PRACTICE EXAM 13: RED SEAL 310S SIMULATION (125 QUESTIONS)

1. When using an air-driven cut-off wheel to remove a corroded exhaust clamp, the minimum required PPE includes:

A. Z87+ safety glasses, hearing protection, gloves, and a face shield to address projectile and particulate hazards

B. Safety glasses alone, because the cut-off wheel guard contains projectile debris

C. Hearing protection alone, because tool noise is the primary recognized hazard

D. Steel-toed boots and a hard hat, because the tool produces no eye-level hazards

2. A click-type torque wrench should be stored:

A. At its maximum scale setting to preload the internal spring for accuracy

B. At the lowest non-zero scale setting to relieve spring tension between uses

C. At whatever setting was used for the last torque value applied that day

D. Disassembled with the calibration spring component removed for storage

3. When responding to a chemical fire in the shop, the technician should consult which SDS section for recommended extinguishing media?

A. Section 2 (Hazards identification)

B. Section 4 (First aid measures and treatment guidance)

C. Section 8 (Exposure controls and required PPE)

D. Section 5 (Firefighting measures, extinguishing media, and special hazards)

4. A vehicle is on a two-post hoist for a transmission removal expected to span two shifts. Before the first technician leaves the shop overnight, the proper procedure is to:

A. Leave the hoist in the up position and post a warning sign on the shop door

B. Lower the vehicle to its safety locks and engage the parking brake overnight

C. Engage the hoist's mechanical safety locks, apply a personal lockout/tagout to the energy isolation point, and document it in the shop log

D. Drop the vehicle off the hoist temporarily and re-lift at the next shift

5. A customer drops off a vehicle for a no-start diagnosis with a written estimate ceiling of $200. After 1.5 hours of diagnosis, the technician finds a failed PCM that will require $1,400 in parts and labor. The correct next step is to:

A. Complete the repair to avoid further diagnostic time, then notify the customer of the total

B. Stop work, contact the customer with the diagnosis and revised estimate, and obtain documented authorization before proceeding with the additional work

C. Substitute a used PCM to stay within the original estimate ceiling

D. Bill the customer for diagnosis only and refuse to continue the repair

6. A small fire breaks out in a parts cleaning tank containing flammable solvent. The most appropriate fire extinguisher is:

A. Class A (water-based, for ordinary combustibles)

B. Class D (for combustible metals such as magnesium)

C. Class K (for cooking oils and fats)

D. Class B (dry chemical, CO_2, or foam, designed for flammable liquids and solvents)

7. A technician will be working alone in the shop on a Sunday to complete an urgent repair. Provincial OHS regulations require:

A. A written working-alone procedure with documented check-in intervals and a designated contact who can summon help if check-ins are missed

B. Written permission from the city fire marshal before any solo shop work

C. The technician to wear a personal alarm device on the body at all times during the shift

D. A second worker on standby in an adjacent building for the entire duration of the work

8. Before measuring a critical engine bearing journal with a digital micrometer, the technician should verify the micrometer's accuracy using:

A. A spare bearing of known thickness as a reference dimension standard

B. Another micrometer in the toolbox to cross-check the reading

C. A certified gauge block traceable to a national measurement standard, confirming the micrometer reads the standard's marked dimension within tolerance

D. The micrometer's zero point with the anvils closed, accepting zero as confirmation

9. A technician has spilled brake parts cleaner on a forearm and the skin is reddening rapidly. The correct first aid is to:

A. Apply a neutralizing cream or paste to chemically counteract the spill

B. Wrap the affected area tightly in plastic to limit further air exposure

C. Apply petroleum jelly to seal the wound from further chemical contact

D. Remove contaminated clothing, flush the affected skin with cool water for 15 minutes, consult the product SDS, and seek medical assessment

10. A scope is connected to a passive (variable reluctance) crankshaft position sensor during engine cranking. The expected waveform is:

A. A 5 V digital square wave with constant amplitude at cranking speed

B. An AC sine-like signal that rises in amplitude with cranking speed, with a missing-tooth gap or reference marker once per revolution

C. A flat DC level that rises proportionally with engine speed

D. A PWM signal whose duty cycle varies with crankshaft acceleration

11. A scope on a Hall-effect camshaft position sensor at idle shows:

A. A digital square wave switching between approximately 0 V and reference (typically 5 V or 12 V), with frequency proportional to camshaft speed and amplitude held constant

B. An AC sine wave whose amplitude varies with camshaft speed

C. A noisy analog signal with no clear pattern at idle speeds

D. A steady DC output equal to battery voltage at all times

12. On a scope trace of a coil-on-plug primary circuit (driver-side to ground), the high-voltage spike that appears immediately after current shut-off represents the:

A. Coil saturation point indicating maximum primary current was reached

B. Dwell period beginning before the next firing event in the sequence

C. Inductive kick from the collapsing primary magnetic field, typically 100–400 V, used by the secondary winding to generate the spark voltage

D. EMI artifact unrelated to coil operation and ignored by the PCM

13. A secondary ignition scope trace shows a normal firing voltage spike followed by a burn line that is unusually short (1.0 ms vs spec 1.5–2.0 ms). The most likely cause is:

A. A weak ignition coil with reduced primary saturation current

B. A worn camshaft lobe affecting valve timing on that cylinder

C. A failed primary ignition driver inside the PCM affecting dwell

D. Increased secondary resistance — a worn spark plug with excessive gap or a high-resistance plug wire — that consumes more coil energy in the firing voltage

14. A scope on a healthy zirconia upstream O2 sensor at steady cruise (closed-loop) shows:

A. Continuous oscillation between approximately 0.1 V (lean) and 0.9 V (rich), crossing 0.45 V several times every 10 seconds in a rapid switching pattern

B. A fixed voltage held steady at 0.45 V with no oscillation

C. A flat 0 V output at all engine speeds and loads

D. A 5 V reference signal modulated with a PWM duty cycle

15. A scope on a healthy zirconia downstream O2 sensor (post-catalyst) at steady cruise shows:

A. The same fast oscillation as the upstream sensor, mirroring it exactly

B. A relatively flat voltage near 0.7–0.8 V with only small variations, because the catalyst stores and releases oxygen and smooths the exhaust composition

C. A flat 0 V because the rear sensor is not used during cruise mode

D. A 0–5 V wide-range linear output identical to a wideband sensor

16. A scope on a MAP sensor during a snap-throttle test (idle to WOT briefly, back to idle) on a healthy engine shows:

A. A flat line at 5 V across the entire test regardless of throttle position

B. A flat line at 0 V across the entire test regardless of throttle position

C. A square wave switching between 0 and 5 V at a frequency tied to RPM

D. A baseline voltage at idle (low, since manifold vacuum is high), a rise to near 5 V during WOT, and a return to baseline as the throttle closes

17. A scope on a piezoelectric knock sensor with the engine running smoothly shows:

A. A flat DC voltage that increases with engine load

B. A clean digital square wave at firing frequency

C. A low-amplitude AC signal (typically <100 mV) with brief higher-amplitude pulses corresponding to combustion events and any actual knock impulses

D. A steady 5 V reference signal that drops to ground when knock occurs

18. A scope on a port fuel injector control circuit (PCM driver to ground) at idle shows: high voltage, dropping to near 0 V when the injector opens, holding low for several milliseconds, then returning high with a brief inductive spike. Injector "on time" is read from:

A. The width of the time the trace is held low (when the injector solenoid is energized and the pintle is open)

B. The amplitude of the inductive spike at turn-off

C. The voltage difference between battery voltage and the lowest reading

D. The period between consecutive inductive spikes

19. A scope on a healthy hot-wire MAF sensor (analog output) during a slow throttle increase from idle to part-throttle cruise shows:

A. A square wave whose frequency rises smoothly with airflow

B. A smooth analog voltage that rises continuously with airflow (typically 0.5–1.0 V at idle to 2.5–4.5 V at high airflow) with no dropouts, glitches, or noise

C. A flat DC voltage that does not change with throttle position

D. An AC sine wave whose amplitude rises with airflow

20. A scope on a healthy potentiometer-type TPS during a slow throttle sweep from closed to WOT shows:

A. A square wave switching at the engine's firing frequency

B. A flat DC voltage that does not change with throttle position

C. A series of voltage steps corresponding to throttle position notches

D. A smooth linear ramp from approximately 0.5 V (closed) to 4.5 V (WOT) with no dropouts, glitches, or dead spots in the resistive element

21. A wideband air-fuel ratio sensor reports Lambda = 0.92 during steady-state operation. The engine is running:

A. Stoichiometric (the ideal 14.7:1 ratio for a gasoline engine)

B. Very lean, with an air-fuel ratio of approximately 17:1

C. Rich, with an air-fuel ratio of approximately 13.5:1 — Lambda less than 1.0 indicates more fuel than stoichiometric

D. So lean the catalyst is at risk of thermal damage

22. A dry compression test on cylinder 3 reads 90 psi (spec 150–165 psi). After 1 tsp of oil is added to the cylinder, the wet test reads 145 psi. The most likely fault is:

A. Worn piston rings — the oil temporarily seals the ring gaps and brings compression near spec, isolating the leak to the rings rather than the valves

B. A burned exhaust valve — the wet test confirms valve leakage by ruling out ring wear

C. A blown head gasket — wet test results do not change with head gasket leaks

D. Normal cylinder operation; wet tests simply produce higher readings on any cylinder

23. A vacuum gauge connected to the intake manifold at idle shows a needle that drops from 18 inHg to 5 inHg every 2–3 seconds, then returns. The most likely cause is:

A. A burned exhaust valve producing a rhythmic single-pulse drop on every firing cycle

B. A sticking valve — the valve intermittently fails to seat fully, producing irregular, intermittent vacuum drops at unpredictable intervals

C. Worn piston rings producing a steady low vacuum reading

D. Normal vacuum gauge operation on a healthy engine

24. During a forced DPF regeneration on a diesel engine, the scan tool reports DPF outlet temperatures of 600°C with rising-then-falling differential pressure across the filter over 15 minutes. This indicates:

A. A failed DPF temperature sensor reporting incorrect high values

B. The regeneration is incomplete and should be aborted by the technician

C. The exhaust system is overheating and operation should be stopped

D. Active regeneration operating normally — high outlet temperature burns soot off the filter, and differential pressure falls as soot is consumed and exits as CO_2

25. At full throttle, a turbocharged engine's scan data shows: commanded boost = 18 psi, actual boost = 8 psi, no DTCs set. The most likely cause is:

A. A boost leak between the turbo compressor outlet and intake manifold (cracked intercooler hose, failed clamp, or leaking intercooler) — the turbo builds boost, but pressure is lost before reaching the manifold

B. A faulty boost pressure sensor reporting low values to the PCM

C. Excessive exhaust backpressure from a plugged catalytic converter

D. Normal operation while the engine is in break-in mode

26. A scan-tool graph of GDI fuel rail pressure during steady cruise shows the rail pressure oscillating ±2 MPa around a mean of 15 MPa (within spec). This pattern is:

A. Indicative of a failing high-pressure fuel pump

B. Indicative of a stuck rail pressure regulator valve

C. Normal — rail pressure naturally fluctuates with each injection event and pump stroke; small oscillation around the commanded mean confirms the system is regulating correctly

D. A symptom of injector leakage requiring service

27. Fuel trim readings: at idle STFT +12% and LTFT +18%; at cruise STFT +1% and LTFT +2%. The pattern points most strongly to:

A. A failing MAF sensor reading low (which would affect both idle and cruise)

B. A vacuum leak — the unmetered air is large relative to total airflow at idle but small at higher airflows, so trims normalize at cruise

C. Low fuel pressure (which typically affects cruise more than idle)

D. A failed front O2 sensor on the affected bank

28. A power balance test on a 4-cylinder engine (disabling each cylinder one at a time) shows RPM drops of: Cyl 1 = 75, Cyl 2 = 70, Cyl 3 = 15, Cyl 4 = 72. The fault isolates to:

A. Cylinder 1, because the largest RPM drop indicates the strongest cylinder is misfiring

B. Cylinders 2 and 4 together, because matched moderate drops indicate paired weakness

C. All cylinders, because the drops are roughly equal across the engine

D. Cylinder 3 — the small RPM drop indicates this cylinder is contributing little power, consistent with weak compression, weak spark, or weak fuel delivery

29. A scan tool shows engine knock retard incrementing 3–6 degrees during acceleration, with base spark advance falling from 24° BTDC to 18° BTDC. The PCM is responding to:

A. Detonation events sensed by the knock sensor — the PCM retards spark to suppress knock and protect pistons, rings, and bearings from damage

B. A failed cam phaser unable to reach commanded position under load

C. A failed throttle position sensor reporting incorrect throttle values

D. A misfire detected on a single cylinder by the misfire monitor

30. After cleaning a drive-by-wire throttle body, the engine idles erratically and stalls. The correct corrective action is:

A. Replace the throttle body assembly because cleaning damaged the motor

B. Add fuel injector cleaner to the tank to restore idle quality

C. Perform the manufacturer's idle/throttle relearn procedure with the scan tool, allowing the PCM to relearn the closed-throttle position

D. Disconnect the battery for 30 minutes to allow universal relearning

31. A misfire is set on cylinder 2 (P0302). The technician swaps the cylinder 2 coil-on-plug with the cylinder 4 coil and clears codes. After the next drive, P0304 (misfire on cylinder 4) sets. The fault is:

A. A failed PCM driver for cylinder 2's ignition control

B. A failed spark plug specific to cylinder 2 originally

C. A wiring fault between the PCM and the cylinder 2 ignition output

D. A failed ignition coil — the misfire followed the coil to its new cylinder, confirming the coil is the failed component

32. A scope on a healthy HS-CAN bus (CAN-H and CAN-L on two channels) at idle with all modules awake shows:

A. Two flat DC lines at 2.5 V each with no switching activity at any time

B. CAN-H swinging from 2.5 V (recessive) to about 3.5 V (dominant), and CAN-L swinging from 2.5 V to about 1.5 V, in synchronized opposition during active frames

C. Both lines swinging together between 0 V and 5 V in unison

D. An AC sine wave at 500 kHz on both lines

33. A DMM in DC volts across CAN-H and CAN-L reads approximately 0 V during the recessive state and approximately 2 V during dominant states. This differential reading indicates:

A. Normal CAN operation — the differential swings from ~0 V (recessive, both lines at 2.5 V) to ~2 V (dominant, with CAN-H at 3.5 V and CAN-L at 1.5 V); communication is functioning correctly

B. A short to ground on the CAN-L line

C. A short to battery voltage on the CAN-H line

D. An open break in the bus between modules

34. With both batteries disconnected on a vehicle with HS-CAN bus, the technician measures CAN-H to CAN-L resistance and reads 60 Ω. This indicates:

A. Only one terminating resistor is connected and the other is open

B. A short between CAN-H and CAN-L somewhere along the bus

C. No terminating resistors are installed anywhere on the network

D. The bus is healthy — two 120 Ω terminators in parallel (one at each backbone end) measure 60 Ω, the standard reading for a properly terminated CAN bus

35. A LIN bus is identified by:

A. A two-wire differential signal at 500 kbit/s with twisted pair

B. A two-wire signal pair color-coded yellow and green

C. A single-wire signal referenced to chassis ground at up to 19.2 kbit/s, used for low-speed, low-priority body subsystems such as window switches, door modules, and mirrors

D. A fiber-optic link operating at 25 Mbit/s on infotainment

36. OBD-II Mode 06 contains:

A. Live data PIDs for current sensor values during operation

B. On-board monitoring test results — values for non-continuous monitors (catalyst, EVAP, O2 sensor) including test result, limit, and pass/fail status before a DTC matures

C. Stored DTCs in the PCM's permanent memory area

D. The vehicle VIN and calibration ID information

37. On a vehicle with multiple network buses (HS-CAN, MS-CAN, LIN), the gateway module:

A. Routes messages between buses, translating between protocols and managing which messages forward between networks for security and bandwidth reasons

B. Functions only as a backup power supply for downstream modules

C. Performs identical functions to the BCM and can be replaced by it

D. Stores DTCs only and has no message-routing function in the network

38. A J2534-compliant reprogramming session requires:

A. Only an internet connection and a generic OBD-II scan tool

B. A manufacturer-specific dealer scan tool, not available to independent shops

C. Only the vehicle battery and a USB cable connected to a laptop

D. A J2534 pass-through device, the manufacturer's reprogramming software (often subscription-based), a stable battery support charger holding 13.5+ V during the flash, and the correct calibration file from the OEM

39. A module reports CAN bus-off conditions repeatedly in its memory, but communication appears normal at the scan tool. The most likely cause is:

A. A failed terminating resistor at the far end of the bus network

B. A failed gateway module rerouting traffic to alternate paths

C. Intermittent network errors (EMI, marginal connection, weak module) that exceed the module's error threshold; the module disconnects, recovers, and reconnects — leaving DTCs but no continuous communication failure

D. A failed PCM that has shut off the bus permanently from service

40. A direct TPMS sensor transmits to the vehicle on a frequency of approximately:

A. 125 kHz, the same frequency as the LF activation signal

B. 315 MHz (North America) or 433 MHz (Europe) — the standard RF band for TPMS sensor transmission

C. 2.4 GHz, the same as Wi-Fi and many wireless protocols

D. 27 MHz, the same band as citizens band radio

41. To capture data during an intermittent driveability event that does not set a DTC, the technician should:

A. Set up a scan tool snapshot/data recording with a manual trigger (or parameter-threshold trigger), then drive until the symptom occurs and trigger the recording

B. Replace the PCM as the most likely cause of any intermittent fault

C. Disconnect the battery and wait for the symptom to occur naturally

D. Connect only a DMM and disregard scan tool data entirely

42. On a vehicle with a security gateway module (e.g., FCA SGW), the technician must authenticate before bidirectional commands and reprogramming. Authentication is performed by:

A. Connecting any J2534 device — no authentication is required by the gateway

B. Entering a generic password supplied by the scan tool manufacturer

C. Disconnecting the security gateway module to bypass it during service

D. Logging into the manufacturer's secure portal (AutoAuth, FCA Tech Authority) with credentials linked to the technician's account; the gateway permits access for the session

43. After replacing a Body Control Module (BCM) on a modern vehicle, the new module typically requires:

A. No further action; the new module operates immediately with defaults

B. Only a battery disconnect for 10 minutes to allow self-learning

C. Programming with the VIN, vehicle option/configuration data, and required learn procedures (key learn, theft system init, window/mirror calibration) before normal vehicle operation

D. Replacement of the PCM as well, since the modules are paired at the factory

44. A hydraulic clutch shows a soft pedal and slow disengagement. As the pedal is pushed slowly to the floor and released, the master cylinder reservoir fluid level:

A. Rises significantly during application as fluid returns through the compensating port

B. Should remain essentially level — minor displacement is normal, but any large rise/fall, frothing, or bubbling indicates internal leakage, air entry, or a failed master cylinder seal

C. Should fall to zero during application as all fluid moves to the slave cylinder

D. Becomes pressurized and ejects from the reservoir cap during pedal travel

45. A scope on a magnetic transmission output speed sensor during a drive at 50 km/h shows:

A. A flat DC voltage equal to vehicle speed in km/h directly

B. A square wave with frequency unrelated to vehicle speed

C. A noise signal with no clear waveform at this speed

D. A periodic AC sine-like signal whose frequency and amplitude both rise with output shaft speed; the TCM converts frequency to vehicle speed for shift logic and TCC control

46. A driveline vibration worsens above 80 km/h. Measured U-joint operating angles are: transmission yoke 3.0° down, driveshaft 1.0° down, pinion yoke 4.5° down. The likely cause is:

A. Excessive operating angle at the rear U-joint (3.5° difference between driveshaft and pinion yoke); operating angles should typically be under 3° and should match the front U-joint angle within 0.5°

B. The driveshaft is too short for this chassis and must be replaced

C. The driveshaft is too long for this chassis configuration

D. Normal driveline operation; angles under 5° are universally acceptable

47. A FWD vehicle has a shudder during acceleration from a stop on level ground, with no noise during turns. The most likely cause is:

A. A worn outer CV joint that should click during turns at higher steering angles

B. A worn front wheel bearing producing a hum that varies with vehicle speed

C. A worn or seizing inner (tripod or plunge) CV joint, which produces shudder under torque during straight-line acceleration as rollers fail to slide smoothly in the housing

D. A failed transmission output shaft seal causing fluid loss

48. A RWD vehicle has a high-pitched whine that increases with vehicle speed regardless of throttle position. The most likely cause is:

A. A worn front wheel bearing producing speed-related noise

B. Worn rear differential pinion bearings — they carry constant load from the driveshaft regardless of throttle, producing a speed-dependent whine that doesn't change with load

C. A worn axle shaft bearing affecting the inner race only

D. Worn transmission input shaft bearings on the front end

49. A 4WD transfer case with chain drive shows excessive backlash and a clunk during shifts between 2WD and 4WD. Measured chain slack is 25 mm (spec max 10 mm). The repair is:

A. Adjust the chain by repositioning the drive sprockets accordingly

B. Add transfer case lubricant to extend chain service life

C. Replace only the most-worn sprocket of the drive set

D. Replace the chain (and inspect sprockets for wear; replace as needed) — a chain in this condition is past service life and will continue to jump under load

50. Line pressure on an automatic transmission at idle in Park reads 70 psi (spec 80–110 psi). At WOT stall in Drive, line pressure reads 110 psi (spec 220–260 psi). The most likely cause is:

A. A failing transmission oil pump — pressure is low at idle and cannot achieve higher pressures under load; pump wear, internal leakage, or a worn pump bushing reduces output proportionally

B. A failing pressure regulator valve in the valve body assembly

C. A blown clutch pack causing internal hydraulic leakage

D. A worn torque converter clutch friction material assembly

51. A scope on a transmission torque converter clutch (TCC) solenoid during a slow application shows a PWM signal starting at 0% duty and rising to 100%. The PCM is:

A. Suddenly engaging the clutch with no modulation between off and on

B. Maintaining clutch slip continuously regardless of vehicle speed

C. Modulating clutch engagement with rising duty cycle to apply controlled friction and minimize engagement shock; duty cycle controls how much hydraulic pressure reaches the TCC apply piston

D. Disengaging the TCC during the application sequence

52. A ring and pinion gear pattern check shows contact concentrated on the face (top) of the ring gear teeth and toward the heel (large end). The corrective action is:

A. Decrease both backlash and pinion depth simultaneously

B. Move the pinion inward (deeper) to shift the pattern toward the root and toe; carrier adjustment may also be needed to reduce backlash slightly

C. Move the pinion outward (shallower) and increase backlash

D. Replace the ring and pinion as the pattern indicates damage

53. An AWD vehicle with a Haldex-style electric coupling shows scan tool data with coupling current 0 A under all conditions, but front-rear wheel speed difference is increasing during turns. The most likely cause is:

A. Normal operation; the coupling should remain inactive during turns

B. A failed front wheel speed sensor on one of the front wheels

C. A failed transmission control module sending incorrect commands

D. A failed coupling pump or actuator — the coupling cannot apply pressure, leaving the vehicle in front-drive only regardless of conditions

54. A clutch-type limited-slip differential exhibits chatter during slow tight turns. The gear oil viscosity is correct and the fluid is recent. The likely cause is:

A. Missing or insufficient limited-slip friction modifier additive in the gear oil; clutch friction surfaces stick and release audibly during slow turns when wheels turn at different speeds

B. Incorrect viscosity gear oil installed during the last service

C. A failed pinion bearing affecting differential operation under load

D. Worn clutch plates inside the differential producing the chatter directly

55. A CVT-equipped vehicle exhibits a brief RPM flare with vehicle speed lagging during firm acceleration from low speed. Scan data shows engine speed up 500 RPM and CVT input-output speed difference also up 500 RPM during the flare. The cause is:

A. Normal CVT operation during a ratio change transition

B. CVT belt slip — the belt is failing to maintain grip on the pulleys under load, allowing engine speed to climb while output lags; typically a service-ending condition requiring CVT replacement

C. A failed throttle position sensor causing erratic throttle response

D. A failed shift solenoid causing erratic gear engagement in the CVT

56. A driveshaft vibration is present at highway speed only, and balance weight is found stuck on one side of the shaft with corrosion visible. The corrective action is:

A. Replace the driveshaft assembly entirely as the safest option

B. Apply additional balance weights opposite the existing weights to compensate

C. Remove all old weights and accept some residual vibration in service

D. Clean the driveshaft surface, re-balance using chassis dynamometer balance equipment, and apply new weights at correct positions to cancel residual imbalance

57. During a transmission service, the technician removes the pan and finds the filter packed with large amounts of clutch friction material plus fine metal particles. The proper action is:

A. Replace the filter and refill with new ATF, returning to service

B. Replace the filter and add an aftermarket additive to prevent further wear

C. Inform the customer that the transmission has internal damage requiring further diagnosis (line pressure, stall test) and likely overhaul or replacement — surface debris of this volume typically indicates progressing internal failure

D. Replace only the pan gasket; the filter is reusable for several services

58. A vehicle's speedometer reads low compared to actual (GPS-verified) speed. Tire diameter is correct. The next test is to:

A. Verify the vehicle speed sensor signal on a scope, comparing pulse frequency at known speeds to the expected frequency based on tire diameter, axle ratio, and sensor pulses per revolution

B. Replace the speedometer head as the most likely cause

C. Replace the PCM as the source of incorrect data display

D. Adjust speedometer calibration through a generic OBD-II scan tool

59. A manual transmission grinds slightly when shifting from 2nd to 3rd gear at moderate engine speeds. Clutch operation tests normal. The most likely cause is:

A. A failed clutch pressure plate diaphragm spring

B. A worn synchronizer ring on 3rd gear — the synchronizer can no longer bring gear-mainshaft speeds together quickly enough before the slider engages dog teeth, allowing brief gear-tooth contact

C. Low transmission fluid level affecting bearing operation

D. A worn input shaft bearing causing gear misalignment

60. A RWD vehicle has a whine that is loud under throttle (drive mode) and disappears during deceleration (coast mode). The most likely cause is:

A. Worn pinion bearings affecting both drive and coast modes equally

B. A failed wheel bearing producing speed-dependent noise regardless of load

C. Ring and pinion wear with the contact pattern shifted to the drive flank — gears mesh on a worn drive flank under load (producing whine); coast loads the less-worn flank instead

D. A worn axle shaft bearing on one side of the rear axle

61. A scope on the alternator output (battery positive terminal) at idle, with electrical loads on, shows:

A. A flat DC line with no variation at any time

B. A square wave at 60 Hz like household alternating current

C. A small AC ripple superimposed on the DC charging voltage (typically <0.5 V peak-to-peak when healthy); a failed diode produces a much larger ripple with a missing pattern hump

D. A pure sine wave at 200 Hz with 12 V amplitude

62. A scope on a failing alternator shows AC ripple of 2.5 V peak-to-peak with one of the six normal positive humps missing from the pattern. This indicates:

A. A single failed diode in the rectifier bridge — one phase of the three-phase output is no longer rectified properly, leaving a gap in the otherwise smooth ripple pattern

B. A failed voltage regulator only, with diodes intact

C. A failed stator winding completely open

D. Normal alternator operation at higher engine speed

63. A starter draw test on a 6-cylinder gasoline engine at room temperature shows a peak current of 600 A during the first 0.1 seconds, then settling to 180 A. The peak is normal because:

A. The starter motor has failed and the high reading is locked rotor current

B. The starter must overcome engine static inertia (no back-EMF in the motor at first) and compression of cylinders being lifted; the brief peak is normal, with running current being the more meaningful diagnostic value

C. The battery is undersized for the application

D. The starter solenoid is intermittently sticking during engagement

64. A battery's open-circuit voltage at 25°C reads 12.4 V after sitting overnight. The approximate state of charge is:

A. 100%, indicating the battery is fully charged

B. 0%, indicating the battery is fully discharged

C. About 25–30% state of charge

D. About 75% — 12.6 V is 100%, 12.4 V is approximately 75%, 12.2 V is roughly 50%, and 12.0 V is about 25% state of charge

65. A vehicle complaint is dead battery after sitting 3–4 days. The correct first step in parasitic draw testing is to:

A. Replace the battery and observe whether the problem returns

B. Disconnect the alternator output to eliminate it as a source

C. Connect a current clamp or DMM in series with the negative battery cable, close all doors and lock the vehicle, allow 30–60 minutes for modules to sleep, then read the steady-state current draw

D. Disconnect the ignition switch to put the vehicle in deep sleep mode

66. A starter cranking voltage drop test from battery negative post to engine block reads 0.8 V (spec less than 0.2 V). This indicates:

A. Excessive resistance in the engine ground path — corroded ground strap, loose fastener, or undersized cable; the high voltage drop deprives the starter of voltage and energy for full cranking power

B. A normal reading within published specification for this test

C. A failed starter motor as the sole cause of the drop

D. A failed alternator regulator affecting cranking circuit voltage

67. A vehicle's stop/start system will not stop the engine at traffic lights. The system is confirmed enabled at the dashboard switch. The most likely inhibit condition is:

A. The transmission is selected in 2nd gear instead of 1st

B. The cabin air vents are set to recirculation mode

C. The vehicle has been driven less than 1,000 km this month

D. Low battery SoC (below ~75–80%), HV battery temperature out of range, A/C demand requiring engine, ECT out of window, or steering input above neutral — any inhibit condition prevents auto-stop

68. A vehicle's climate control "MAX HEAT" command produces cool air only. Scan tool data shows blend door actuator commanded 100% hot, actual position reported 100% hot. The most likely cause is:

A. A failed blend door actuator with internal gear damage

B. A failed heater coolant flow path — low coolant level, restricted heater core, stuck heater control valve, or seized water pump; the actuator position is correct but no hot coolant reaches the core

C. A failed cabin temperature sensor reporting incorrect values

D. A failed A/C compressor clutch coil unrelated to the heat circuit

69. An A/C system's low side reads 5 psi (spec 35–45 psi at 30°C) and high side reads 220 psi (spec 250–300 psi). The evaporator is frosted. The most likely cause is:

A. Overcharge of refrigerant in the system

B. A failed compressor with low output capability

C. Low refrigerant charge — both pressures below spec, low-side near zero, evaporator frosted; this is the classic signature of a system starved of refrigerant

D. Air contamination in the refrigerant circuit

70. A 3-wire A/C pressure transducer (5V reference, ground, signal) on a healthy system at idle reads on the signal line approximately:

A. About 1.5–2.5 V at typical system pressures (40–50 psi low side or 200–300 psi high side, depending on which side it monitors); the voltage rises linearly with pressure

B. A square wave at the compressor cycling frequency

C. A flat 5 V signal regardless of pressure conditions

D. A flat 0 V signal until pressure exceeds 400 psi

71. An A/C compressor clutch will not engage when commanded. The clutch coil resistance measures 0.8 Ω (spec 3–5 Ω). The fault is:

A. An open circuit in the clutch coil winding

B. Normal operation; the coil resistance is functioning correctly

C. A burned-out PCM driver for the clutch relay

D. A shorted (turn-to-turn) coil winding — low resistance causes excessive current draw, blowing the relay fuse or causing the PCM to disable the output; the coil must be replaced

72. A new low-beam headlamp has been installed but the aim is too high. The correct adjustment procedure is:

A. Replace the headlamp assembly entirely as defective

B. Adjust the bulb position within the headlamp housing

C. Use the vertical (and horizontal) aim adjustment screws while the vehicle is at curb weight, on a level floor, at the manufacturer's specified distance from the aiming wall (typically 7.6 m / 25 ft), and verify pattern against the target

D. Loosen the headlamp mounting bolts and physically rotate the housing

73. A power window with auto-up and pinch protection has been disconnected (battery removed) and reconnected. The window will not auto-up. The corrective action is:

A. Replace the window motor as the most likely cause of failure

B. Perform the window initialization procedure (window fully down with switch held; window fully up with switch held; ignition cycle) so the BCM learns the full travel range and pinch threshold

C. Replace the BCM as the cause of feature loss

D. Drive the vehicle 200 km for automatic relearning of window limits

74. A heated outside mirror does not warm during rear defroster operation. Battery voltage is present at the mirror connector with defroster active. The next test is to:

A. Measure the resistance of the mirror heating element across its heater terminals — a healthy element typically reads 1–10 Ω; an open reading indicates a broken element and the mirror glass or assembly must be replaced

B. Replace the mirror motor; the heating element is integral to the motor

C. Replace the BCM as the source of heated mirror commands

D. Recalibrate the mirror through the scan tool

75. A vehicle's charging voltage at the battery posts reads 13.0 V at idle with a warm engine and all accessories off. Specification is 13.8–14.6 V. The most likely cause is:

A. Normal operation; 13.0 V is within tolerance for a warm engine

B. The battery is fully charged and not accepting further current

C. A failed alternator brush set as the sole cause

D. Excessive voltage drop in the alternator output cable (corroded terminal, loose battery connection, or undersized cable), or a failed regulator/temperature compensation, leaving the battery undercharged

76. A vehicle's heated steering wheel works intermittently — heating on some startups, off on others. Heating tests with the wheel at any position. The most likely cause is:

A. A failed heated seat element (unrelated to the steering wheel circuit)

B. A worn slip ring or clock spring — the contact rings deliver power across the rotating steering wheel, and intermittent contact (corrosion, wear) causes intermittent operation

C. A failed BCM relay supplying the steering wheel heat circuit

D. A blown heated steering wheel fuse intermittently

77. A break is identified in a rear defroster grid line. The recommended repair is:

A. Replace the entire rear window glass assembly

B. Disable the affected grid line through BCM software programming

C. Apply conductive paint (formulated for defroster repair) to bridge the break; once cured, the line functions and the repair is typically permanent

D. Solder a wire across the break in the grid line

78. A power door lock actuator does not respond to remote, switch, or door switch commands. A DMM at the actuator harness connector reads 0 V to both terminals during command attempts. The fault is:

A. Upstream of the actuator — the BCM is not commanding power (failed BCM driver, broken wire, or fuse) or the ground path is open; further testing isolates the cause along the supply chain

B. The actuator motor itself, regardless of supply voltage

C. The remote keyless entry transmitter battery and signal

D. The vehicle's body control module's internal memory only

79. A customer complains of reduced airflow from dashboard vents and a musty odor. The vehicle has 80,000 km. The most likely cause is:

A. A failed blower motor with worn brushes reducing output

B. A clogged HVAC evaporator core requiring service

C. A failed blower control resistor or PWM module

D. A clogged or contaminated cabin air filter — high mileage with no recent replacement restricts airflow and harbors bacterial growth producing the musty smell

80. An Intelligent Battery Sensor on the negative battery terminal reports battery state to the BCM. The BCM uses this information primarily to:

A. Provide the customer with a dashboard fuel economy estimate

B. Calculate state of charge and state of health, adjust regulated voltage by temperature and SoC, authorize stop-start, and load-shed as needed to protect the battery from over-discharge

C. Operate the radio and infotainment system functions

D. Control the engine speed governor for idle stability

81. A conductance battery tester reports: rated 600 CCA, measured 450 CCA, 92% SoC. The correct decision is:

A. Replace the battery immediately because measured CCA is below rated

B. Add water to the battery's electrolyte cells

C. The battery is functional but degraded — measured CCA at 75% of rated typically indicates the plates are sulfating; advise monitoring and replacement at next service if symptoms appear or the trend continues

D. Return the battery to service with no recommendation; no degradation is indicated

82. A handheld scope on the alternator B+ terminal at 2000 RPM with electrical loads shows ripple voltage of 0.4 V peak-to-peak. The reading indicates:

A. A healthy alternator — ripple under 0.5 V peak-to-peak is the typical specification, confirming all rectifier diodes are functioning correctly

B. A failed diode requiring alternator replacement

C. A failed regulator allowing excessive output voltage

D. A failed battery cable causing high resistance to ripple

83. A right front headlamp works dimly. A DMM measures 0.6 V from battery negative to the headlamp ground during operation (spec less than 0.1–0.2 V). The voltage drop indicates:

A. A failed headlamp bulb internally affecting the light output

B. A failed BCM affecting the lighting control function

C. A blown low-beam fuse intermittently reducing supply

D. Excessive resistance in the headlamp ground path (corroded ground stud, loose terminal, or paint under the connection) — the high resistance starves the bulb of current

84. A scope on a passive (variable reluctance) wheel speed sensor during a slow drive from a stop shows:

A. A digital square wave with constant amplitude at all wheel speeds

B. An AC sine-like signal whose frequency and amplitude both rise with wheel speed; at very low speeds the amplitude may be too small for the ABS module to detect, which is why passive sensors are limited at low speed

C. A flat DC voltage rising linearly with wheel speed

D. A square wave at 5 V switching at engine firing frequency

85. A scope on an active (Hall-effect or magnetoresistive) wheel speed sensor at very low vehicle speed shows:

A. No signal at all because active sensors do not work below 8 km/h

B. An AC sine wave with low amplitude at low speeds

C. A digital square wave with constant amplitude (typically 0 V and 5 V or 12 V); frequency drops with wheel speed but amplitude remains constant, allowing the ABS module to detect motion down to very low speeds

D. A noise pattern with no clear waveform identifiable

86. A brake fluid moisture content test reads 4.5% moisture. The technician should:

A. Flush the entire brake system with new DOT-rated fluid and re-bleed; moisture above 3% has lowered boiling point and risks vapor lock under heavy braking

B. Top off only the master cylinder reservoir with fresh fluid

C. Heat the fluid in the system to boil off the absorbed moisture

D. Add a moisture-absorbing additive to the master cylinder

87. A vehicle's brake pad wear warning illuminates. Inspection finds the pads within service life specification. The most likely cause is:

A. A normal warning cycle that will clear on its own with use

B. A broken or damaged brake pad wear sensor wire — the sensor's continuity is monitored by the BCM, and an open circuit triggers the warning regardless of actual pad thickness

C. The brake fluid level is low and triggering the wear warning

D. The ABS pump motor has failed and is reporting a generic warning

88. After replacing rear brake pads on a vehicle with an Electronic Parking Brake (EPB), the technician must:

A. Drive the vehicle for 100 km so the EPB self-calibrates

B. Disconnect the battery for 30 minutes to reset the EPB

C. Pump the brake pedal 50 times before driving the vehicle

D. Use the scan tool (or manufacturer procedure) to retract the EPB motor before installation, install pads, then return the EPB to normal mode and perform any required pad bedding/calibration

89. A vehicle has a soft brake pedal that slowly sinks to the floor when held with the engine running. No external fluid leaks. The most likely cause is:

A. Internal leakage past the master cylinder's primary or secondary seals — fluid is moving from the pressure chamber back to the reservoir under sustained pressure, allowing the pedal to sink without external evidence

B. A failed ABS modulator valve preventing pressure delivery

C. Air in the brake system from a recent fluid service

D. A worn brake pad caliper seal allowing fluid loss

90. A tire shows scalloped/cupped wear around the tread surface, with raised and worn areas alternating in pattern. The most likely cause is:

A. Chronic over-inflation pressure

B. Chronic under-inflation pressure

C. Worn shock absorbers or struts — the suspension cannot damp tire bounce, allowing the tire to bounce against the road and produce the characteristic scalloped wear pattern

D. Incorrect tire rotation interval being followed

91. A vehicle exhibits feather-edge wear on the front tires (one side of each tread block sharp, the other side rounded). The most likely cause is:

A. Caster setting out of specification for this vehicle

B. Incorrect toe setting — improper toe causes tires to scrub sideways while rolling, producing the asymmetric feather-edge pattern

C. Worn ball joints with unloaded vertical play visible

D. Worn shock absorbers producing a cupped pattern

92. A tire shows excessive wear on the inside edge with the outside relatively unworn. Alignment shows the wheel at $-2.5°$ camber (spec $-0.5° \pm 0.5°$). The cause is:

A. Excessive toe-in setting on the affected wheel

B. Worn shock absorbers producing uneven wear distribution

C. Over-inflation pressure causing center-edge variation

D. Excessive negative camber — the tire leans inward at the top, concentrating contact and load on the inner edge; alignment must be corrected and suspension inspected to prevent recurrence

93. A MacPherson strut has visible oil on the lower portion of the strut tube during inspection. The proper action is:

A. Replace the strut assembly — visible oil indicates a failed strut seal and reduced damping; struts cannot be repaired and must be replaced (typically in pairs across the axle for balance)

B. Wipe the strut clean and observe over the next several weeks

C. Add hydraulic fluid through the strut top to replenish the lost fluid

D. Replace only the seal at the top of the strut

94. A hydraulic power steering system shows hard steering at low speed and during turns. Pressure at the high-pressure line reads 600 psi at relief (spec 1200–1500 psi). The most likely cause is:

A. A failed steering rack causing excessive internal back-pressure

B. A failed steering pressure switch reporting incorrect values

C. A failing power steering pump — internal wear (vane, rotor, or pump body) prevents the pump from generating rated pressure; the pump must be replaced

D. A clogged power steering fluid filter

95. A scope on an EPS torque sensor (3-wire: 5V ref, ground, two complementary signal outputs) at zero steering effort shows:

A. Both signal lines at maximum voltage (5 V) simultaneously

B. The two signal lines crossing at approximately 2.5 V each (centered around the reference midpoint), with one signal rising and the other falling proportionally as steering torque is applied; the dual signals allow the EPS module to detect circuit faults

C. Both signal lines at 0 V simultaneously

D. A square wave at the engine firing frequency

96. After a wheel alignment with adjustment of toe, the technician must:

A. Replace the steering angle sensor as a precaution after toe adjustment

B. Disconnect the battery for 30 minutes for a SAS reset

C. Drive the vehicle for 50 km for self-calibration to occur

D. Perform the steering angle sensor (SAS) zero-point calibration using the scan tool with the wheels straight; the calibration sets the sensor's reference to match the new toe-corrected geometry

97. A tire is balanced statically only and then road-tested. At highway speed the steering wheel shakes side to side. The cause is:

A. The tire was only statically balanced — static balance corrects only up/down imbalance; a dynamic (couple) imbalance remains, producing the side-to-side shake at speed; dynamic balancing corrects both

B. The tire pressures are not set to the placard values

C. The wheel bearings are worn on both front wheels simultaneously

D. The front ball joints need replacement for proper steering feel

98. A vehicle has a humming noise that increases with vehicle speed but is unaffected by braking. During cornering, the noise becomes louder when turning right. The bad bearing is:

A. The right front, because right turns load that wheel directly

B. The left front — right turns transfer weight to the outside (left) front, loading its bearing and making its noise louder

C. The right rear, loaded similarly to the front in right turns

D. The left rear, loaded similarly to the front in right turns

99. A vehicle has brake drag on one wheel only after several brake applications. The drag does not occur on the first application. The most likely cause is:

A. A failed brake caliper piston seal allowing fluid loss

B. A failed master cylinder primary seal affecting circuit pressure

C. A collapsed brake hose with internal flap failure — pressure passes from master cylinder to caliper, but the deteriorated rubber lining acts as a one-way valve preventing release; the caliper stays applied until the system cools

D. A failed proportioning valve restricting return flow

100. A brake pedal pulses up and down rhythmically during braking, in time with wheel rotation. The most likely cause is:

A. A failed master cylinder allowing fluid pulsation

B. Air in the brake hydraulic system causing pedal feedback

C. A failed brake booster losing power assistance during braking

D. Excessive rotor thickness variation or lateral runout — as the rotor's high and low spots p pads at each rotation, the variation pushes pads (and pistons, and fluid) back into the caliper bores

101. A tire sidewall reads "P225/65R17 102H." The "102" indicates:

A. The load index — 102 corresponds to a maximum load capacity of 850 kg (1874 lb) per tire; the load index is a coded number, not a direct measurement

B. The maximum cold inflation pressure in psi

C. The tire's aspect ratio as a percentage of width

D. The DOT compliance code for this tire size

102. A tire's DOT code ends in "2722." This indicates:

A. The tire is rated to 27 psi maximum at 22°C ambient

B. The tire was manufactured 27 weeks ago from today

C. The tire was manufactured in the 27th week of 2022 — the four-digit DOT date code shows week and year; tires typically should be replaced after 6–10 years even with adequate tread remaining

D. The tire is approved by 27 different regulatory bodies in 2022

103. On a SLA suspension where the spring is mounted on the upper control arm, the lower ball joint is the unloaded follower at ride height. To inspect this ball joint for wear, the technician should:

A. Hoist the vehicle by the upper control arms alone

B. Place a jack under the upper control arm to maintain suspension preload while hoisting the vehicle, then inspect the ball joint for vertical play with a pry bar; or measure axial play with the suspension at ride height

C. Compress the suspension by pushing down on the bumper before inspection

D. Inspect with all wheels off and the vehicle on jack stands at the frame

104. A vehicle's brake bleeding sequence is right rear, left front, left rear, right front. The rationale is:

A. Right rear is bled first because of heaviest cargo loading there

B. The order is chosen to minimize total brake fluid consumption

C. The sequence is arbitrary and does not affect bleeding outcome

D. The vehicle has a diagonal-split (X-pattern) brake system common on FWD vehicles; each circuit handles one front and one diagonally-opposite rear corner, and the sequence bleeds the longest line on each circuit first

105. A vehicle's door jamb placard specifies 35 psi cold for the front tires. After a 20-minute drive on a 25°C day, the technician measures the front tires at 39 psi. The technician should:

A. Leave the pressure at 39 psi — the placard specifies cold pressure, and the 3–6 psi rise from operation is expected; releasing air would leave the tires underinflated when cool

B. Release air to bring the pressure down to 35 psi exactly

C. Add air to reach 41 psi to compensate for the cooling that follows

D. Replace the tires because the pressure rise indicates a sidewall failure

106. A FWD vehicle with a unitized hub bearing assembly has an axle nut torque spec of 220 Nm + 45° angle. The technician should:

A. Tighten only by feel; the specification is approximate

B. Torque to 220 Nm only and skip the angle requirement entirely

C. Torque to 220 Nm with a calibrated wrench, then turn an additional 45° using a torque angle gauge or witness marks; the angle component ensures consistent clamping load regardless of friction variation

D. Use an air impact gun at the maximum setting available

107. A vehicle has been in a frontal collision. The scan tool reads the SRS module and reports: Driver Airbag — Deployed, Passenger Airbag — Deployed, Driver Pretensioner — Deployed, Side Curtains — Not Deployed. The proper action is:

A. Reset the SRS codes and return the vehicle to service immediately

B. Replace each deployed component (driver airbag, passenger airbag, driver pretensioner with seat belt assembly), assess the SRS module's deployment record (typically requiring reset or replacement per manufacturer procedure), and perform a thorough body/structural inspection

C. Replace only the SRS module and clear the codes recorded

D. Use the SRS scan tool to "undeploy" the airbags

108. A seat belt has been subjected to a previous moderate collision (no airbag deployment but tension load on the webbing). Inspection finds the webbing intact with no fraying or burn marks. The proper action is:

A. Replace the webbing only as a precaution against future failure

B. Inspect the retractor for tension and return to service if functional

C. Recommend a new pretensioner only if one is available for the vehicle

D. Replace the entire seat belt assembly — manufacturer guidance typically calls for seat belt replacement after any significant load event regardless of visible damage, since internal fibers can stretch beyond elastic limit without external evidence

109. A vehicle's driver airbag warning light illuminates after a steering wheel replacement. Scan tool reads B0021 (Driver Airbag Squib Loop Open). The most likely cause is:

A. The clock spring (steering wheel rotary connector) was damaged during removal/installation, has slipped from center position, or lost continuity from normal wear — the clock spring routes power across the rotating steering wheel and is a common cause of squib loop opens

B. A failed driver airbag igniter from the recent service

C. A failed SRS module unrelated to the steering wheel work

D. A failed body wiring harness routed near the column

110. Before working on the SRS system to remove a deployed pretensioner, the technician must wait the manufacturer-specified discharge period. The typical wait time is:

A. No wait period is required after a deployment has occurred

B. 30 seconds to 1 minute, sufficient for safety in all cases

C. 1 to 10 minutes after disconnecting the battery, depending on manufacturer (consult service information) — the SRS module's reserve capacitor must discharge before connectors can be safely separated

D. 24 hours after the deployment event for complete discharge

111. A vehicle has water ingress in the front of the cabin during rain. The sunroof tracks are clear of debris. The next inspection point is:

A. The HVAC drain at the firewall only as the primary path

B. The cowl drain area below the windshield wiper assembly

C. The windshield seal at the upper perimeter of the glass

D. The sunroof drain tubes — they route water from the corners of the sunroof through the A-pillars to outlets behind the front fenders; blockage at any point along the tube causes water to back up and seep into the cabin

112. A vehicle's power window auto-up reverses (drops back down) immediately after starting up, even with no obstruction. The most likely cause is:

A. A failed motor with reduced torque output for closing

B. The pinch-protection threshold has not been calibrated after a recent battery disconnect or motor replacement; the system interprets normal closing resistance as an obstruction and triggers reversal — performing the window initialization procedure resolves this

C. A failed BCM giving incorrect command signals

D. A weak battery affecting the motor's available torque

113. After a frontal collision repair, the technician must verify the body's underbody control points are within manufacturer specifications. This is done by:

A. Comparing measured dimensions at manufacturer-designated control points (holes, bolts, or surfaces with published locations) against dimension specifications, using a measuring system (tram gauge, laser, or similar) to confirm restoration within tolerance

B. Visual inspection only, looking for obvious distortion of panels

C. Test-driving the vehicle and observing steering pull or feel

D. Disassembling all body panels to inspect the underlying structure

114. A power mirror assembly with memory positions, heated glass, blind spot indicator, and auto-dim has been replaced. The customer reports blind spot indicator works but memory recall is absent and tilt-down on reverse is not active. The corrective action is:

A. Replace the BCM to restore the lost memory functions

B. Replace the mirror assembly again with another new unit

C. Calibrate or configure the new mirror through the scan tool — program memory positions, learn blind spot zones, and enable tilt-down-on-reverse per the manufacturer's procedure

D. Disconnect the battery for 30 minutes to allow BCM relearning

115. During collision repair, a body panel is being replaced. The manufacturer specifies panel bonding adhesive (rather than welding) for this panel. The technician should:

A. Substitute welding for the recommended bonding because welding is stronger

B. Use any two-part epoxy adhesive available at the local parts store

C. Skip the bonding step entirely if welding is also possible at the panel

D. Use the manufacturer-recommended panel bonding adhesive (typically a 2-part urethane or epoxy specifically formulated for automotive structural panel bonding), prepare both surfaces per technical instructions, and clamp the joint for the cure period

116. A heated seat cushion does not produce heat. The technician confirms voltage is present at the seat heat element connector during command. The next test is to:

A. Replace the BCM as the source of the heating failure

B. Measure the resistance of the heating element at the connector with the element disconnected from the harness — a healthy element typically reads 1–5 Ω; an open reading indicates a broken element wire and the cushion (or element) must be replaced

C. Replace the seat heat control switch on the console

D. Replace the seat cover material that contains the element

117. Before service on a high-voltage hybrid/EV system, the technician must inspect the Class 0 (1000 V rated) HV gloves. The proper inspection procedure is:

A. Visually inspect for cracks, tears, and contamination; perform a roll-and-trap air test (roll the gauntlet cuff toward the fingers to trap and pressurize air, hold the inflated glove near the ear and face to detect leaks); discard the gloves if any defect is found

B. Spray the gloves with water to check for absorption through fabric

C. Test the gloves with a multimeter set to ohms range

D. No inspection is required for new gloves still in original packaging

118. To safely de-energize a hybrid HV system before work, the manufacturer's sequence is typically:

A. Disconnect the 12V battery alone — this de-energizes the HV system completely

B. Remove the manual service disconnect immediately without other steps

C. Turn the vehicle OFF and remove the key/fob, wait for HV power-down, remove the manual service disconnect (MSD), wait the specified discharge time for inverter capacitors to bleed, and verify the absence of voltage at specified test points using a Cat III/IV-rated meter

D. Drive the vehicle until the HV battery is empty, then service it immediately

119. A hybrid battery scan tool data shows typical cell module voltage 3.65 V, but one module reading 2.85 V. The interpretation is:

A. Normal operation; cell voltage variation up to 1 V is acceptable

B. The low-reading module is significantly imbalanced and is either depleted, defective (high internal resistance), or has a sense wire problem; the BMS may set a fault and limit pack capacity, and the module typically requires diagnosis and possibly replacement

C. The battery is fully charged and operating normally

D. The scan tool data display has failed and shows incorrect values

120. An EV in North America uses a Combined Charging System (CCS-1) connector. The CCS-1 connector combines:

A. AC charging only with no DC capability provided

B. DC fast charging only with no AC capability provided

C. AC charging routed through a separate connector type

D. The standard J1772 AC connector (top portion) for Level 1/Level 2 AC charging plus two additional DC pins (bottom portion) for DC fast charging at higher power levels; one port handles both methods

121. A scope on the EV traction motor inverter during deceleration shows the motor torque value as a negative number (e.g., −200 Nm). This indicates:

A. The motor is operating in regenerative braking mode — negative torque represents the motor acting as a generator, providing braking force and converting kinetic energy back to electrical energy that flows into the HV battery

B. A failed torque sensor reporting incorrect values to the inverter

C. The motor is producing reverse torque to drive the wheels backward

D. Normal operation during forward acceleration with positive torque

122. After replacing an HV cable on an EV, the technician must verify the cable's insulation resistance before reconnecting it. The test is performed with:

A. A standard digital multimeter on its lowest resistance scale

B. A test light connected across the cable terminals

C. A high-voltage insulation tester (megger) at the manufacturer-specified test voltage (typically 500 V or 1000 V DC); a healthy HV cable should read more than 100 MΩ from each conductor to ground and between conductors

D. A continuity tester on the lowest scale available

123. A traction motor inverter on an EV converts:

A. AC battery voltage to DC for the traction motor

B. DC battery voltage to three-phase AC for the permanent magnet synchronous motor — the inverter switches IGBTs or SiC FETs at high frequency, using PWM to synthesize three-phase AC sine waves with the frequency and amplitude needed for commanded speed and torque

C. High-frequency RF for wireless charging operation

D. Single-phase AC to DC for the 12V auxiliary system

124. An EV owner reports significant range loss in cold weather (40% reduction at −10°C compared to room temperature). The most likely cause is:

A. A failed traction motor unable to operate in cold weather conditions

B. A failed BMS reporting incorrect state of charge values

C. Worn HV battery contactors causing energy loss in the pack

D. Reduced lithium-ion chemistry efficiency in cold temperatures (slower ion movement, higher internal resistance, less usable capacity) combined with cabin heating draw, motor/battery preconditioning energy use, and reduced regen acceptance — all normal physical limitations rather than faults

125. A hybrid HV battery is liquid-cooled. Scan data shows inlet coolant temperature 35°C, outlet temperature 35°C, with the battery under heavy discharge at 100 kW. The technician should:

A. Investigate the cooling system — under heavy discharge, inlet and outlet temperatures should differ by several degrees as coolant absorbs heat; identical readings suggest a failed coolant pump, a temperature sensor fault, or air in the cooling circuit

B. Conclude that the battery is functioning normally as designed

C. Conclude that the battery is overheating and reduce vehicle load

D. Replace the HV battery as the source of the cooling failure

Practice Exam 13: Answer Key and Explanations

1. A — Cut-off wheels throw high-velocity fragments and produce loud, abrasive particulate. Z87+ impact-rated safety glasses, hearing protection, gloves, and a face shield together address eye, ear, hand, and face exposures simultaneously; the wheel's guard reduces but does not eliminate projectile risk.

2. B — Storing a click-type torque wrench at the lowest non-zero setting relieves spring tension without fully unloading the internal mechanism. Full unloading or maximum loading shifts the calibration over time; the low-setting practice preserves accuracy between annual calibration intervals.

3. D — Section 5 of every SDS specifies firefighting measures: suitable and unsuitable extinguishing media, special hazards from combustion products, and protective equipment for firefighters. Knowing the section number lets the technician find the answer quickly when seconds matter during a shop fire.

4. C — Engaging mechanical safety locks, applying a personal lockout/tagout to the hoist's energy isolation point, and documenting the lockout protects anyone who enters the shop from inadvertent operation. Provincial OHS lockout requirements apply whenever stored energy could harm someone — hoists meeting that definition.

5. B — Provincial consumer protection law requires the technician to stop work and obtain authorization before exceeding an estimate by any material amount. Continuing without authorization can make the additional charges legally non-collectible regardless of how well the repair is done.

6. D — Class B extinguishers (dry chemical, CO_2, or foam) are designed for flammable liquids including gasoline, oils, and parts cleaning solvents. Class A water-based agents would spread the burning liquid; Class D and K are for entirely different hazards.

7. A — Working-alone regulations require a written procedure with documented check-in intervals and a designated contact who can summon help if a check-in is missed. The framework ensures that if the technician is incapacitated, someone notices and responds quickly.

8. C — A certified gauge block traceable to a national measurement standard (NIST or equivalent) is the only reliable reference for verifying micrometer accuracy. Checking against unverified hardware would inherit any error in the reference, defeating the purpose of pre-measurement verification.

9. D — Removing contaminated clothing, flushing with cool running water for at least 15 minutes, consulting the SDS, and seeking medical assessment is the universal first response for chemical skin exposure. Neutralizing creams and barrier seals can react unpredictably and trap chemical against the skin.

10. B — A passive (variable reluctance) sensor generates voltage by induction as the toothed reluctor wheel passes the magnetic pickup. Voltage amplitude rises with speed because faster movement induces larger EMF; the missing-tooth gap provides the reference position the PCM needs for timing.

11. A — A Hall-effect sensor uses a transistor switch driven by the magnetic field across a semiconductor element, producing a digital square wave between 0 V and reference voltage. Amplitude is constant because the switch is either on or off, an advantage over passive sensors at low speeds.

12. C — When the PCM opens the primary circuit, the coil's collapsing magnetic field induces a large voltage spike across the primary winding (the inductive kick). The secondary, with many more turns, steps this voltage up by the turns ratio to produce the spark voltage at the plug.

13. D — Burn time reflects how long the spark sustains across the plug gap. Excess secondary resistance (worn plug, high-resistance wire) raises firing voltage and consumes more of the coil's stored energy before the arc strikes, leaving less energy to maintain the burn after the arc forms.

14. A — A healthy zirconia O2 sensor produces a Nernst-cell voltage that switches rapidly as the PCM oscillates fuel trim around stoichiometric in closed loop. Rapid switching across 0.45 V is the diagnostic signature of a responsive sensor capable of supporting accurate closed-loop control.

15. B — A functioning catalyst stores and releases oxygen, smoothing the exhaust composition reaching the rear sensor. The OBD-II catalyst monitor uses the relative activity of front vs rear sensors — when rear activity matches front, the catalyst has lost its oxygen storage capacity and sets a code.

16. D — Manifold absolute pressure rises from idle (high vacuum = low MAP voltage) toward atmospheric pressure at WOT (low vacuum = high MAP voltage), then falls back as the throttle closes. The scope trace visualizes this throttle-pressure relationship continuously, useful for diagnosing MAP response problems.

17. C — A piezoelectric knock sensor produces a small AC voltage in response to mechanical vibration. Normal combustion produces a baseline noise pattern, while genuine knock events appear as larger amplitude pulses that the PCM identifies through frequency filtering and timing correlation.

18. A — During injector "on time," the PCM driver pulls one side of the coil to ground, and the trace drops near zero volts. The width of this low period — measured in milliseconds — is the injector pulse width that determines how long fuel is delivered.

19. B — A hot-wire MAF measures mass airflow by tracking how much current is needed to keep a heated wire at a constant temperature against the cooling effect of incoming air. Output voltage rises smoothly with airflow; any dropout, step, or noise indicates a damaged sensing element or contaminated hot wire.

20. D — A potentiometer-type TPS uses a wiper sliding along a resistive strip, producing a voltage proportional to throttle angle. A smooth ramp during slow sweep confirms the wiper makes continuous contact across the full range; dropouts or dead spots indicate a worn track that will set a TPS DTC.

21. C — Lambda is the ratio of actual AFR to stoichiometric AFR (14.7:1 for gasoline). Lambda 0.92 means actual AFR = 14.7 × 0.92 ≈ 13.5:1, which is richer than stoichiometric — a normal commanded condition under heavy load to provide power enrichment and cooling.

22. A — Engine oil added to the cylinder seals the rings against the bore. If the wet test rises significantly toward spec, the leakage was at the rings; if the wet test stays low, the leak is past a valve or head gasket where added oil cannot help.

23. B — A burned valve produces a rhythmic single-pulse drop on every firing of that cylinder, while a sticking valve fails to seat at unpredictable intervals, producing the irregular pattern described. Vacuum gauge needle behavior — rhythm, dwell, and depth — distinguishes between these mechanical faults.

24. D — Active regeneration burns accumulated soot (carbon) to CO_2 at high exhaust temperatures. As soot is consumed and exits the filter, differential pressure across the DPF drops from its pre-regen peak — the falling differential pressure during high-temperature operation is the signature of a successful regen.

25. A — A boost leak downstream of the compressor allows pressurized air to escape before reaching the manifold, producing a wide gap between commanded and actual boost without a DTC. Pressure-testing the charge piping with shop air locates the leak quickly by hiss or soap-bubble inspection.

26. C — GDI rail pressure naturally fluctuates with each high-pressure pump stroke and each injection event. Small oscillation (±2 MPa) around the commanded mean is normal regulation; a flat trace or large excursions would indicate failed regulation or pump output.

27. B — A vacuum leak admits unmetered air that is large relative to total airflow at idle (drives trims sharply positive) but small at higher airflows (trims normalize). The pattern — large positive idle trim resolving at cruise — is essentially diagnostic for an air leak rather than a fuel-system or sensor fault.

28. D — Disabling a healthy cylinder produces a meaningful RPM drop; disabling a weak cylinder produces little change because it was contributing little power to begin with. The small drop on cylinder 3 isolates the weakness to that cylinder, narrowing the next-step diagnostic to compression, spark, or fuel for that cylinder.

29. A — The PCM responds to knock-sensor input by retarding spark timing in small increments to suppress detonation. The reported knock retard and the falling spark advance are the PCM's protective action, not a defect — but they signal that detonation is occurring and requires investigation of cause.

30. C — Drive-by-wire systems learn the closed-throttle position adaptively; cleaning resets the throttle body's mechanical reference relative to the learned value. The manufacturer's relearn procedure (scan tool command or specific key cycle) tells the PCM to recalibrate to the cleaned position.

31. D — Swapping coils between cylinders and observing whether the misfire follows the coil is a definitive diagnostic test. The misfire moved from cylinder 2 to cylinder 4 with the coil swap, isolating the fault to the coil itself rather than the plug, harness, or PCM driver.

32. B — CAN-H and CAN-L are differential signals: in dominant state CAN-H rises to about 3.5 V while CAN-L falls to about 1.5 V; in recessive state both lines sit at 2.5 V. Differential signaling provides excellent noise immunity because EMI affects both lines equally and the differential cancels it.

33. A — Reading the difference between CAN-H and CAN-L on a DMM shows ~0 V recessive and ~2 V dominant on a healthy bus. The DMM averages the rapid switching, but the recessive-vs-dominant differential pattern is consistent with normal CAN operation.

34. D — Two 120 Ω terminating resistors at the ends of the CAN backbone appear in parallel when measured anywhere along the bus, producing 60 Ω. The reading confirms both terminators are present and intact, ruling out broken bus wiring or missing terminator faults.

35. C — LIN (Local Interconnect Network) is a single-wire, ground-referenced, master-slave bus running at up to 19.2 kbit/s — cheaper than CAN and adequate for low-bandwidth body subsystems like switches, mirrors, and seats. The single-wire architecture is the simplest way to recognize a LIN bus on a wiring diagram.

36. B — Mode 06 contains on-board monitoring test results: numerical values, manufacturer-specified limits, and pass/fail status for each non-continuous monitor. Reading Mode 06 lets the technician see whether a monitor is borderline before the DTC matures, a powerful diagnostic for hard-to-reproduce faults.

37. A — The gateway module routes messages between physical buses with different speeds, protocols, or security boundaries. It manages bandwidth (forwarding only required traffic) and security (blocking unauthorized commands from outside the trusted bus), and provides a single point for diagnostic access.

38. D — J2534 reprogramming requires the pass-through hardware, OEM software (often subscription-based), a battery support charger holding voltage steady during the flash, and the correct calibration file from the OEM portal. Battery support is critical — a voltage dip during flashing can brick the module.

39. C — A module records bus-off and recovers (per CAN standard) when error counts exceed threshold. Intermittent EMI or marginal connections can produce these cycles without taking the network down at scan-tool level, leaving the technician to chase a fault that "isn't there" in real time.

40. B — Direct TPMS sensors transmit on regional ISM bands — 315 MHz in North America, 433 MHz in Europe — that are reserved for low-power short-range devices. The same sensors are wakened by 125 kHz LF activation, but transmission is on the higher band.

41. A — Snapshot/data recording with manual trigger captures a window of live data around the symptom moment. The technician can drive until the event occurs, trigger the recording, and review the freeze-frame-style data afterward for fuel trim, sensor values, and module state at the symptom.

42. D — Modern secure gateways (e.g., FCA SGW) require credential-based authentication via the OEM portal before bidirectional commands or reprogramming are permitted. The portal verifies the technician's identity and grants session access; bypassing the gateway is not permitted and is detectable by the module.

43. C — A new BCM ships blank and must be programmed with the VIN, vehicle option configuration, and required learn procedures (theft system, keys, calibrations) before normal operation. Skipping this step leaves features disabled or non-functional regardless of mechanical installation.

44. B — A healthy clutch master cylinder is sealed except for the small compensating port. Reservoir fluid should remain essentially level during application; significant rise, fall, frothing, or bubbling indicates internal leakage past the master cylinder cup seal — a common cause of soft clutch pedal.

45. D — A magnetic output speed sensor produces an AC signal whose frequency and amplitude both rise with shaft rotation. The TCM converts frequency to vehicle speed for shift logic and TCC slip calculation; the sensor type is functionally identical to a passive wheel speed sensor.

46. A — Driveline operating angles should typically be less than 3° at each U-joint and should match each other within 0.5°. The 3.5° rear U-joint angle and the 2° mismatch with the front cause cyclic torque variation that manifests as vibration at higher speeds.

47. C — Inner tripod or plunge CV joints handle torque while allowing axial in-and-out movement. When the rollers fail to slide smoothly in the housing (typically from wear, contamination, or loss of lubricant), the joint produces shudder under torque rather than the click that worn outer joints produce in turns.

48. B — Pinion bearings carry constant load from the driveshaft regardless of throttle position, so the whine they produce is purely speed-dependent. Drive-and-coast load cycling tests instead isolate ring-and-pinion gear wear, while wheel bearings produce a different (typically broader-spectrum) noise.

49. D — A worn transfer case chain with excessive slack will not regain spec by adjustment — chain stretch and tooth wear are usually advanced together. Replacing the chain (and inspecting sprockets) restores driveline integrity and prevents the chain from jumping a sprocket under load.

50. A — The transmission oil pump generates all line pressure; if both idle and full-load pressures fall short of spec, the pump cannot produce its rated output. Valve body issues typically affect pressure response or shifting characteristics rather than the entire pressure range.

51. C — A PWM signal to the TCC solenoid controls hydraulic pressure to the lockup clutch through duty cycle. Rising duty cycle increases pressure and applies the clutch progressively, blending smoothly from full slip to full lockup and minimizing the engagement bump the driver might otherwise feel.

52. B — A face/heel contact pattern indicates the pinion is too shallow and backlash is too loose. Moving the pinion inward (deeper) shifts the contact pattern toward the root and toe; the carrier may need adjustment to bring backlash into spec after the pinion change.

53. D — A Haldex-style AWD coupling uses an electric pump to generate hydraulic pressure that applies a clutch pack connecting the rear driveline. Zero current draw under all conditions with no AWD function indicates the pump motor or actuator winding has failed open, and the system defaults to front-drive only.

54. A — Limited-slip differential friction modifier modifies the static-to-dynamic friction ratio of the clutch surfaces. Without sufficient modifier, the clutches stick-slip during slow tight turns when wheels rotate at significantly different speeds, producing the chatter; refilling with the correct LS fluid or adding modifier resolves the issue.

55. B — When engine speed climbs faster than CVT output speed under load, the belt is slipping on the pulleys. CVT belt slip rapidly damages the belt and pulley surfaces (heat, glazing, scoring) and is typically not repairable — usually requiring CVT assembly replacement.

56. D — Driveshaft balance requires a clean surface, professional balancing equipment, and weights applied at the calculated correction positions. Improvised additions on top of corroded existing weights cannot achieve the precision needed to eliminate the imbalance at highway speed.

57. C — Large amounts of clutch material plus metal in the filter indicate the transmission is shedding friction surfaces and metal-on-metal contact is occurring inside. Simply refilling and returning to service hides progressing internal damage that will fail more dramatically soon; honest communication with the customer is required.

58. A — Verifying VSS output frequency on a scope at known speed lets the technician compare against the calculated expected frequency (tire diameter, axle ratio, sensor pulses per revolution). The test isolates whether the speedometer reading error is from the sensor, the speedometer head, or upstream gearing.

59. B — A synchronizer brings the gear's speed to match the mainshaft before the slider engages the dog teeth. When the synchronizer ring wears, it cannot synchronize speeds quickly enough during a moderate-rpm shift, allowing brief tooth-on-tooth contact that produces the grinding sound.

60. C — Ring and pinion teeth contact on the drive flank under throttle and on the coast flank during deceleration; wear or improper setup of one flank produces noise only when that flank carries load. A drive-only whine isolates the wear pattern to the drive side of the gear teeth.

61. C — Three-phase alternator output is rectified by six diodes into DC; small ripple (<0.5 V peak-to-peak) is the residual switching pattern from the rectifier. A larger ripple with a missing "hump" reveals a failed diode that no longer rectifies one phase of the output.

62. A — Each diode in the bridge rectifies one phase of the three-phase stator output; the resulting DC has six "humps" per revolution (three positive, three negative). A single failed diode removes its contribution, leaving a gap in the ripple pattern and reducing usable output capacity.

63. B — Peak starter current is highest at the moment of engagement because the motor has no back-EMF and must overcome static inertia plus compression. Once the engine begins turning, back-EMF builds and current drops to running level — which is the more diagnostically meaningful number.

64. D — Open-circuit battery voltage scales linearly with state of charge: 12.6 V = 100%, 12.4 V ≈ 75%, 12.2 V ≈ 50%, 12.0 V ≈ 25%, 11.8 V = 0%. The 12.4 V reading after overnight rest indicates a partially charged battery rather than a failed one.

65. C — The standard parasitic draw procedure connects an ammeter in series with the negative cable, lets all modules complete their sleep sequence (which can take 30–60 minutes), then reads the steady-state draw. Interrupting the process before sleep completes causes high readings unrelated to actual draw.

66. A — Voltage drop in the ground path means resistance is present in the return circuit. 0.8 V (vs spec <0.2 V) drops voltage available to the starter and dissipates the power as heat at the bad connection — the bad ground steals from the starter's cranking energy.

67. D — Stop-start systems use multiple inhibit conditions to ensure auto-stop is safe and re-start will be reliable: battery SoC, battery and engine temperatures, climate demand, brake vacuum, steering position. Any inhibit holds the engine running; identifying the active inhibit requires reading scan tool data while the symptom occurs.

68. B — When the blend door reports it has reached the commanded position but the air remains cool, the actuator is not the fault. The hot coolant must be flowing through the heater core — restricted core, low coolant level, failed water pump, or stuck heater control valve all break the heat-delivery chain.

69. C — Low charge causes both pressures to fall below spec; the small amount of remaining refrigerant boils aggressively at the orifice, dropping evaporator temperature below freezing and producing visible frost. Adequate charge would maintain both pressures in their normal ranges.

70. A — A 3-wire pressure transducer outputs voltage proportional to pressure on a 5 V scale. Mid-range pressures produce mid-range voltages (around 2 V); high pressures push voltage toward 4-5 V and very low pressures toward 0.5 V. Reading the transducer voltage diagnoses A/C control inputs to the PCM.

71. D — A clutch coil with shorted turns presents abnormally low resistance, causing excessive current draw when energized. The high current trips the relay fuse or the PCM's overcurrent protection, disabling clutch engagement; the coil must be replaced as the only fix.

72. C — Headlamp aim is performed using the dedicated adjustment screws on the housing, at curb weight, on a level floor, at the manufacturer's specified distance from a wall target. Following the procedure produces the correct beam pattern for both driver visibility and oncoming traffic safety.

73. B — Auto-up and pinch protection require the BCM to know the window's full travel range and the motor's normal current draw. After a power loss, the BCM must be retaught the window's limits through the initialization procedure before auto-up can resume safely.

74. A — A heated mirror element is a low-resistance grid (1-10 Ω typical); with voltage confirmed at the connector, the only remaining circuit element is the element itself. An open reading indicates a broken element wire — the heating grid is integral to the mirror glass assembly and cannot be repaired.

75. D — A 13.0 V reading falls short of the 13.8–14.6 V spec, indicating the battery is not being fully charged. Cable voltage drops, regulator faults, or temperature compensation issues all produce undervoltage; the battery slowly discharges over time and may set DTCs related to low system voltage.

76. B — The clock spring assembly routes power across the rotating steering wheel for the airbag, horn, switches, and heated wheel circuits. Worn or corroded contact surfaces produce intermittent operation that varies with steering wheel position or vibration during driving.

77. C — Conductive paint formulated for defroster repair bridges the break with a metallic film that, once cured, conducts current similarly to the original grid line. The repair is straightforward and typically permanent if surface preparation and cure time follow the manufacturer's instructions.

78. A — With 0 V to both terminals during command, the BCM is not delivering power to the actuator. The fault lies upstream: BCM driver, fuse, wiring, or ground path — testing each in turn isolates the cause without unnecessarily replacing the (functional) actuator.

79. D — A clogged cabin air filter restricts airflow through the HVAC case and harbors moisture that promotes bacterial growth, producing both symptoms simultaneously. The combination of reduced airflow plus musty odor at high mileage strongly points to filter neglect rather than a blower or evaporator issue.

80. B — The IBS reports current, voltage, and temperature to the BCM via LIN or CAN. The BCM uses this data to calculate SoC and SoH, adjust charging voltage by temperature, authorize stop-start function, and load-shed when needed to prevent over-discharge during long key-off periods.

81. C — Conductance testers measure internal resistance, which correlates with available capacity. Measured CCA at 75% of rated indicates plate sulfation or aging — functional but degraded. Customer communication and monitoring at the next service balance vehicle reliability with avoiding premature replacement.

82. A — Less than 0.5 V peak-to-peak AC ripple confirms all six rectifier diodes are functioning. Reading ripple voltage is a fast, sensitive test that catches diode failures before they cause noticeable charging system symptoms or battery damage.

83. D — A voltage drop on the ground side represents resistance in the return path that wastes voltage as heat. With 0.6 V dropped in the ground, less voltage and current reach the bulb, producing dim operation; cleaning and tightening the ground connection restores normal operation.

84. B — A passive (variable reluctance) WSS generates voltage by induction; both frequency and amplitude rise with wheel speed. At very low speeds, the induced amplitude can drop below the ABS module's detection threshold — a limitation that drove the industry toward active sensors.

85. C — Active (Hall or magnetoresistive) sensors use a powered semiconductor element to produce a digital square wave with constant amplitude. Frequency falls with speed but the amplitude stays the same down to very low speeds, enabling reliable wheel speed detection during slow rolling.

86. A — Brake fluid is hygroscopic; moisture content above 3% lowers the boiling point enough to risk vapor lock during heavy braking, producing pedal fade or loss. Full system flush with new DOT-rated fluid restores boiling point and preserves brake safety margin.

87. B — Brake pad wear sensors complete a circuit that the BCM monitors for continuity; an open circuit (from broken wire or damaged sensor) triggers the warning regardless of actual pad thickness. Inspecting the sensor wiring before assuming pad wear avoids unnecessary brake service.

88. D — EPB calipers have an internal spindle driven by an electric motor; pressing the piston back without retracting the spindle damages the mechanism. The scan tool service mode retracts the spindle safely, and post-installation calibration restores normal EPB function.

89. A — Brake fluid moving past worn master cylinder seals returns to the reservoir under sustained pressure, allowing the pedal to sink without external evidence. The internal leak does not show as fluid loss because the fluid recycles within the master cylinder rather than escaping the system.

90. C — Worn shocks or struts cannot damp suspension oscillation, allowing the tire to bounce against the road surface and produce the characteristic scalloped wear pattern. Replacement of the shocks (in axle pairs for balance) eliminates the cause; the tire wear is the symptom.

91. B — Incorrect toe causes the tires to scrub sideways while rolling, producing asymmetric feather-edge wear where one side of each tread block becomes sharp and the other rounded. The wear pattern is essentially diagnostic for a toe error and points to alignment as the fix.

92. D — Excessive negative camber tilts the tire so the inner edge bears most of the load. The contact patch concentrates on the inside, producing the heavy inner-edge wear; correcting camber to spec and inspecting suspension components for collision damage or wear prevents recurrence.

93. A — Oil on a strut tube indicates a failed strut seal — the damper has lost its hydraulic fluid and cannot damp suspension motion. Struts cannot be rebuilt economically; replacement (typically in axle pairs for balance) is the standard repair.

94. C — A power steering pump that cannot reach rated pressure at the relief valve has internal wear preventing full output — typically vane, rotor, or pump body wear. The pump must be replaced; reservoir fluid level and the system itself are not the cause when the pump cannot meet specification.

95. B — EPS torque sensors use dual complementary signals for fault detection: one rises while the other falls as torque is applied, crossing at the reference midpoint at zero effort. The dual-signal arrangement lets the EPS module detect a sensor or wiring fault by comparing the two signals against expected complementary behavior.

96. D — SAS zero-point calibration sets the sensor's "wheels straight" reference. Any alignment change (especially toe adjustment) shifts the steering wheel-to-wheels relationship and requires recalibration so EPS, ESC, ABS, and ADAS systems read steering angle correctly.

97. A — Static balance corrects only up-and-down (vertical) imbalance; couple imbalance — opposite weight on opposite sides of the wheel centerline — produces the side-to-side shake at speed. Dynamic balancing on a modern wheel balancer corrects both static and couple imbalance.

98. B — In a right-hand turn, weight transfers to the outside (left) front wheel, loading its bearing more heavily and amplifying its noise. The bearing noise increases when loaded; the bad bearing is on the side opposite the turn direction.

99. C — A collapsed brake hose develops an internal one-way restriction: pressure passes to the caliper but cannot return when the pedal is released. Heat from repeated brake applications further restricts the deteriorated lining; first applications work normally because the system has cooled.

100. D — Rotor thickness variation or lateral runout pushes the pads, pistons, and fluid back into the caliper bores at each rotation, creating a rhythmic pedal pulse synchronized with wheel rotation. Measuring rotor runout with a dial indicator and thickness with a micrometer confirms the cause.

101. A — The load index 102 is a coded number tied to a published load chart: 102 corresponds to 850 kg per tire maximum. The load index, combined with the speed rating letter, defines the tire's mechanical capacity for the vehicle's weight and operating conditions.

102. C — The DOT date code's last four digits give week and year of manufacture: "2722" = 27th week of 2022. Tire age matters because rubber compounds harden over time even without use; replacement at 6-10 years is recommended regardless of tread depth.

103. B — When the lower ball joint is the unloaded follower, maintaining suspension preload during inspection requires the jack to support the upper control arm. Inspecting with the joint unloaded reveals wear that would be hidden if spring force compressed the joint during inspection.

104. D — Diagonal-split brake systems split front and rear into two diagonal pairs (right rear with left front, left rear with right front). The bleeding sequence starts at the longest line of each circuit (farthest from the master cylinder) to clear air efficiently from both circuits.

105. A — Placard pressure is specified cold. Operating temperature raises tire pressure 3-6 psi; setting hot tires to the cold placard pressure would leave them underinflated when cool, reducing handling, fuel economy, and tire life. The 39 psi reading after a short drive is normal and expected.

106. C — Torque-plus-angle fastener specifications first establish initial clamping with a calibrated wrench, then add a precise angular rotation to ensure consistent final clamping load. The angle component compensates for friction variation between fasteners, giving uniform clamping force across different installations.

107. B — After airbag deployment, each deployed component (including the seat belt pretensioner assembly) is single-use and must be replaced. The SRS module typically requires reset or replacement per manufacturer procedure, and a thorough structural inspection of the body and chassis is required before the vehicle is safe to return to service.

108. D — Manufacturer guidance typically calls for seat belt replacement after any significant load event because the webbing fibers can be stretched beyond their elastic limit without external evidence. Trusting visual inspection alone for safety-critical webbing risks compromised crash performance.

109. A — The clock spring delivers continuity to the driver airbag squib across the rotating steering wheel; damage during wheel removal, mis-centering during reinstallation, or normal wear can all open the squib loop. The clock spring is the most common cause of squib codes set after steering column or wheel service.

110. C — The SRS module's reserve capacitor stores enough energy to deploy airbags for 1-10 minutes after battery disconnect. Waiting the manufacturer-specified discharge period ensures the capacitor cannot fire the squib while the technician handles the connector; bypassing the wait risks accidental deployment.

111. D — Sunroof drain tubes route water from the sunroof tracks to outlets at the lower body. Blockage anywhere along the tube — typically debris at the corners or kinks in the line — causes water to back up into the cabin from the front, producing the symptom described.

112. B — Pinch protection compares actual motor current during closing against a learned baseline; without recent calibration, the system may interpret normal closing resistance as an obstruction. Performing the window initialization procedure reteaches the BCM the window's full travel and normal current draw.

113. A — Control points are manufacturer-designated reference locations on the body whose dimensions are published. Comparing measured dimensions at control points against specifications verifies the structure has been restored within tolerance after collision repair — the only objective way to confirm a straight repair.

114. C — Modern integrated mirror assemblies have multiple functions that require configuration: memory positions must be programmed, blind spot zones learned, and tilt-down-on-reverse enabled. Scan tool calibration per manufacturer procedure activates each function after replacement.

115. D — Manufacturer-specified panel bonding adhesives are engineered for the specific structural application; substituting generic adhesives or welding can compromise crashworthiness, corrosion resistance, or panel-to-panel strength. Following the OEM procedure preserves the engineered safety performance of the repair.

116. B — A heated seat element is a low-resistance grid (1-5 Ω); confirming voltage at the connector eliminates upstream fault paths, leaving the element itself as the likely cause. An open resistance reading indicates a broken element wire and requires cushion or element replacement.

117. A — HV gloves must be inspected before each use because pinhole leaks or contamination can defeat their dielectric protection. The roll-and-trap air test pressurizes the glove enough to reveal small leaks audibly and visually; any defect requires immediate disposal and replacement.

118. C — De-energizing the HV system safely requires multiple sequential steps culminating in voltage verification at the inverter test points. Skipping verification — assuming the system is dead because MSD was removed — risks contact with capacitor-stored energy that can be lethal at HV levels.

119. B — Cell or module voltage variation beyond a few hundred millivolts indicates imbalance: the low-reading module is either depleted, has high internal resistance, or has a faulty voltage sense connection. The BMS limits pack performance to protect cells, and diagnosis followed by module replacement or balancing is typically required.

120. D — CCS-1 combines the standard J1772 AC connector with two additional DC pins below it, allowing one charge port to handle both Level 1/2 AC charging and DC fast charging. The combined connector reduces vehicle complexity and supports the broadest range of public charging infrastructure.

121. A — During regen, the traction motor functions as a generator: vehicle kinetic energy turns the motor, which produces electricity that flows into the HV battery. Negative torque values on the scan tool represent this braking direction of torque — the motor is opposing motion to slow the vehicle.

122. C — HV cable insulation resistance must be verified with a megger at the specified test voltage (500 V or 1000 V DC) to ensure the cable's insulation is intact under operating stress. Standard multimeters cannot test at these voltages and read low resistance even on healthy cables; a megger is the only valid tool.

123. B — The traction inverter switches IGBTs or SiC FETs at high frequency to synthesize three-phase AC from the HV battery's DC. PWM modulates the duty cycle of the switches to produce sine waves of variable frequency and amplitude, controlling the motor's speed and torque continuously.

124. D — Cold-weather range loss is caused by lithium-ion chemistry limitations (slower ion movement, higher internal resistance, less usable capacity), plus cabin heating energy draw, motor/battery preconditioning, and reduced regen acceptance into cold cells. The 40% reduction is consistent with normal physical behavior, not a fault.

125. A — Coolant flowing through a battery under heavy discharge should rise in temperature between inlet and outlet as it absorbs heat. Identical inlet/outlet readings indicate no flow (failed pump), no heat transfer (air lock or sensor fault), and require diagnosis before continued operation risks thermal runaway.