while the load is operating; less than 0.1-0.2 V indicates a good ground
- C. The current flowing through the ground wire under no load
- D. The temperature of the ground wire during operation

81. An Intelligent Battery Sensor (IBS) mounted on the negative battery terminal monitors:

- A. The fuel level in the vehicle's tank
- B. Tire pressure through wireless communication
- C. The ambient air temperature for climate control reference
- D. Battery current, voltage, and temperature; the IBS reports this data to the BCM/PCM, which calculates state-of-charge and state-of-health, adjusts charging voltage, and authorizes stop-start function

82. An AGM (Absorbed Glass Mat) battery typically requires:

- A. A charger designed for AGM batteries (or with AGM mode) — AGM batteries have different voltage curves than flooded batteries, and charging at flooded-battery voltage can damage the AGM
- B. The same charging profile as any flooded lead-acid battery
- C. Charging only at low rate (1-2 amps) regardless of battery size
- D. Distilled water added periodically to maintain electrolyte level

83. After replacing a wiper motor, the wipers do not return to the park position correctly when turned off. The most likely cause is:

- A. A failed wiper switch on the steering column
- B. A failed BCM causing wiper command failure
- C. Improper installation of the wiper arms onto the motor splines — the park position depends on arm position on the splined output shaft when the motor is at its park stop; arms must be reinstalled with the motor at park position

D. Low washer fluid level preventing wiper operation

84. Brake pad friction material thickness is measured at:

A. The center of the pad surface only

B. The thinnest point of the friction material (typically with a brake pad gauge or caliper), since uneven wear concentrates wear at specific points and the thinnest point determines remaining service life

C. Three locations averaged for total thickness

D. The pad backing plate thickness, since friction material thickness varies

85. A brake rotor's lateral runout specification is typically:

A. Less than 5.0 mm (significant runout is acceptable on most vehicles)

B. Less than 2.5 mm (typical operating tolerance for normal driving)

C. Less than 1.0 mm (close to specification for most applications)

D. Less than 0.05-0.08 mm (50-80 microns); excessive runout causes brake pedal pulsation and uneven rotor wear

86. A scope trace of an active (Hall-effect) wheel speed sensor at moderate vehicle speed shows:

A. A digital square wave with consistent frequency and amplitude (typically 5V or 12V peak-to-peak), with frequency proportional to wheel speed

B. An AC sine wave with amplitude proportional to wheel speed

C. A steady DC voltage that increases with wheel speed

D. A complex AM-modulated signal varying with wheel speed

87. To service brake pads on a vehicle with an Electronic Parking Brake (EPB), the technician must:

A. Disconnect the battery for 30 minutes before disturbing the caliper

- B. Press the piston back manually using a C-clamp without any electronic intervention
- C. Activate EPB service mode through the scan tool (or manufacturer procedure), retracting the EPB motor so the piston can be safely retracted; reactivate normal EPB function after pad installation
- D. Replace the EPB caliper entirely; the EPB is not separately serviceable

88. For a typical vehicle with a diagonal (X-pattern) split brake system, the bleeding sequence specified by most manufacturers is:

- A. Right rear, left front, left rear, right front
- B. Per the manufacturer's specific procedure (often: right rear, left front, left rear, right front — bleeding the farthest corner on each circuit first), with service information consulted
- C. Always front first, then rear (right side, then left side)
- D. Sequence does not matter as long as all four wheels are bled

89. A vehicle exhibits brake drag on the right front wheel: the wheel is hot to the touch after a short drive, and the brake does not release fully after pedal application. Brake fluid level is correct and there are no external leaks. The most likely cause is:

- A. A failed master cylinder providing one-way valve action
- B. A failed proportioning valve restricting rear pressure only
- C. A failed ABS modulator holding pressure to the right front
- D. A collapsed brake hose to the right front caliper — the internal flexible hose has degraded so pressure passes to the caliper but cannot return, trapping pressure and holding the brake applied

90. To retract a brake caliper piston during pad replacement on a non-EPB caliper, the technician uses:

- A. A C-clamp or piston compression tool to press the piston back into its bore; twist-style rear calipers require a specific tool to rotate the piston back
- B. An air impact gun to forcefully drive the piston back
- C. A hammer and punch to drive the piston back
- D. A long pry bar wedged between the caliper and the rotor

91. A vehicle has DTC C0241 (ABS Module Voltage Low). The most likely cause is:

- A. A failed wheel speed sensor on a single wheel
- B. A failed ABS pump motor commanding excessive current
- C. Low system voltage (weak battery, alternator output insufficient, or excessive voltage drop in ABS supply); the ABS module requires stable voltage and sets the code when supply drops below threshold
- D. A failed brake fluid level sensor

92. The Steering Axis Inclination (SAI) angle on a typical alignment specification refers to:

- A. The angle of the steering wheel column relative to vertical when viewed from the side
- B. The angle of the steering axis (through the upper and lower ball joints, or strut top mount and lower ball joint) from vertical, viewed from the front; SAI and caster return the wheel to center after a turn
- C. The vehicle's pitch angle when accelerating
- D. The angle between the wheel and the brake rotor

93. A vehicle pulls slightly to the right at highway speed. The technician verifies tire pressures and tire wear are equal. An alignment check shows right front camber at  $+0.2^\circ$  and left front camber at  $-0.3^\circ$  (spec:  $0^\circ \pm 0.5^\circ$ , both within tolerance). The most likely cause is:

- A. A failed power steering pump providing inconsistent assist
- B. Worn wheel bearings causing a pull during operation
- C. A failed brake caliper dragging on one side
- D. Both camber readings are within tolerance, but the  $0.5^\circ$  side-to-side difference (right side more positive) causes a right pull; cross-camber within  $\sim 0.3^\circ$  is typically required for straight tracking

94. A tire that has been chronically over-inflated typically shows:

- A. Wear concentrated in the center of the tread, with the edges showing less wear; over-inflation bulges the contact patch in the center and reduces shoulder contact

- B. Wear concentrated on both edges, with the center showing less wear
- C. Diagonal wear from corner to corner of the tread
- D. Uniform wear identical to a properly inflated tire

95. On a tire sidewall reading "P225/65R17 102H," the "65" indicates:

- A. The tire's load index in a coded format
- B. The tire's maximum cold inflation pressure in psi
- C. The tire's aspect ratio (sidewall height as a percentage of tread width); 65 means the sidewall is 65% of 225 mm = approximately 146 mm tall
- D. The tire's speed rating in m/s

96. A "hub-centric" wheel and hub design means:

- A. The wheel is centered on the brake rotor during installation
- B. The wheel is centered on the hub by a precise fit between the wheel's center bore and the hub's pilot ring (lug nuts clamp but do not center); proper centering eliminates off-center vibration
- C. The hub is centered on the bearing during manufacture
- D. The wheel and hub are mounted concentrically through a magnetic centering mechanism

97. A shock absorber's bounce test is performed by:

- A. Driving the vehicle at highway speed and checking for harshness
- B. Removing the shock absorber for bench testing only
- C. Visually inspecting the shock absorber for oil leakage
- D. Pressing down firmly on the corner of the vehicle and releasing; a healthy shock allows no more than 1.5 bounce cycles before settling, while a worn shock allows several oscillations

98. On a SLA (Short-Long Arm) suspension where the spring is mounted on the lower control arm:

- A. The lower ball joint is the load-bearing joint (carries vehicle weight) and the upper ball joint is the follower joint (no vertical load at ride height); each must be inspected differently
- B. The upper ball joint is always the load-bearing joint
- C. Both ball joints are equally loaded at ride height
- D. Neither ball joint carries vehicle load; the spring carries all weight

99. After replacing the EPS rack or column assembly, the system typically requires calibration that includes:

- A. Driving the vehicle for 100 km to allow the system to self-learn
- B. Adjusting the steering wheel hub position with the rack centered
- C. A scan-tool calibration that sets the EPS torque sensor zero-point and the steering angle sensor (SAS) zero-point, typically requiring specific wheel positions and ignition states per the manufacturer's procedure
- D. Recharging the power steering fluid reservoir

100. The Steering Angle Sensor (SAS) requires "zero-point" calibration after:

- A. Every tire rotation regardless of alignment
- B. Any steering system service (rack replacement, column work, alignment, steering wheel removal, related suspension work) — the calibration sets the sensor's reference to "wheels straight ahead"
- C. Every oil change as part of routine maintenance
- D. Only after a steering angle sensor replacement, with no other triggers requiring calibration

101. A vehicle has directional tires (with arrows on the sidewall indicating rotation direction). The recommended rotation pattern is:

- A. Cross-pattern rotation (X-pattern) for even wear
- B. Side-to-side rotation (left tires to right side, right tires to left side)
- C. Replace all tires every 30,000 km without rotation

D. Rotate front to rear on the same side only (left to left, right to right), preserving rotation direction; crossing sides would reverse direction and degrade wet-weather performance

102. A wheel hub bearing produces a humming/growling noise that changes when the vehicle is loaded by turning. To isolate which side has the failing bearing, the technician should:

- A. Listen with a stethoscope at each wheel during operation
- B. Drive the vehicle in a tight circle in both directions; the bearing noise will be louder when the bearing is unloaded
- C. Drive through gentle left and right S-curves at moderate speed; a worn bearing's noise gets louder when loaded by weight transfer (vehicle turning toward the opposite side of the bad bearing)
- D. Disassemble each wheel bearing for visual inspection

103. A brake fluid moisture content tester (electronic) measures:

- A. The water content of the brake fluid through electrical conductivity or capacitance; readings of 3% or higher moisture content typically warrant brake fluid replacement to maintain boiling point
- B. The brake fluid's color through optical sensors
- C. The brake fluid's viscosity at operating temperature
- D. The brake fluid's volume in the master cylinder reservoir

104. When disassembling a MacPherson strut to replace components (strut cartridge, top mount, spring), the technician must:

- A. Heat the strut to soften the spring before disassembly
- B. Use a proper spring compressor to safely compress the spring before removing the top mount nut; the compressed spring stores tremendous energy and can cause severe injury if released uncontrolled
- C. Remove the top mount nut quickly to release the spring before it can recoil
- D. Cut the spring with a saw to release tension safely

105. The vehicle manufacturer's tire pressure specification listed on the door jamb placard refers to:

- A. The pressure to set with the tires hot (after driving)
- B. The maximum pressure the tire can hold during operation
- C. The average pressure the tire should maintain across all conditions
- D. The cold inflation pressure (measured before driving or after 3+ hours of rest); pressure rises 3-6 psi during operation, and placard pressure produces correct operating pressure when set cold

106. On a vehicle with a sealed wheel hub bearing assembly mounted to the steering knuckle by bolts, the axle nut on a driven wheel is typically torqued to:

- A. Hand-tight only, since the bearing is pre-set
- B. 25-50 Nm, typical of small fasteners
- C. The manufacturer's specification, typically a high torque (150-300 Nm or more, sometimes plus an angle), securing the axle to the hub without affecting bearing preload (sealed and pre-set)
- D. A specific torque listed on the hub assembly itself, not in the service manual

107. A vehicle has DTC B0028 (Driver Airbag Squib Circuit Open). The most likely cause is:

- A. An open circuit in the airbag squib wiring, a damaged clock spring (which routes power through the steering column), a failed igniter, or a connector fault — all breaking the electrical path to the airbag
- B. A failed crash sensor in the front bumper
- C. A failed seat belt buckle switch
- D. Normal operation during the airbag system's self-test

108. A scan tool reads "Pretensioner 1 - Deployed" in the SRS module. This indicates:

- A. The pretensioner is operating normally with no fault
- B. The vehicle is in airbag deployment-disabled mode
- C. The seat belt pretensioner has a temporary diagnostic message that will clear at next ignition cycle
- D. The pretensioner has deployed in a crash event; the pretensioner and seat belt assembly must be replaced, and the SRS module reset or replaced per manufacturer procedure

109. During routine inspection, the technician finds a seat belt with a small but visible burn mark on the webbing about 30 cm from the buckle, with adjacent fibers melted. The proper action is to:

- A. Trim the damaged area with scissors and reuse the belt
- B. Apply a fabric patch over the damaged area to reinforce it
- C. Replace the entire seat belt assembly because damaged webbing may not hold occupant loads in a crash; seat belt webbing is a safety-critical component that cannot be repaired
- D. Lubricate the webbing with silicone spray to restore flexibility

110. Before working on the SRS system (e.g., replacing a steering wheel airbag), the technician should:

- A. Disconnect the battery and wait the manufacturer-specified time (typically 1-10 minutes, depending on the vehicle) for the SRS module's reserve capacitor to discharge, before disconnecting the airbag harness
- B. Work immediately without battery disconnection; modern SRS modules have no reserve capacitor
- C. Disconnect the battery and immediately begin work; the SRS capacitor discharges instantly
- D. Drain the brake fluid before SRS work to depressurize the system

111. A driver door lock actuator does not respond to either the key fob or the lock switch; the passenger door operates normally. The technician should:

- A. Replace the BCM because the lock function has failed
- B. Apply battery voltage directly to the actuator's motor terminals; if the actuator operates, the fault is in the wiring, BCM output, or switch — if not, the actuator has failed
- C. Replace the key fob first because remote keyless operation has failed
- D. Recalibrate the central locking system through a scan tool

112. A heated seat element fails to produce heat. The technician measures the element resistance and finds it open (infinite resistance). The fault is:

- A. A failed thermostat in the heating circuit

- B. A failed seat heat control switch
- C. A failed BCM relay supplying power to the seat
- D. A broken element wire within the seat cushion, typically from repeated flexing or compression over service life; the seat element (or seat cushion) must be replaced

113. A vehicle's headliner has water stains and the cabin smells musty after rain. The most likely cause is:

- A. A failed windshield washer reservoir leaking into the cabin
- B. A failed cabin air filter contaminated with mould
- C. Clogged sunroof drain tubes — water entering the sunroof tracks cannot flow through the drains (at the sunroof corners, through the A-pillars to outlets behind the front fenders) and backs up into the cabin
- D. A leaking heater core dripping into the headliner

114. A side curtain airbag is designed to deploy in response to:

- A. A side impact above a calibrated severity threshold (detected by sensors in the doors or B-pillars) or a rollover event (roll-rate sensor); the curtain protects the head in side impacts and rollovers
- B. A frontal impact above a severity threshold during normal operation
- C. The driver pressing a deployment button manually during a crash
- D. A rapid deceleration measured by the ABS wheel speed sensors

115. During collision repair, "control points" on the vehicle body refer to:

- A. The locations of all body alignment shims as installed at the factory
- B. Specific manufacturer-designated reference points on the body (typically holes, bolts, or surfaces) measured against dimension specifications to verify the structure is restored within tolerance after repair
- C. The areas that must be controlled by the customer during body repair operations
- D. The locations where body sealant is applied at the factory

116. After replacing an exterior mirror assembly that includes integrated functions (blind spot indicator, signal repeater, heated glass, auto-dim, memory), the technician may need to:

- A. Drive the vehicle for 100 km for the mirror to self-calibrate
- B. Disconnect the battery for 30 minutes to allow the BCM to relearn
- C. Replace the entire mirror module and accept that some features may not work
- D. Calibrate or configure the new mirror through the scan tool (e.g., blind spot zone setting, memory position learning, auto-dim sensitivity, motor travel limits), per the manufacturer's procedure

117. A hybrid vehicle's HV battery health is assessed during diagnosis by reading:

- A. Only the total battery pack voltage at the inverter
- B. The HV battery's storage temperature only
- C. Individual cell or module voltages (and temperatures) reported by the BMS through scan tool; voltage imbalance beyond tolerance, low overall SoC, or temperature differences indicate degraded health
- D. The 12V auxiliary battery voltage only, as a proxy for HV battery health

118. A hybrid vehicle has DTC P0AA6 (Hybrid Battery Voltage System Isolation Fault). The most likely cause is:

- A. Degraded insulation between HV conductors and chassis (leakage detected by the IMD), often caused by a failed HV cable, damaged connector, coolant intrusion, or contamination
- B. A failed 12V auxiliary battery affecting the BMS power
- C. Normal startup self-test of the HV system
- D. A failed brake light bulb in the brake circuit

119. During a hybrid vehicle's "ready to drive" sequence, the BMS commands the HV contactors. A scan tool shows the contactors commanded "closed" but the inverter reports "0 V" on the DC bus. The most likely cause is:

- A. Failed HV contactors (welded open, mechanical failure, seized) or failed pre-charge resistor circuit preventing safe HV connection to the inverter
- B. Normal operation during the inverter's startup sequence
- C. A failed wheel speed sensor preventing the vehicle from entering ready mode
- D. A failed 12V auxiliary battery affecting the dashboard display

120. A hybrid vehicle's HV battery State of Charge (SoC) is typically managed by the BMS within a specific range to extend battery life. The typical operating SoC window for a hybrid is:

- A. 0-100% (full discharge to full charge) for maximum capacity utilization
- B. 100% at all times (the battery is always kept fully charged)
- C. Approximately 20-80% (or a narrower window depending on manufacturer) — the BMS avoids the high and low extremes of SoC because operating in those zones accelerates lithium-ion degradation
- D. Exactly 50% SoC at all times during operation

121. Regenerative braking on an EV during normal driving:

- A. Operates only during emergency stops at high decelerations
- B. Provides braking effort through the traction motor (acting as a generator), with friction brakes engaging only for additional deceleration; the driver feels seamless deceleration as the system blends regen and friction
- C. Disengages the traction motor from the wheels during deceleration
- D. Operates only when the vehicle is parked

122. During AC Level 2 charging through a J1772 connector, the EV and the EVSE (Electric Vehicle Supply Equipment) communicate the maximum available charging current through:

- A. A separate Bluetooth connection between the EV and EVSE
- B. A signal on the AC neutral wire (not Live)
- C. An RFID tag in the charging connector

D. The Control Pilot (CP) signal — a PWM signal on the CP pin where the duty cycle indicates the maximum current the EVSE can deliver; the EV reads this and configures its onboard charger accordingly

123. High-voltage cables on a hybrid or EV are universally colour-coded:

- A. Yellow, to indicate caution and high temperature
- B. Green, to indicate ground reference
- C. Orange, to provide universal visual warning of high voltage; technicians and first responders worldwide recognize orange cables as HV components that require special handling
- D. Black, to match the chassis ground colour

124. A scan tool shows the EV traction motor temperature at 145°C (spec maximum 130°C during operation). The most likely cause is:

- A. Normal operation during high-power acceleration; no action needed
- B. A failed motor cooling system component — coolant flow issue (failed electric water pump, blocked passages), low coolant in the motor cooling circuit, or a failed temperature sensor reading high
- C. A failed 12V battery affecting the BMS cooling
- D. A failed regen braking module

125. After removing the Manual Service Disconnect (MSD) on a hybrid/EV battery pack, the technician must:

- A. Begin work immediately, as the MSD removal eliminates all HV hazards
- B. Wait 30 minutes regardless of manufacturer specification
- C. Wait the manufacturer-specified time (typically 5-10 minutes) for the inverter's DC bus capacitors to discharge, then verify the absence of voltage at specified test points using a Cat III/IV-rated multimeter
- D. Drain the inverter coolant before beginning work

## Practice Exam 12: Answer Key and Explanations

1. D — Lot number, batch code, and date of manufacture are not among the six mandatory WHMIS supplier label elements. The six required elements are product identifier, initial supplier identifier, pictograms, signal word, hazard statements, and precautionary statements (plus reference to the SDS). Manufacturers may include lot/batch info voluntarily, but it is not WHMIS-required.
2. A — Manufacturer-designated lift points are engineered to safely support the vehicle's weight and load distribution through the strongest structural members. Lifting elsewhere can crush body panels, damage rocker panels, or shift the load and let the vehicle slip off the hoist, causing serious injury or property damage.
3. B — Provincial OHS regulations for working alone require a check-in system that lets a designated contact detect emergencies. Scheduled phone or text intervals with documented procedures ensure that if the technician is injured or incapacitated, someone notices within a short window and can respond.
4. C — Calibration records must be auditable: dated, signed, traceable to a recognized standard, and showing the next due date. Verbal records or undocumented checks fail audit requirements and undermine measurement confidence for warranty and regulatory work.
5. A — A chemical splash in the eye requires immediate, prolonged flushing with copious water for at least 15 minutes to dilute and remove the chemical before deeper tissue damage occurs. Delayed flushing, wiping dry, or applying neutralizers can worsen injury; water and time are the proven first response.
6. D — PASS stands for Pull (the pin), Aim (at the base of the fire, not the flames), Squeeze (the handle), and Sweep (side to side). Aiming at the base attacks the fuel source, the part of the fire that must be smothered to stop combustion.
7. B — Flat-rate labor is charged at the manual's listed hours regardless of how long the technician actually takes.  $4.5 \text{ hours} \times \$120/\text{hr} = \$540$ , the customer's labor charge per the flat-rate principle.
8. C — Provincial consumer protection legislation requires the repair order to capture customer identification, vehicle identification, complaint, authorized work, parts and labor charges, and a

signature documenting authorization. Missing required elements can make the charges legally non-collectible.

9. A — A hoist's rated capacity assumes the load is centered between the lifting arms; an off-center vehicle concentrates load on one side, potentially exceeding that side's rated capacity. The shifted center of gravity can also cause the vehicle to slide off the arms as the hoist rises.

10. D — P0301 is read as P-Power-train, 0 generic, 3 ignition/misfire family, 01 cylinder identifier. The first two digits identify the system (misfire), and the last two identify which cylinder, so P0301 specifically reports a misfire detected in cylinder 1.

11. C — When both banks read lean simultaneously, the cause must affect both banks equally — a vacuum leak (large enough to reach both sides), low fuel pressure (common rail), restricted fuel filter, or a MAF undercount of incoming air. Single-bank sensor failures cannot produce dual-bank lean codes.

12. B — Most manufacturers consider 10 percent cylinder-to-cylinder variation acceptable, with variation beyond that requiring further investigation (wet test, leakdown, vacuum gauge). The 10 percent rule catches developing issues before they cause noticeable performance problems.

13. D — Positive fuel trim means the PCM is adding fuel; +15 percent STFT with +20 percent LTFT shows the system has been chronically lean long enough for the learned correction to climb. The pattern points to unmetered air (vacuum leak), low fuel pressure, or a MAF reading low.

14. A — A typical MAF on a 2.0L at idle measures airflow of 3-7 g/s, which corresponds to approximately 0.8-1.2 V on a 0-5V signal range. The scaling lets the PCM determine fueling precisely across the engine's full operating range.

15. C — A healthy zirconia O<sub>2</sub> sensor switches rapidly between lean ( $\approx 0.1$  V) and rich ( $\approx 0.9$  V) crossings as the PCM oscillates fuel trim around stoichiometric. The fast switching is the diagnostic signature of a responsive sensor that can support closed-loop control.

16. B — An ECT reading  $-40^{\circ}\text{C}$  tells the PCM the engine is freezing cold, so it commands extended cold-start enrichment, suppresses closed-loop, and may retard timing. The result is excessive fuel use, rich exhaust, possible black smoke, and accelerated catalyst aging from constant cold-start fueling.

17. D — P0325 is the knock sensor 1 circuit code, reporting an electrical fault in the sensor's wiring or the sensor itself rather than a knock event. The typical fault is an open or shorted circuit, a failed sensor element, or a corroded connector at the sensor's pigtail.

18. A — A rhythmically fluctuating vacuum gauge that drops and recovers in regular pulses indicates a single cylinder is losing compression on each compression cycle — typically a burned valve in one cylinder. The pulse rate corresponds to the firing rate of the affected cylinder.

19. C — P0455 is the large evaporative emission leak code, set when the EVAP system pressure or vacuum cannot be maintained at the threshold. A loose, missing, or damaged gas cap is the most common cause, followed by cracked hoses, failed canister vent valves, or canister damage.

20. B — Fuel pressure at 250 kPa against a spec of 380-420 kPa with the pump running indicates the supply system cannot maintain pressure under load. A weak pump that cannot achieve rated output, a restricted filter limiting flow, or a leaking regulator (in systems with one) are the standard causes.

21. A — A progressive increase in commanded IAC position over time indicates the throttle body and IAC bypass passage have accumulated carbon, restricting the airflow path. The PCM compensates by opening the IAC further to maintain target idle, but eventually the IAC runs out of authority and idle becomes rough.

22. D — An injector balance test compares each cylinder's contribution to engine output, typically through RPM contribution, fuel rail pressure drop, or short-term injector trim values. Cylinders that contribute significantly less than others indicate weak or partially blocked injectors needing service.

23. B — Boost at half the specification under full load points to either an air leak between the turbo and the throttle body, a wastegate that is not closing fully, or a turbo that cannot reach normal speed (worn bearings, damaged compressor wheel). Each fault reduces the boost the engine can develop under demand.

24. C — DPF differential pressure climbs as soot accumulates; readings 40-100 times normal at idle indicate the filter is severely plugged and cannot regenerate effectively. The vehicle typically needs a forced regeneration with the scan tool or DPF service to restore proper exhaust flow.

25. A — On a MAP sensor with a positive-slope output (the typical configuration), high manifold pressure corresponds to high voltage. WOT at sea level produces approximately atmospheric pressure in the manifold ( $\approx 100$  kPa), driving MAP output near the upper end of the 0-5V range.

26. B — A pressure test that holds initially and then drops suddenly typically indicates an intermittent internal leak that opens under pressure — most commonly a head gasket weak spot that fails the test while showing no external leak. Internal leakage may discharge into a cylinder, the exhaust, or the oil gallery.

27. D — P0401 reports EGR flow insufficient, set when the PCM commands EGR but the resulting effect (MAP change, O<sub>2</sub> response, or position feedback) is below threshold. Carbon-clogged passages, a stuck or weak EGR valve, or a failed position sensor are the typical causes on most engines.

28. C — A PCV valve stuck wide open admits unmetered air to the intake manifold, behaving like a continuous vacuum leak. The unmetered air leans the mixture, leading to rough idle, positive fuel trims, and lean DTCs (P0171, P0174) when the PCM cannot compensate adequately.

29. A — P0011 indicates the cam phaser has not achieved the commanded position; once oil pressure and OCV control signal are confirmed normal, the fault path narrows to oil flow inside the OCV or phaser. Sludge restriction, OCV screen blockage, or a mechanically failed phaser are the typical culprits.

30. B — P0521 reports inconsistency between the pressure sensor signal and PCM expectations, but it does not by itself prove the sensor or the actual pressure is at fault. Installing a mechanical gauge at the sender port and reading actual pressure is the only way to distinguish between a sensor problem and a real low-pressure condition.

31. D — Vacuum leaks unmeter air that the MAF cannot see, leaning the mixture; at idle the leak is large relative to total airflow (driving fuel trims sharply positive), but at higher RPM the leak becomes a small fraction of total airflow and trims normalize. The audible whistle confirms the symptom pattern.

32. A — U-codes are the OBD-II network communication code family, and U0100 specifically identifies "lost communication with the engine control module/PCM." The code is set in another module that has stopped receiving expected messages from the PCM, isolating the diagnosis to a network or PCM-side fault.

33. C — When several modules simultaneously report U0100 (lost comm with PCM), the common element is the PCM itself or its connections (power, ground, network wiring). The widespread fault pattern points to the target module, not to each reporting module individually.

34. B — Each CAN wire is referenced to chassis ground, so the technician probes one CAN wire at a time against ground to verify recessive (~2.5 V) and dominant levels. The differential measurement between the two wires can also be made, but voltage to ground confirms each side's bias correctly.

35. D — A failed reprogramming event is recoverable in most cases through the OEM's documented recovery procedure (boot-mode entry, recovery flash file, alternate session). Replacement is the last resort after recovery has been attempted with stable battery support and correct procedure.

36. A — The BCM controls body electrical functions — lighting, locks, windows, wipers, climate control inputs, security — and serves as the communication hub for those subsystems. The PCM and TCM handle powertrain controls; the BCM stays focused on body electrical functions.

37. C — Freeze frame captures the operating conditions present when the DTC matured: RPM, vehicle speed, ECT, fuel trim, MAP, throttle position, and a few related PIDs. The captured data lets the technician understand what conditions triggered the fault, valuable for reproducing intermittent issues.

38. B — Direct TPMS sensors sleep until awakened by a 125 kHz LF signal from an activation tool. Once awakened, the sensor transmits its ID, pressure, and temperature on the RF link to the scan tool or the activation tool's built-in receiver.

39. D — Modern parasitic draw specifications are typically 30-80 mA after all modules complete their sleep sequence (which can take 20-60 minutes). Higher draws point to a circuit that has not gone to sleep correctly or a component that is failing.

40. A — Enhanced scan tools access manufacturer-specific DTCs, full data PIDs from every networked module, bidirectional command capability, module configuration, and TSB lookups — functions a generic scan tool cannot perform. The capability difference is significant for any work beyond basic powertrain DTCs.

41. C — Back-probing a connector terminal (using a small probe inserted alongside the wire) lets the technician measure voltage or signal with the system fully operational, not disturbed by disconnection. Cutting insulation creates a moisture entry point and a long-term reliability problem.

42. B — A TSB documents a known issue, the affected vehicle range, the recommended diagnostic procedure, and the corrective action authorized by the manufacturer. Following the TSB often saves the technician hours of diagnostic time on issues the manufacturer has already isolated.

43. D — Modern vehicles use secure gateways and signed firmware to prevent unauthorized reprogramming and security-sensitive operations. Authentication credentials (OEM portal account, NASTF VSP, J2534 secure pass-through tokens) authorize the technician to perform reflashes and key/immobilizer functions.

44. A — P0700 is the generic "transmission control system malfunction" code that turns on the MIL on the dashboard; it does not identify the specific fault. The actual TCM-side codes (often P07xx or manufacturer-specific) contain the diagnostic details the technician must retrieve to proceed.

45. C — A torque converter stall test loads the converter at full throttle while the wheels are held stationary; engine RPM stabilizes at the stall speed determined by the converter's torque-multiplication and the transmission's holding components. The test is limited to 5 seconds maximum to prevent overheating the ATF.

46. B — ATF temperature should stabilize during steady operation; a continuous climb under normal load and tow weight indicates the cooler cannot remove heat fast enough. Restricted cooler flow, low ATF level, or a failed thermostat in coolers with active control are the standard culprits.

47. D — Line pressure of 50 psi versus 80-110 psi spec at idle in Park identifies a hydraulic problem: failing pump, low fluid, internal leak past a valve body or seal, or a stuck pressure regulator. The TCM has limited command authority over base pressure at idle in Park, so the fault is mechanical.

48. A — A PWM signal's average voltage equals supply voltage  $\times$  duty cycle;  $12\text{ V} \times 0.50 = 6.0\text{ V}$  effective on the solenoid. The solenoid coil's inductance smooths the switching into a steady-state magnetic force that produces a proportional hydraulic output.

49. C — In standard ring-and-pinion setup terminology, a heel pattern (pattern toward the larger end of the tooth) indicates backlash is too loose — the ring gear is too far from the pinion. Repositioning the carrier to move the ring gear toward the pinion decreases backlash and shifts the pattern toward toe.

50. B — A magnetic-base inclinometer (or smartphone with an inclinometer app) reads the angle of each yoke face from horizontal; the difference between the driveshaft yoke and the pinion yoke (or transmission yoke) gives the operating angle at that U-joint. Direct angle measurement is the only reliable way to verify driveline angles.

51. A — Sharp-turn clicking on a FWD vehicle is the classic outer CV joint symptom; the joint can pass torque at the angle but with audible click as worn ball-and-cage surfaces snag. Asymmetric noise (louder one direction than the other) suggests one outer joint is more worn than the other.

52. C — P1842 is a manufacturer-specific code for the AWD coupling actuator circuit. Open or short faults in the electric clutch actuator coil, or a failed actuator winding, set the code and disable AWD functionality.

53. B — TCC slip ratio is the difference between engine speed and transmission input speed at cruise; spec is below 5 percent when TCC is commanded on. 30 percent slip with TCC commanded indicates the lockup clutch is not applying or has worn its friction surface beyond its hydraulic capacity.

54. D — Fresh ATF is bright pink/red with a slight sweet smell; the colour and odour change predictably as the fluid oxidizes and the friction material wears in. Healthy ATF colour with fresh smell at a service interval is exactly what the technician hopes to find.

55. A — A solenoid coil specification of 12-30 ohms that measures 0.5 ohms is a near-short circuit caused by insulation breakdown between turns of the coil. The solenoid draws excessive current, produces little magnetic force, and may damage the PCM/TCM driver if not replaced.

56. C — The transmission input shaft turns only when the clutch is engaged; pressing the clutch pedal stops the input shaft and its bearing. A bearing whine that varies with engine RPM and disappears with the clutch pedal isolates the source to the input shaft or front transmission bearing.

57. B — Milky brown transfer case fluid is a water-and-oil emulsion produced when water enters the case. The damaged vent or driving through deep water is the typical entry path; inspecting for damage and identifying the water source before refilling prevents repeat failures.

58. D — The TCC is a friction clutch inside the torque converter that mechanically locks the impeller and turbine together, eliminating the small slip inherent in fluid coupling. Lockup at cruise improves fuel economy by about 5-10 percent and reduces ATF heat generation substantially.

59. A — Driveline balance weights are applied 180° opposite the heavy spot identified by the analyzer; the weight cancels the imbalance force. The analyzer is re-run after weight application to verify the correction or to identify the next correction needed.

60. C — A sudden RPM flare without proportional vehicle acceleration on a CVT indicates the belt is slipping on the pulleys; engine power is no longer transferring to the wheels. CVT belt slip is typically a service-ending failure that requires CVT replacement or major rebuild.

61. B — Modern conductance-based testers measure internal resistance because it is closely correlated with capacity; a healthy 12V battery typically shows 3-10 milliohms. Higher resistance reflects sulfated plates or aged active material that cannot deliver high current.

62. D — A healthy alternator's rectifier converts three-phase AC into DC with minimal ripple; the spec is typically less than 0.5 V AC at the battery terminal under load. Higher ripple voltage indicates a failed diode that no longer rectifies one phase correctly, reducing output capacity and aging the battery.

63. A — During cranking, the battery voltage drops under the starter's heavy current draw; 9.6 V is the standard minimum threshold for a healthy starting system. Voltage below 9.6 V indicates a weak battery, excessive starter draw, or high resistance in the cranking circuit.

64. C — Voltage drop is allowed up to 0.5 V on the positive cable and 0.2 V on the ground cable under cranking load. Drops exceeding these values indicate cable corrosion, undersized cable, or loose terminations that rob the starter of available voltage.

65. B — Pulling fuses one at a time while watching the current draw lets the technician isolate the offending circuit; when the draw drops to specification, the most recently pulled fuse's circuit is the cause. The procedure then narrows to the components fed by that fuse for further diagnosis.

66. D — B2456 is a left-side high beam output failure code, set when the BCM expects current flow through the high beam circuit but does not detect it. A burned-out bulb, an open in the wiring or socket, or a failed left-side relay are the standard mechanical causes.

67. A — A commanded position of 100 percent with reported actual position of 5 percent means the actuator cannot reach its target; worn gears, a broken motor armature, or a binding door are the common causes. The fault is mechanical at the actuator, not at the temperature sensor or coolant level.

68. C — Both A/C pressures converging toward middle values (low side higher than spec, high side lower than spec) is the signature of a compressor that cannot create the normal pressure differential. Worn internal components — pistons, vanes, or scrolls — fail to compress the refrigerant adequately under load.

69. D — A high-side pressure substantially above specification with low-side near or below spec indicates the system cannot reject heat at the condenser. Failed cooling fan, debris-blocked condenser fins, overcharge, or non-condensable gases all raise high-side pressure by preventing condensation.

70. B — Modern A/C charging is done by mass using a recovery/recharge machine with an integrated electronic scale. The machine evacuates the system to remove air and moisture, then dispenses the exact specified charge by weight, the only reliable charging method.

71. A — A simple hand test of the heater core inlet and outlet hoses with the engine warm and heat selected confirms coolant flow through the core; both hoses should be hot. A cool outlet hose isolates restriction inside the core itself.

72. C — Most modern vehicles place the cabin air filter in the HVAC case behind the glove box. Dropping the glove box from its stops gives access to the filter cover, and the filter slides out for replacement without tools.

73. B — A PWM blower module switches battery voltage to the blower at high frequency with variable duty cycle, producing infinitely variable speed without the heat losses of a resistor pack. The PWM approach replaces the older blower resistor design and gives the automatic climate control finer control over fan speed.

74. D — The voltage drop method locates a grid line break by tracing the line with a DMM in DC voltage mode: voltage drops smoothly from supply to ground along an intact line, but jumps to zero (or to supply) at a break. The remaining cold section identifies exactly where the break is for conductive paint repair.

75. D — Door lock actuators are momentary devices: the motor drives a cam through its travel in 0.5-1 second at 0.5-2 A, then the cam reaches an end stop and the motor stalls (and is de-energized by the BCM). At rest, the actuator draws zero current.

76. B — The auto-up calibration procedure teaches the BCM the window's full travel range and the pinch-protection threshold; cycling the window through full down and full up positions with the switch held lets the system record motor current and travel limits. Pinch protection then triggers correctly when an obstruction creates abnormal current draw.

77. D — TPMS sensor batteries are sealed inside the sensor and typically last 5-10 years; the sensor is replaced as a complete unit when the battery dies. Replacement at that interval also typically coincides with tire replacement, simplifying the service.

78. A — Heated seat elements are designed to dissipate significant heat through  $I^2R$  losses, so their resistance is low (1-5 ohms). An open reading indicates a broken element wire, often from repeated flexing of the heating element inside the seat cushion.

79. C — Low beams not working while high beams work normally narrows the fault to the low-beam side of the circuit: the low-beam relay, the supply and ground at the low-beam socket, or the switch position for low beam. Testing the relay first (often by swap) and then verifying voltage and ground is the most efficient diagnostic path.

80. B — A ground integrity check is a voltage drop test between the load's ground terminal and the battery negative post, performed with the load operating. Less than 0.1-0.2 V indicates a clean ground; higher values point to corrosion, undersized wire, or a poor termination in the ground path.

81. D — The IBS measures battery current (through a precision shunt), terminal voltage, and battery temperature, sending the data over LIN or CAN to the BCM/PCM. The host module uses this information to calculate state of charge and state of health, adjust charging voltage, and authorize stop-start function.

82. A — AGM batteries require a higher absorption voltage and a slightly different charging profile than flooded batteries. Using a charger without AGM mode can overcharge or undercharge the AGM, accelerating internal degradation.

83. C — The wiper park position is set by the relationship between the motor's mechanical park stop and the angular position of the wiper arms on the splined output shaft. If the arms are installed with the motor in any position other than park, the wipers return to the wrong position when turned off.

84. B — Brake pad wear is rarely uniform; the thinnest point determines remaining service life because it will reach minimum first. A brake pad gauge or caliper measures the thinnest section directly to make a go/no-go service decision.

85. D — Modern brake rotor lateral runout specifications are very tight — 0.05 to 0.08 mm (50-80 microns) — because larger runout produces visible brake pedal pulsation and uneven pad wear. The technician verifies runout with a dial indicator after rotor installation.

86. A — Hall-effect wheel speed sensors produce a digital square wave whose frequency rises with wheel speed; the amplitude is constant. The constant amplitude lets the ABS module read low-speed signals reliably, an advantage over passive AC sensors whose amplitude drops at low speed.

87. C — EPB calipers have an electric motor that drives a spindle to apply the parking brake; pressing the piston back without retracting the spindle damages the internal mechanism. Service mode (activated through the scan tool or manufacturer procedure) retracts the spindle, and the technician restores normal EPB function after pad installation.

88. B — Manufacturer-specified bleeding sequence varies by vehicle, but the common principle is to bleed the corner farthest from the master cylinder first on each independent circuit. On diagonal-split systems the sequence is often right rear, left front, left rear, right front, but the service manual is consulted for confirmation.

89. D — A collapsed brake hose develops an internal one-way restriction in the rubber lining: pressure passes from the master cylinder to the caliper, but the caliper cannot release. The result is brake drag on one wheel only, with no external leak and normal fluid level.

90. A — A C-clamp or dedicated caliper compression tool slowly presses the piston back into its bore, allowing room for new pad thickness. Twist-style rear calipers (with integrated parking brake mechanism) require a specific tool that rotates the piston as it retracts.

91. C — C0241 reports that the ABS module's supply voltage has fallen below the operating threshold required for safe function. Weak battery, alternator output too low, or excessive voltage drop in the supply or ground circuits are the standard causes the technician investigates first.

92. B — SAI is the inward tilt of the steering axis when viewed from the front of the vehicle; the steering axis runs from the upper ball joint (or strut mount) to the lower ball joint. SAI works with caster to provide self-centering action that returns the wheel to straight after a turn.

93. D — Side-to-side camber difference (cross-camber) of  $0.5^\circ$  produces a pull toward the side with more positive camber, even though each individual reading is within tolerance. Most alignment specifications require cross-camber within  $\sim 0.3^\circ$  for straight tracking, which is why a vehicle in spec can still pull.

94. A — Over-inflation lifts the tire's shoulders off the road and concentrates load on the center of the tread, producing a wear pattern with worn center and less-worn edges. Under-inflation produces the opposite pattern: heavier wear on the shoulders.

95. C — In the metric tire size code, the middle number is the aspect ratio: the sidewall height as a percentage of the section width. For "P225/65R17," the sidewall measures 65 percent of 225 mm = 146 mm tall.

96. B — A hub-centric wheel and hub design uses a precise fit between the wheel's center bore and the hub's center pilot ring to locate the wheel concentrically. Lug nuts then provide clamping force, but the hub does the centering, which eliminates the off-center vibration possible with lug-centric designs.

97. D — The bounce test loads each suspension corner and observes how quickly the suspension settles. A healthy shock damps the motion to no more than 1.5 cycles before stopping; a worn shock allows multiple oscillations because it can no longer dissipate the spring's stored energy.

98. A — On an SLA suspension with the spring on the lower control arm, the lower ball joint carries the vehicle's weight and the upper joint is the unloaded follower. The load-bearing joint is inspected with the suspension unloaded (so the wear is not masked by preload), while the follower is inspected at ride height.

99. C — EPS calibration after rack or column replacement sets the torque sensor zero-point (no driver input = no assist) and the SAS zero-point (wheels straight = 0°). The procedure is performed with the scan tool, the wheels in specified positions, and the ignition cycled per the manufacturer's instructions.

100. B — SAS zero-point is the reference that lets the ESC, ABS, EPS, and ADAS systems know which way the wheels point. Any service that disturbs the steering or alignment (rack replacement, alignment, wheel removal, suspension work that shifts wheel position) requires the zero-point to be re-established.

101. D — Directional tires have a tread pattern that only performs correctly when rotating in the marked direction. Crossing sides during rotation reverses the rotation direction and degrades wet-weather grip, so directional tires are rotated front-to-rear on the same side only.

102. C — Weight transfers to the outside wheels during a turn; the bad bearing is louder when it carries more load. By turning left and right through S-curves and noting which direction makes the noise louder, the technician identifies the bearing on the side opposite the turn as the worn one.

103. A — Electronic brake fluid moisture testers use conductivity or capacitance sensing to estimate water content directly. 3 percent moisture or more lowers boiling point enough to risk vapour lock during heavy braking, so the fluid is replaced at that threshold.

104. B — MacPherson strut springs store significant energy at any compressed position; a coil spring compressor immobilizes the spring before the top mount nut is removed. Releasing the nut without the compressor lets the spring launch with enough force to cause serious injury.

105. D — The door jamb placard pressure is the cold inflation pressure measured before driving or after at least three hours of rest. Tire pressure rises 3-6 psi during operation as the air heats, so setting hot tires to placard pressure leaves them underinflated when they cool.

106. C — Sealed wheel hub bearing assemblies have internal preload set at the factory; the axle nut's high torque (often 150-300 Nm or more, sometimes with an additional angle) secures the axle to the hub without affecting the sealed bearing. Manufacturer specification is followed exactly.

107. A — B0028 is a driver airbag squib circuit open code; the path from the SRS module through the clock spring to the airbag igniter is broken. Common causes are a damaged clock spring (from excess steering rotation or normal wear), an unplugged connector, or a failed igniter element.

108. D — A "deployed" status in the SRS module's data list means the pretensioner has fired during a crash event; the pretensioner is single-use and must be replaced along with the seat belt assembly. The SRS module also typically requires reset or replacement per the manufacturer's procedure after deployment.

109. C — Seat belt webbing is a safety-critical load-bearing component that cannot be repaired by sewing, patching, or any other field method. A burn mark with melted fibers compromises the webbing's strength, and the entire seat belt assembly must be replaced.

110. A — The SRS module contains a reserve capacitor that holds enough energy to fire airbags for several minutes after battery disconnect. The manufacturer-specified wait time (typically 1-10 minutes) ensures the capacitor discharges below the fire threshold before the airbag harness is disconnected.

111. B — Applying battery voltage directly to the actuator's motor terminals tests the motor and mechanical linkage in isolation. If the actuator operates with direct power, the fault is upstream (wiring, BCM output, switch); if it does not, the actuator itself is failed.

112. D — Heated seat elements consist of fine resistance wires sewn into the cushion; repeated flexing and compression eventually break a wire, producing an open circuit. Once broken, the element (or sometimes the cushion containing it) must be replaced — repair of the wire inside the cushion is not practical.

113. C — Water stains on the headliner and a musty cabin after rain are classic symptoms of clogged sunroof drain tubes. Water enters the sunroof's perimeter tracks during rain but cannot drain through the tubes to outlets at the corners; instead it backs up and seeps into the headliner.

114. A — Side curtain airbags deploy in response to side-impact sensors (in the doors or B-pillars) detecting an impact above threshold, or a roll-rate sensor detecting a rollover. The curtain protects the occupant's head, the body region most vulnerable in side impacts and rollovers.

115. B — Control points are manufacturer-designated locations on the body structure used as references for measurement during collision repair. Comparing measured dimensions at control points against the manufacturer's specifications verifies the structure has been restored within tolerance for safety and alignment.

116. D — Modern mirror assemblies often integrate multiple subsystems that must be configured: blind spot zones, memory positions, auto-dim sensitivity, motor travel limits. A scan tool calibration through the manufacturer's procedure ensures each function operates correctly after replacement.

117. C — A modern BMS monitors and reports each cell or module's voltage and temperature; a scan tool reads this data through OEM software or enhanced aftermarket tools. Voltage imbalance between modules, low overall SoC, or temperature variation outside spec indicates degraded battery health.

118. A — P0AA6 reports a hybrid battery isolation fault, set when the IMD measures resistance between the HV system and chassis below the safe threshold. Failed HV cables, damaged connectors, coolant intrusion into HV components, or contamination create the leakage path the IMD detects.

119. A — Contactors commanded closed with no DC bus voltage at the inverter isolates the fault to the HV connection itself: contactors that have welded open, failed mechanically, or seized, or a pre-charge resistor circuit that has failed to bring the bus up safely. The pack and BMS are otherwise responding to commands.

120. C — Hybrid BMSes typically keep the HV battery within a narrower SoC window (often 20-80 percent or less) to extend cycle life. Operating at the extremes accelerates lithium-ion degradation, so the BMS deliberately reserves both top and bottom margin to preserve usable capacity over the vehicle's life.

121. B — Regen braking uses the traction motor as a generator during deceleration, recovering energy back to the HV battery. The friction brakes engage only when more deceleration is needed than regen can supply, with the brake-by-wire system blending the two seamlessly so the driver feels normal pedal response.

122. D — J1772's Control Pilot (CP) line carries a PWM signal whose duty cycle indicates the maximum current the EVSE can provide. The EV reads the duty cycle, configures its onboard charger accordingly, and replies on the CP line to confirm readiness for charging.

123. C — HV cables on all hybrid and EV vehicles are colour-coded orange, providing a universal visual warning of high voltage. Technicians and first responders recognize the colour and apply HV-safe handling procedures accordingly.

124. B — A traction motor running 15°C above its maximum spec is overheating, and the cause is almost always in the cooling system: failed electric water pump, blocked coolant passages, low coolant level in the motor loop, or a temperature sensor reading incorrectly high. Continued operation risks demagnetizing rotor magnets or burning insulation.

125. C — DC bus capacitors in the inverter store energy after the MSD is removed, and that energy takes time to dissipate through the bleed-down circuit. The manufacturer-specified wait time (typically 5-10 minutes) is followed by a voltage verification at specified test points with a Cat III/IV-rated meter before any HV work.