

PRACTICE EXAM 16: RED SEAL 310S SIMULATION (125 QUESTIONS)

1. When using a torque wrench to tighten a critical fastener, the technician should choose:
 - A. A click-type wrench set to maximum scale for highest accuracy
 - B. A click-type or beam-type wrench rated for the target torque in the middle third of its range, since wrenches are most accurate in this range
 - C. An air impact wrench with a torque stick for fastest application
 - D. Any torque wrench available regardless of its rated range

2. To measure the inside diameter of a bored cylinder, the most accurate tool is:
 - A. A standard outside micrometer with extension arms
 - B. A digital caliper with internal jaws
 - C. A bore gauge (dial bore gauge) set against a known standard, providing readings to 0.001 mm or 0.0001"
 - D. A tape measure with millimeter graduations

3. To find the proper PPE for handling a chemical product, the technician consults:
 - A. Section 1 of the SDS (identification information)
 - B. Section 4 of the SDS (first aid measures)
 - C. Section 9 of the SDS (physical and chemical properties)

D. Section 8 of the SDS (exposure controls and personal protection)

4. When loosening a stubborn fastener with a socket, the technician should choose:

A. A 6-point socket sized exactly to the fastener, since 6-point grips the flats and avoids rounding off heads

B. A 12-point socket of the same size for better grip

C. An adjustable wrench for flexibility in sizing

D. A pair of pliers gripping the fastener flats

5. To lock out a hoist for service, the technician selects:

A. A red bandanna tied to the hoist control

B. A keyed padlock applied to the hoist's energy isolation point, with a tag identifying the technician and the date

C. Tape wrapped around the hoist control buttons

D. A handwritten note placed on the operator's desk

6. Provincial OHS regulations require a shop eye wash station to:

A. Be located within 100 m of any chemical handling area

B. Be tested annually by a certified electrician

C. Be located behind locked storage to prevent vandalism

D. Be within 10 seconds of travel from any chemical splash area, tested weekly for proper flow, and deliver tepid water (16–38°C) for at least 15 minutes

7. To measure the depth of a brake rotor's grooves and assess wear, the technician should use:

- A. A depth micrometer or dial depth gauge, taking measurements at multiple points around the rotor and recording the deepest reading
- B. A tape measure held against the rotor surface
- C. A standard outside micrometer at one point
- D. A visual estimate based on experience

8. A shop fire extinguisher should be inspected:

- A. Annually by the shop owner only
- B. Once during the extinguisher's service life
- C. Monthly for visual verification of pressure gauge, seal, accessibility, and no damage, plus annual professional inspection and recharging per fire code
- D. Only after the extinguisher is used

9. A working-alone procedure should specify:

- A. Only the technician's name
- B. Check-in interval, designated contact person, location, scope of work, expected completion time, and emergency response steps if a check-in is missed
- C. The technician's home phone number only
- D. Only the type of work being performed

10. A compression gauge for an automotive gasoline engine should have a range of:

- A. 0–300 psi, since gasoline engine compression typically falls in the 130–200 psi range and the gauge needs headroom above the highest expected reading for accuracy
- B. 0–50 psi, too small for the expected range
- C. 0–1000 psi, excessive range that reduces reading accuracy
- D. 0–25 psi, suitable only for vacuum measurement

11. A vacuum gauge measuring engine manifold vacuum reads in:

- A. PSI only across the gauge's full range
- B. Bar only as a metric unit
- C. Newtons of force exerted on the diaphragm
- D. Inches of mercury (inHg) or kilopascals (kPa), with a typical idle reading of 17–22 inHg for a healthy gasoline engine

12. A cylinder leakage tester:

- A. Measures combustion pressure during engine operation
- B. Records peak compression during cranking
- C. Applies regulated compressed air to a cylinder at TDC compression, comparing input pressure to cylinder pressure to report a leakage percentage
- D. Measures coolant pressure across the radiator

13. When verifying engine oil pressure against specification, the technician should use:

- A. The dashboard oil pressure warning light alone
- B. A mechanical oil pressure gauge installed at the oil pressure sender port, since the gauge directly reads pressure independent of the electrical sender's accuracy
- C. A digital multimeter set to volts
- D. The vehicle's scan tool reading the oil pressure sensor PID

14. A cooling system pressure tester:

- A. Measures coolant temperature during operation
- B. Records coolant flow rate through the radiator
- C. Pressurizes the cooling system to the rated cap pressure (typically 13–18 psi) and observes pressure drop or visible leaks over 5–15 minutes
- D. Measures coolant pH for chemistry verification

15. To verify ignition timing on a vehicle with mechanical distributor ignition, the technician uses:

- A. A digital multimeter set to frequency
- B. A vacuum gauge connected to the intake manifold
- C. A compression gauge installed in cylinder 1
- D. A timing light clamped on cylinder 1's plug wire and aimed at the harmonic balancer marks while the engine idles at the specified RPM

16. To identify the specific cylinder of a misfire on an OBD-II vehicle, the technician uses:

- A. An OBD-II scan tool to read the misfire monitor's per-cylinder counts and any cylinder-specific DTCs (P0301, P0302, etc.)
- B. A vacuum gauge alone to identify cylinder issues
- C. A compression tester alone for cylinder-specific data
- D. A timing light at idle for misfire identification

17. To verify the response speed of an upstream O2 sensor, the technician uses:

- A. A digital multimeter set to volts, reading the sensor at idle
- B. A timing light aimed at the harmonic balancer
- C. A digital storage oscilloscope (DSO) connected to the O2 sensor signal wire, observing the sensor's switching rate at steady cruise
- D. A pyrometer measuring exhaust temperature

18. When testing fuel pressure on a port-injection vehicle, the technician installs:

- A. A vacuum gauge at the throttle body
- B. A fuel pressure gauge at the fuel rail's service port, rated for at least 100 psi with the appropriate fittings for the system
- C. A compression gauge at the fuel rail
- D. A digital multimeter set to AC volts

19. To locate a small vacuum leak, the most efficient tool is:

- A. A vacuum gauge alone at the manifold

B. A propane bottle moved around suspect areas

C. A scan tool reading fuel trim values

D. A diagnostic smoke machine that introduces low-pressure visible smoke into the intake system, allowing the leak to be located precisely by smoke escape

20. To set valve clearance on a solid-lifter engine, the technician uses:

A. A feeler gauge of the specified clearance, inserted between the valve stem tip and the rocker arm/cam follower with the cylinder at TDC compression

B. A dial indicator on the valve face

C. A torque wrench on the rocker arm bolt

D. A compression gauge in the cylinder

21. A vacuum gauge at idle on a healthy gasoline engine typically reads:

A. 5–10 inHg, indicating poor sealing

B. 17–22 inHg, the healthy idle range for most gasoline engines at sea level (readings drop with altitude — approximately 1 inHg per 1000 ft)

C. 28–30 inHg, exceeding normal range

D. 0 inHg, indicating no vacuum present

22. When removing modern spark plugs from an aluminum head, the technician should use:

A. A standard 6-point socket of the plug's hex size

B. An impact socket of any size that fits

C. A spark plug socket (with rubber or magnetic insert to retain the plug and prevent insulator damage) sized to the plug's hex

D. A pair of pliers gripping the plug body

23. To measure engine bearing oil clearance during an engine rebuild, the technician uses:

A. Plastigauge — a calibrated plastic strip placed across the bearing journal, compressed by the assembled bearing cap, then measured against the supplied scale

B. A standard outside micrometer alone

C. A feeler gauge between the bearing and the journal

D. A torque wrench on the connecting rod cap

24. An aftermarket block heater for cold-weather starting is typically rated:

A. 50 W, too small for effective cold-weather heating

B. 2500 W, exceeding normal household circuit capacity

C. 100 W, suitable only for accessory heating

D. 400–1500 W, with the specific wattage matched to the engine displacement and the manufacturer's specification for that vehicle

25. To verify catalytic converter operating temperature, the technician uses:

A. A standard touch test on the converter body

B. A digital multimeter at the O₂ sensor connector

C. An infrared pyrometer (or contact thermocouple) reading the inlet and outlet temperatures, with a healthy converter typically showing a 25–40°C rise from inlet to outlet at operating temperature

D. A pressure gauge at the exhaust pipe

26. A typical 4-cylinder gasoline engine's compression specification might read:

A. 50 psi minimum on each cylinder with no maximum variation specified

B. 130–170 psi on each cylinder, with maximum cylinder-to-cylinder variation of 10% (or 15 psi, per manufacturer specification)

C. Over 300 psi on each cylinder during normal cranking

D. Less than 50 psi on each cylinder at operating temperature

27. To test electronic fuel injector operation off the vehicle, the technician uses:

A. A vacuum gauge connected to the injector

B. A compression tester at the injector port

C. A timing light at the injector connector

D. A noid light (or scan tool bidirectional command), then a flow tester to verify proper opening, spray pattern, and flow volume

28. A diesel particulate filter (DPF) is monitored by:

A. A differential pressure sensor measuring pressure difference between inlet and outlet of the DPF, plus temperature sensors before and after; rising differential pressure indicates soot loading

B. A vacuum gauge at the throttle body

- C. A compression gauge in the cylinder
- D. A timing light aimed at the harmonic balancer

29. To measure engine crankshaft endplay, the technician uses:

- A. A feeler gauge between the rear main bearing and the crankshaft
- B. A torque wrench on the harmonic balancer bolt
- C. A dial indicator mounted to the engine block with the plunger touching the crankshaft snout, then prying the crankshaft toward each end while reading the total travel
- D. A compression gauge in cylinder 1

30. To check whether a vehicle's catalyst monitor is approaching the DTC threshold without setting a code, the technician reads:

- A. The vehicle's freeze frame data only
- B. OBD-II Mode 06 data, which shows actual numerical test results, manufacturer-set limits, and pass/fail status for the catalyst monitor and other non-continuous monitors
- C. The vehicle's mileage and service history records
- D. The owner's manual for the maintenance schedule

31. Spark plug gap is measured with:

- A. A wire gauge (a set of round wire blades in 0.001" or 0.025 mm increments) inserted between center and ground electrodes, comparing the fit to the manufacturer-specified gap
- B. A dial indicator on the spark plug body

- C. A feeler gauge between the threads of the plug
- D. A torque wrench on the spark plug hex

32. To measure CAN bus terminating resistance, the technician uses:

- A. A digital multimeter set to AC volts
- B. An ammeter in series with the bus
- C. A scope set to peak detection
- D. A digital multimeter set to ohms, with both batteries disconnected; a healthy bus reads approximately 60 Ω measured across CAN-H and CAN-L

33. A J2534 pass-through device:

- A. Reads and clears generic DTCs only
- B. Provides a standardized interface between a PC running the manufacturer's reprogramming software and the vehicle's network, allowing technicians to perform OEM reprogramming with the correct calibration file
- C. Replaces the vehicle's gateway module during service
- D. Acts as a substitute for the vehicle's PCM during testing

34. A digital storage oscilloscope (DSO) used on a CAN bus should be set to:

- A. AC coupling with 60 Hz bandwidth limitation
- B. DC coupling with 50 Hz sweep rate

C. DC coupling with appropriate voltage scale (typically 5 V/div) and timebase (typically 10–50 μ s/div) to capture the differential signaling pattern between CAN-H and CAN-L

D. Microwave-range frequency analysis mode

35. The most reliable source for vehicle wiring diagrams is:

A. Generic aftermarket repair manuals from any publisher

B. Online enthusiast forums and shared documents

C. The manufacturer's published service information (subscription-based or dealer access), since OEM diagrams reflect the vehicle's actual harness configuration and connector pinouts

D. The original owner's manual provided to the customer

36. A TPMS activation tool:

A. Reads engine DTCs and provides bidirectional commands

B. Transmits a 125 kHz LF signal to wake each TPMS sensor, then receives the sensor's RF transmission to read its ID, pressure, and temperature for relearn procedures

C. Replaces failed TPMS sensors directly

D. Inflates tires to the placard pressure automatically

37. Compared to HS-CAN, the LIN bus operates at:

A. Higher speed and uses differential signaling

B. The same speed but uses fiber-optic cable

C. The same speed but with optical isolation

D. Much lower speed (up to 19.2 kbit/s), single-wire signaling referenced to chassis ground, used for low-bandwidth body subsystems

38. OBD-II Mode 06 is used to:

- A. Read live data PIDs for current sensor values during operation
- B. Clear stored DTCs and reset readiness monitors
- C. Review numerical test results, manufacturer-set limits, and pass/fail status for non-continuous monitors for early detection of marginal conditions before a DTC matures
- D. Reprogram modules with new calibration files

39. After replacing a BCM, the technician must use:

- A. The OEM (or J2534-compliant equivalent) scan tool with the manufacturer's reprogramming software to write the VIN and option configuration to the new module, and perform required learn procedures
- B. A generic OBD-II code reader only
- C. A multimeter set to volts at the connector
- D. A vacuum gauge at the module

40. To diagnose intermittent multi-module communication faults that may trace to a poor ground, the technician uses:

- A. A test light to verify ground continuity
- B. An ohmmeter measuring ground resistance with the system off
- C. A scan tool reading ground voltage PIDs

D. A digital multimeter set to DC volts, measuring voltage drop from each module's ground terminal to the battery negative post during normal operation; readings exceeding 0.2 V indicate excessive resistance

41. A parasitic draw test uses:

A. A test light in series with the battery

B. A current clamp meter (or DMM in series with a short jumper) measuring DC current draw on the negative battery cable after 30–60 minutes of module sleep

C. A scan tool reading the battery charge state

D. A timing light on the alternator output

42. A digital multimeter set to DC volts measuring across CAN-H and CAN-L on a healthy active bus reads approximately:

A. 2 V differential during dominant state, 0 V differential during recessive state; the DMM may average to a reading between 0.5 V and 1.5 V depending on bus activity

B. Exactly 0 V at all times

C. 12 V continuously

D. 5 V continuously

43. A frequency counter (or DMM in Hz mode) is used to:

A. Measure DC voltage at sensor connectors

B. Test resistance of heating elements

C. Measure the frequency output of sensors that produce a pulse-train signal (Hall-effect CKP, MAF, wheel speed sensors), converting frequency to engine RPM, airflow, or wheel speed

D. Measure coolant temperature directly

44. When installing a new clutch, the disc must be centered on the flywheel using:

A. Visual alignment by eye

B. A standard screwdriver inserted through the disc

C. A torque wrench on the pressure plate bolts

D. A clutch alignment tool (a plastic or metal pilot tool simulating the input shaft diameter and pilot bearing) inserted through the disc and into the pilot bearing during pressure plate installation

45. When reinstalling a two-piece driveshaft, the technician should:

A. Reinstall in any orientation to save assembly time

B. Reinstall the driveshaft sections in their original phased orientation (U-joints in the same plane) using factory match marks or measurements, to preserve correct balance and prevent vibration

C. Add weights randomly along the driveshaft

D. Replace both sections regardless of condition

46. Pinion bearing preload on a typical RWD differential is measured with:

A. A torque wrench reading the static torque to rotate the pinion

B. A feeler gauge between the pinion bearing and the housing

C. An inch-pound torque wrench measuring the rolling torque to rotate the pinion (typically 15–30 in-lb for new bearings, 5–15 in-lb for used bearings), set by the crush sleeve or pinion shim per specification

D. A dial indicator at the pinion nose

47. Ring and pinion gear backlash is measured with:

A. A dial indicator mounted to the differential housing, plunger against a ring gear tooth face, then rocking the ring gear back and forth (pinion held stationary) and reading the total travel; typical spec is 0.005–0.010" (0.13–0.25 mm)

B. A feeler gauge between gear teeth

C. A torque wrench on the carrier bearing

D. A micrometer on the ring gear

48. When inspecting a CV joint, the technician checks for:

A. Backlash with a dial indicator at the wheel

B. Inflation pressure of the boot

C. Compression of the spline at the hub

D. Boot integrity (no tears or cracks), grease leakage, abnormal play in the joint when articulating it, and audible noise during rotation under load — each indicating different failure modes

49. Transmission line pressure is measured with:

A. A vacuum gauge at the dipstick port

B. A pressure gauge rated for at least 300 psi (or the manufacturer-specified range) installed at the transmission's test port, with readings taken at specific operating conditions and compared to specification

C. A compression gauge installed where the dipstick goes

D. A multimeter set to AC volts at the test port

50. Torque converter clutch (TCC) slip is verified by:

A. A scan tool reading engine RPM and transmission input speed (or output speed adjusted for gear ratio), then calculating the difference; spec is typically less than 5% slip with TCC commanded on

B. A vacuum gauge at the torque converter

C. A pressure gauge in the torque converter

D. A timing light on the torque converter cover

51. To check ring and pinion contact pattern, the technician applies:

A. Engine oil to the gear teeth

B. Grease to the gear teeth

C. Marking compound (typically Prussian blue or manufacturer-supplied gear marking dye) to several ring gear teeth on both flanks, then rotates the ring gear under light braking load on the pinion; the pattern transferred reveals tooth contact location

D. Brake fluid to the gear teeth

52. When refilling a manual transmission, the technician must use:

A. Any gear oil viscosity available in the shop

B. Automatic transmission fluid (ATF) as a universal substitute

C. Engine oil of the same SAE grade

D. The manufacturer-specified gear oil — correct viscosity (typically SAE 75W-90 or 80W-90), correct GL rating (often GL-4 or GL-5), and correct synthetic or conventional formulation

53. To measure driveline operating angles, the technician uses:

A. A magnetic-base inclinometer (or digital angle gauge) placed on each yoke face — transmission output, driveshaft, and pinion — with the vehicle at curb weight on a level surface, then calculates the operating angle difference at each U-joint

B. A torque wrench on the pinion nut

C. A vacuum gauge at the differential

D. A multimeter set to ohms

54. AWD coupling fluid is replaced:

A. Annually regardless of mileage on the vehicle

B. At the manufacturer-specified interval (typically 50,000–80,000 km), using the specified fluid type — the fluid carries clutch material and degrades with use, and the wrong fluid type can cause coupling damage

C. Only when the AWD warning light illuminates

D. Never; AWD fluid is lifetime

55. A U-joint is properly inspected by:

A. A visual look from a distance

B. A pressure test of the bearing caps

C. A torque wrench applied to the cross

D. With the driveshaft installed, the technician applies hand pressure to twist the driveshaft against the U-joint to feel for free play, then inspects for rust streaks at the cap seals and listens for clicks during rotation under load

56. To install a new transmission rear output shaft seal without damage, the technician uses:

A. A hammer driving directly on the seal face

B. A pair of pliers grasping the seal

C. A seal driver (correct diameter for the seal) and a hammer or air hammer, driving the seal squarely into the bore until it bottoms or reaches the specified depth, with the seal lightly lubricated before installation

D. A wooden block to seat the seal

57. A hydraulic clutch system requires:

A. Engine oil as the working fluid

B. The manufacturer-specified DOT brake fluid (typically DOT 3 or 4) — clutch hydraulic systems share fluid technology with brake systems, and mineral oils destroy the rubber seals

C. Power steering fluid as the working fluid

D. Coolant from the engine cooling system

58. A hydraulic clutch system is bled by:

- A. Keeping the master cylinder reservoir full, depressing the clutch pedal slowly, opening the slave cylinder bleeder, closing the bleeder before pedal release, and repeating until clear fluid emerges with no air bubbles
- B. Pumping the clutch pedal rapidly while the bleeder is open
- C. Opening the slave cylinder bleeder while gravity-feeding fluid from above
- D. Applying compressed air to force fluid through the system

59. The CV axle nut on a FWD vehicle is torqued to:

- A. 50 Nm (35 ft-lb), typical of small fasteners
- B. 100 Nm (70 ft-lb), typical of suspension fasteners
- C. Hand-tight only, since the bearing is pre-set
- D. The manufacturer's specified torque, typically 150–300 Nm (110–220 ft-lb) plus an angle on many vehicles, securing the axle to the hub without affecting the pre-set sealed bearing

60. A worn manual transmission synchronizer ring is identified by:

- A. A scan tool reading transmission input speed
- B. A vacuum gauge at the transmission port
- C. Measuring the gap between the synchronizer ring and the gear's clutch cone with a feeler gauge — a healthy gap is typically 1.0–1.5 mm, while a worn ring reduces the gap below 0.5 mm, indicating end of service life
- D. A pressure gauge at the shift solenoid

61. When measuring the resistance of a 5–10 mΩ battery cable connection, the technician uses:

- A. A standard DMM ohm range, which cannot resolve milliohm values
- B. A 4-wire (Kelvin) milliohmmeter, or voltage drop testing during operation — voltage drop typically produces more useful diagnostic information than direct resistance measurement at these low values
- C. A vacuum gauge calibrated for resistance
- D. A timing light frequency reader

62. A battery conductance tester:

- A. Measures the battery's internal resistance and reports CCA, state of charge, and state of health by comparing measured conductance to the battery's rated CCA; conductance correlates to available capacity
- B. Measures battery temperature only
- C. Charges the battery while testing
- D. Reports the battery's manufacturing date code

63. To verify alternator output under load, the technician uses:

- A. A vacuum gauge at the alternator pulley
- B. A timing light on the alternator B+ terminal
- C. A compression gauge at the field winding
- D. A clamp-on DC current meter on the alternator output cable plus a DMM at the battery, with engine at 1500–2000 RPM and electrical load applied; rated amperage and 13.8–14.6 V confirms healthy charging

64. To detect a failed alternator diode, the technician uses:

- A. A DMM set to DC volts at the battery posts
- B. A vacuum gauge at the alternator
- C. A digital storage oscilloscope (DSO) or DMM set to AC volts at the alternator output, looking for ripple voltage exceeding 0.5 V peak-to-peak or significant missing humps in the scope pattern
- D. A compression gauge at the alternator

65. Starter current draw is measured with:

- A. A DMM in series with the starter cable
- B. A clamp-on DC current meter around the starter's positive cable during cranking; spec is typically 150–250 A running current for most automotive starters
- C. A vacuum gauge at the starter
- D. A timing light on the starter motor

66. A voltage drop test on the positive starter cable during cranking is performed with:

- A. A DMM set to DC volts, with leads on the battery positive post and the starter input terminal while the engine cranks; readings exceeding 0.5 V indicate excessive resistance in the cable or connections
- B. An ohmmeter with the system off
- C. A test light only
- D. A scan tool reading battery PIDs

67. To verify headlamp aim, the technician uses:

- A. A measuring tape at the headlamp

B. A scope on the headlamp connector

C. A headlamp aim alignment kit (mechanical optical or electronic), measured at the manufacturer-specified distance (typically 7.6 m / 25 ft) from a vertical aiming target, with the vehicle at curb weight on a level surface

D. A timing light on the headlamp bulb

68. A/C system pressures are measured with:

A. A vacuum gauge alone

B. A DMM set to volts at the service ports

C. A pyrometer at the compressor

D. A manifold gauge set (low-side blue, high-side red) connected to the system's service ports, with low side typically reading 30–50 psi and high side 200–300 psi at idle on an ambient day

69. Before recovery service, a technician verifies the type and purity of refrigerant in an A/C system using:

A. A vacuum gauge alone at the service port

B. A refrigerant identifier — an electronic instrument that samples the refrigerant and reports its composition; identifying contaminated refrigerant prevents recovery machine damage and ensures proper handling

C. A timing light at the compressor

D. A compression gauge at the service port

70. To locate small refrigerant leaks, the most sensitive tool is:

A. An electronic refrigerant leak detector (with sensitivity typically 5 g/year or better), waved slowly around suspect components, plus UV dye introduced to the system and observed with a UV light to identify the leak point precisely

B. A vacuum gauge alone

C. A standard household flashlight

D. A pressure gauge at the service port

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

A. 100% (fully charged)

B. 0% (fully discharged)

C. About 25–30%

D. About 75% — 12.6 V is 100%, 12.4 V is approximately 75%, 12.2 V is approximately 50%, 12.0 V is approximately 25% SoC

72. An AGM battery requires charging at:

A. 18 V continuous for fast charging

B. Standard flooded-battery voltage of 13.8 V

C. AGM-specific voltage (typically 14.4–14.8 V absorption, with temperature compensation and an AGM-aware charger); the standard flooded-battery profile causes overcharging and AGM damage

D. 12 V continuous

73. An Intelligent Battery Sensor (IBS) on the negative battery terminal:

- A. Measures current (through a precision shunt), voltage, and temperature, reporting via LIN or CAN to the BCM/PCM; the host module uses this data to calculate state of charge and state of health, adjust charging voltage, and authorize stop-start
- B. Provides additional battery capacity through a built-in cell
- C. Functions only as a secondary ground point
- D. Disconnects the battery during long parking periods

74. A cabin air filter is typically located:

- A. Inside the engine air intake duct
- B. Behind the glove box (or in a similar HVAC case location accessible from inside the cabin), with airflow direction marked on the filter frame for correct installation orientation
- C. Under the vehicle near the front bumper
- D. Inside the trunk near the spare tire

75. A blower motor that operates only at high speed typically has:

- A. A failed blower motor itself
- B. A failed cabin temperature sensor
- C. A failed evaporator core
- D. A failed blower motor resistor (or PWM blower module) — the resistor steps down voltage for lower speeds, but the high-speed connection bypasses the resistor and connects directly to battery voltage

76. A vehicle delivers only cool air on MAX HEAT command. Scan tool shows the blend door actuator commanded full hot and actual position 100% hot. The likely cause is:

- A. A failed blend door actuator with internal gear damage
- B. A failed cabin temperature sensor
- C. Low engine coolant level, a restricted heater core, a stuck heater control valve, or a failed water pump — all preventing hot coolant from reaching the heater core despite correct blend door position
- D. A failed compressor clutch coil

77. A halogen headlamp bulb's typical operating filament temperature is:

- A. About 100°C, slightly above ambient
- B. About 3000°C — the tungsten filament glows white-hot, and skin oils on the glass envelope cause hot spots and premature failure; clean handling with gloves is essential
- C. Below freezing temperature
- D. The same as ambient air temperature

78. Installing HID/LED bulbs in a halogen headlamp housing typically:

- A. Produces poorly-controlled beam patterns that scatter light, create glare for oncoming traffic, and may not be road-legal in many jurisdictions; the proper alternative is OEM-spec halogen replacements or an OEM HID/LED retrofit assembly
- B. Always improves visibility significantly with no trade-off
- C. Is universally road-legal in all jurisdictions
- D. Reduces battery load on the vehicle

79. When installing wiper arms after motor replacement, the technician must:

- A. Install the arms at any visible position
- B. Use a torque wrench at maximum setting on the arm nuts
- C. Apply lubricant under the arm splines
- D. Position the wiper motor at its park position, then install the wiper arms with their blades at the manufacturer-specified park location (typically just above the lower edge of the windshield)

80. A broken rear defroster grid line is repaired with:

- A. Regular household spray paint applied across the break
- B. Aluminum foil tape over the break
- C. Conductive paint (formulated for defroster repair) applied across the break after surface preparation and masking, allowed to cure per the manufacturer's specification before testing
- D. Solder applied directly to the glass surface

81. After replacing a power window motor, the technician must:

- A. Perform the window initialization procedure (window fully down with switch held, then fully up with switch held, then ignition cycle) so the BCM learns the new motor's normal current and travel range, restoring auto-up and pinch protection
- B. Disconnect the battery for 30 minutes only
- C. Drive the vehicle for 100 km for automatic relearning
- D. Replace both door window motors at once

82. A heated seat element is tested by measuring:

- A. The element's voltage drop with the system off
- B. The element's resistance (typically 1–5 Ω for a healthy element) with the harness disconnected and a DMM in ohms; an open reading indicates a broken element wire and requires cushion replacement
- C. The element's temperature with a contact thermometer
- D. The element's current draw with the system off

83. A clock spring assembly:

- A. Provides additional storage for the airbag inflator
- B. Adjusts the steering angle electronically for ESC
- C. Stores energy for the airbag deployment
- D. Routes electrical signals (horn, airbag, cruise control, steering wheel controls) across the rotating steering wheel via a flat ribbon cable, allowing continuous electrical connection while the steering wheel rotates

84. Brake fluid moisture content is measured with:

- A. A pH strip dipped in the fluid
- B. A vacuum gauge at the master cylinder
- C. An electronic brake fluid moisture tester that uses conductivity or capacitance sensing; readings of 3% or more typically indicate the need for fluid replacement to maintain proper boiling point
- D. A timing light on the brake hose

85. Brake rotor thickness is measured at multiple points with:

A. A brake rotor micrometer (a specialized outside micrometer with thin anvils that fit between the rotor's friction surfaces), comparing the thinnest reading to the manufacturer's minimum thickness specification stamped on the rotor or published in service information

B. A standard caliper at one point

C. A feeler gauge in the rotor groove

D. A tape measure across the rotor diameter

86. Brake rotor lateral runout is measured with:

A. A standard outside micrometer at one point

B. A dial indicator with its base mounted to the steering knuckle or hub, plunger against the rotor's friction surface; the rotor is rotated by hand and the total deviation is read, with spec typically less than 0.05–0.08 mm (50–80 microns)

C. A feeler gauge between rotor and caliper

D. A vacuum gauge at the wheel cylinder

87. An active (Hall-effect or magnetoresistive) wheel speed sensor at very low vehicle speed shows on a scope:

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 speed

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, enabling detection down to very low speeds

D. A flat DC voltage that varies with wheel speed

88. Tire tread depth is measured with:

- A. A standard ruler held against the tread
- B. A vacuum gauge applied to the tread surface
- C. A torque wrench reading at the tire valve
- D. A tread depth gauge inserted into the tread groove, reading in 1/32" or millimeters; legal minimum is typically 2/32" (1.6 mm), with replacement recommended at 4/32" (3.2 mm) for wet-weather safety

89. A quality tire pressure gauge:

- A. Has accuracy of ± 1 psi (or $\pm 2\%$) across its working range, is verified periodically against a reference standard, and is the technician's primary instrument for setting cold tire pressure to placard
- B. Has accuracy of ± 25 psi for general use
- C. Should display pressure only above 60 psi
- D. Functions only with cold tires

90. Wheel lug nuts are tightened with:

- A. An air impact wrench at maximum setting
- B. A calibrated torque wrench in a star pattern to the manufacturer's specified torque, after hand-threading each lug nut to verify the threads engage cleanly
- C. A standard combination wrench at maximum hand force
- D. A pry bar inserted in the lug nut

91. A wheel alignment is performed against:

- A. The technician's preference for handling

- B. A generic alignment specification that applies to all vehicles
- C. The customer's described preference
- D. The vehicle manufacturer's published alignment specification (camber, caster, toe, thrust angle), referenced to the specific make, model, and year — typically through the alignment machine's database or OEM service information

92. Power steering pump pressure is tested with:

- A. A vacuum gauge at the return line
- B. A DMM set to volts at the pump
- C. A power steering pressure tester (gauge rated for at least 2000 psi, with shutoff valve for dead-head testing) installed in the high-pressure line, then operating the system at idle and at higher RPM with the steering at lock-to-lock to read the pump's maximum output
- D. A timing light on the pump pulley

93. A Steering Angle Sensor (SAS) is calibrated with:

- A. A scan tool, with the wheels straight ahead and the ignition cycled per the manufacturer's procedure; the calibration sets the sensor's reference to match the "wheels straight" condition for ESC, ABS, EPS, and ADAS systems
- B. A DMM set to ohms at the SAS connector
- C. A vacuum gauge at the steering column
- D. A torque wrench on the steering wheel hub

94. When servicing rear brakes on a vehicle with an Electronic Parking Brake (EPB), the technician must:

- A. Pump the brake pedal 50 times to retract the piston
- B. Use the scan tool to activate EPB service mode, which retracts the EPB motor's spindle and allows the piston to be safely retracted; after installation, restore EPB to normal mode and perform any required bedding/calibration
- C. Disconnect the battery for 30 minutes only
- D. Apply a torch to the EPB caliper to free the mechanism

95. A diagonal-split brake system is typically bled in the sequence:

- A. Front first, then rear, working clockwise around the vehicle
- B. Random order; sequence does not matter
- C. All four wheels simultaneously
- D. Right rear, left front, left rear, right front (bleeding the longest line on each circuit first), with the master cylinder reservoir kept full throughout

96. A load-bearing lower ball joint on a SLA suspension (spring on lower arm) is inspected by:

- A. Placing a jack under the lower control arm to support the suspension at ride height (unloading the joint from the spring's compression force), then checking for vertical play with a pry bar between the steering knuckle and control arm
- B. Lifting the vehicle by the frame and inspecting with the suspension hanging
- C. Driving the vehicle on a dynamometer
- D. Removing the joint completely and inspecting on the bench

97. Dynamic wheel balance corrects:

- A. Only up-and-down (vertical) imbalance
- B. Only side-to-side (couple) imbalance
- C. Both static (vertical) and couple (side-to-side) imbalance; modern wheel balancers spin the wheel to detect both and direct the technician to apply correction weights at specific locations
- D. Only the radial runout of the tire

98. A wheel bearing's condition is evaluated by:

- A. A scan tool reading the wheel speed sensor PID
- B. Listening for noise during cornering (an outside-loaded bearing produces louder noise when loaded by weight transfer), feeling for roughness when spinning the wheel by hand with the brake released, and observing for visible play with the wheel raised
- C. A timing light on the wheel bearing
- D. A compression gauge at the hub

99. When replacing a failed strut, the technician should:

- A. Replace only the failed strut alone
- B. Replace all four struts together regardless of condition
- C. Replace the strut and add a steering damper
- D. Replace struts in axle pairs (both front or both rear together) to maintain matched damping; one new strut paired with one worn strut causes uneven handling and accelerates wear of the newer component

100. A tire sidewall reading "P225/65R17 102H" identifies the load index 102 as:

- A. A coded value corresponding to a maximum load capacity of 850 kg per tire, looked up against a published load index table — the index is a coded number, not a direct measurement
- B. A direct measurement of tire pressure in psi
- C. The tire's aspect ratio in percentage
- D. The DOT compliance code number

101. A tire's DOT date code "2722" indicates:

- A. The tire's load rating
- B. The tire's section width in millimeters
- C. The tire was manufactured in week 27 of 2022, with typical service life of 6–10 years regardless of tread depth — rubber hardens and cracks over time, reducing wet grip and increasing failure risk
- D. The tire's speed rating

102. Vehicle alignment thrust angle is:

- A. The angle of the steering wheel column from vertical
- B. The angle between the vehicle's geometric centerline and the rear axle's thrust line; a non-zero thrust angle causes the vehicle to "dog-track" and is corrected during a 4-wheel alignment by adjusting rear toe
- C. The angle of the steering knuckle in turns
- D. The angle of the tire's contact patch

103. A collapsed brake hose with an internal one-way flap produces:

- A. Reduced brake pedal travel

B. Increased brake fluid level

C. Loss of all brake function on the affected circuit

D. Brake drag on one wheel only — pressure passes from the master cylinder to the caliper, but the deteriorated rubber lining prevents pressure release; the caliper stays applied until the system cools

104. A new master cylinder requires:

A. Bench bleeding before installation — filling the reservoir, using short plastic lines to recirculate fluid back into the reservoir from each outlet, and stroking the pushrod until no air bubbles emerge

B. Installation without any preparation

C. Soaking in hot water before installation

D. Application of grease to the pushrod tip only

105. New brake pads typically require:

A. No bedding procedure; pads function immediately at full performance

B. Aggressive emergency braking to seat the pads

C. A bedding procedure (typically 5–10 moderate stops from 50–80 km/h with brief cool-down periods, then 1–2 firm stops from higher speed), allowing the pads' friction surface to seat properly to the rotor and develop optimal friction characteristics

D. 1000 km of normal driving before any braking

106. A direct TPMS sensor is installed in the wheel with:

A. The valve stem nut torqued to maximum setting

B. A torque wrench at the manufacturer-specified torque (typically 4–8 Nm / 35–70 in-lb for the sensor body or valve stem nut) — over-tightening cracks the sensor body, under-tightening allows air leaks at the valve seal

C. The fingers only, since the sensor body is fragile

D. An impact wrench at maximum setting

107. Before working on the SRS system, the technician must:

A. Disable the dashboard warning light by removing the bulb

B. Apply battery power to the airbag connector to verify operation

C. Drain the brake fluid before any SRS-related work

D. Disconnect the negative battery cable and wait the manufacturer-specified time (typically 1–10 minutes) for the SRS module's reserve capacitor to discharge before disconnecting any airbag harness connectors

108. A deployed seat belt pretensioner:

A. Must be replaced as a complete seat belt assembly, since the pretensioner is a single-use pyrotechnic device that cannot be reset or refurbished — reuse risks failure to deploy in a subsequent crash or premature deployment during service

B. Can be reset using a scan tool procedure

C. Can be field-rebuilt by replacing the gas generator

D. Operates safely without replacement after deployment

109. Seat belt webbing with visible damage (cuts, burns, fraying, melted fibers) requires:

- A. Trimming the damaged area and continuing to use the belt
- B. Replacement of the entire seat belt assembly, since damaged webbing may fail under crash load and seat belt assemblies are non-repairable single units — replacement is the only safe option
- C. Application of fabric repair tape
- D. Disconnection of the seat belt and operation without it

110. When installing a new clock spring assembly, the technician must:

- A. Disconnect the locking pin immediately before installation
- B. Rotate the clock spring lock-to-lock several times before installation
- C. Verify the new clock spring is centered as shipped (typically with a locking pin or alignment mark), confirm the steering wheel is at straight-ahead before installation, and remove the locking pin only after the clock spring is installed and the steering wheel reattached
- D. Apply lubricant to the clock spring ribbon cable

111. During collision repair verification, the body's structural integrity is confirmed by:

- A. Visual inspection of body panels only
- B. Driving the vehicle to test for steering pull
- C. Resetting the SRS module's deployment record
- D. Measuring at manufacturer-designated control points (specific holes, bolts, or surfaces with published dimensional specifications) using a tram gauge, laser system, or similar tool, comparing measured dimensions to OEM specification

112. When a sunroof-equipped vehicle has water ingress in the cabin, the most common cause is:

- A. Blocked sunroof drain tubes — debris (leaves, dirt, insect debris) accumulates in the tubes that route water from sunroof corners through the A-pillars to outlets behind the front fenders; cleaning the blocked tubes restores function inexpensively
- B. A failed sunroof seal requiring complete sunroof replacement
- C. A failed windshield seal allowing water entry
- D. Condensation from the HVAC system that cannot be addressed

113. A power mirror assembly with integrated functions (memory positions, blind spot indicator, auto-dim, heating) requires after replacement:

- A. Disconnection of the battery for 30 minutes
- B. Configuration through the scan tool to program memory positions, learn blind spot detection zones, enable tilt-down-on-reverse, and verify all integrated functions operate per the manufacturer's procedure
- C. Visual confirmation of operation only
- D. Driving 100 km for self-calibration

114. When using panel bonding adhesive for body panel replacement, the technician must:

- A. Apply household epoxy adhesive in any thickness
- B. Skip the bonding step and use only mechanical fasteners
- C. Use the manufacturer-recommended panel bonding adhesive (formulated for automotive structural bonding), prepare both surfaces per technical instructions, mix the components in the specified ratio and pot life, apply the specified bead pattern, and clamp for the full cure period
- D. Replace the panel with a non-bonded section

115. After a frontal collision repair, front impact crash sensors require:

- A. No inspection; sensors are not affected by collisions
- B. Replacement of all crash sensors regardless of inspection findings
- C. Disconnection of the sensor harness permanently
- D. Inspection for physical damage, verification of mounting bolt torque (sensors are orientation-sensitive), confirmation that connectors are fully seated and harness is undamaged, with codes cleared only after the SRS module reports all sensors operational

116. After replacing a power window regulator, the technician must perform:

- A. The window initialization procedure (window fully down with switch held, then fully up with switch held, then ignition cycle) so the BCM learns the new regulator's travel range and pinch protection thresholds, restoring auto-up function
- B. Disconnection of the battery for 60 minutes
- C. Replacement of the BCM as well to ensure compatibility
- D. Driving the vehicle for 100 km before testing

117. Class 0 (1000 V) HV insulating gloves must be inspected before each use by:

- A. Stretching the gloves to maximum extension
- B. Visually inspecting for cracks, tears, contamination, then performing the roll-and-trap air test (rolling the gauntlet cuff toward the fingers to trap and pressurize air inside, holding the inflated glove near the ear and face to detect air leaks); discarding the gloves if any defect is found
- C. Applying water to the gloves to test for absorption
- D. Testing the gloves with a DMM set to ohms

118. To de-energize a hybrid HV system before service, the proper sequence is:

- A. Disconnect the 12 V battery only
- B. Remove the manual service disconnect (MSD) and begin work immediately
- C. Turn the vehicle OFF and remove the key/fob, wait for HV power-down, remove the MSD, wait the manufacturer-specified discharge time for the inverter DC bus capacitors to bleed, and verify the absence of voltage at specified test points using a Cat III/IV-rated multimeter
- D. Drive the vehicle until the HV battery is empty

119. When verifying voltage absence on a hybrid/EV HV system, the multimeter must be:

- A. A standard household DMM rated for 120 V AC
- B. A test light rated for 12 V DC
- C. A continuity tester rated for low voltage
- D. A Cat III/IV-rated digital multimeter with the appropriate voltage rating for the system being tested (typically 600 V or 1000 V), since lower-rated meters can fail catastrophically when exposed to HV transients

120. High-voltage cables on hybrid and EV vehicles are universally colored:

- A. Orange, providing a universal visual warning of high voltage that technicians and first responders worldwide recognize as requiring HV-safe handling
- B. Red, indicating positive supply
- C. Black, matching chassis ground
- D. Green, indicating ground reference

121. A scan tool reads HV battery cell module voltages on a hybrid. A healthy pack typically shows:

- A. Significant variation (more than 1 V) between cell modules
- B. Tight uniformity between cell modules (typically within 50–100 mV of each other), at the cell chemistry's nominal voltage; significant variation indicates imbalance, cell failure, or BMS sense issues
- C. Zero voltage on all cell modules
- D. Voltage equal to the 12 V auxiliary battery

122. After replacing an HV cable, the technician verifies insulation integrity with:

- A. A test light at the cable terminals
- B. A standard DMM in continuity mode
- C. A visual inspection only
- D. A high-voltage insulation tester (megger) at the manufacturer-specified test voltage (typically 500 V or 1000 V DC), measuring insulation resistance between each conductor and ground, and between conductors; a healthy HV cable reads more than 100 M Ω

123. An EV in North America using a Combined Charging System (CCS-1) connector receives:

- A. AC charging only on all connector pins
- B. DC fast charging only on all connector pins
- C. AC charging on the standard J1772 portion (top of the connector) and DC fast charging through two additional pins below it; a single port supports both Level 1/Level 2 AC and DC fast charging
- D. Only Tesla proprietary charging

124. During EV deceleration with the accelerator released, the traction motor:

- A. Operates as a generator (regenerative braking), with vehicle kinetic energy spinning the motor to produce electrical energy that flows back into the HV battery; friction brakes engage only when more deceleration is needed than regen can supply, with brake-by-wire blending the two transparently
- B. Operates as a motor pushing the vehicle forward
- C. Disengages mechanically from the wheels
- D. Reverses direction to slow the vehicle

125. Before any HV contact during service, the technician must verify voltage absence by:

- A. Touching the HV component with bare hands to feel for current
- B. Measuring with a Cat III/IV-rated DMM at the manufacturer's specified test points after de-energization (key off, MSD removed, capacitor discharge wait time observed); the meter must read essentially zero before any HV contact is permitted
- C. Using a 12 V test light at the HV cable
- D. Looking for visible sparks at the HV connectors

Practice Exam 16: Answer Key and Explanations

1. B — Torque wrenches are most accurate in the middle third of their range; readings near the bottom or top of the scale introduce significant error. Selecting a wrench whose range places the target torque in the middle of its scale provides the highest accuracy for critical fasteners that depend on precise clamp load.
2. C — A bore gauge measures inside diameters to 0.001 mm or 0.0001" when calibrated against a known standard, providing the precision required for cylinder, bearing, or pin-bore measurements. Outside micrometers cannot reach internal surfaces, and calipers lack the precision and contact accuracy needed for engine-machining work.
3. D — Section 8 of the SDS lists exposure controls and required personal protective equipment for handling the chemical. The 16-section SDS format is standardized under WHMIS 2015/GHS, with each section assigned to specific hazard information; PPE selection comes from Section 8 specifically.

4. A — A 6-point socket grips the fastener's flats rather than the corners, distributing force across the full flat surface and resisting rounding. A 12-point socket contacts only at the corners, concentrating force where the metal is weakest — the wrong choice for stubborn or rusted fasteners.
5. B — Lockout/tagout regulations require a keyed padlock (under the technician's exclusive control) at the energy isolation point with a tag identifying the technician and date. The lock prevents others from energizing the equipment, and the tag identifies who applied the lockout — both elements are required by OHS regulations.
6. D — Provincial OHS regulations specify all four requirements: 10-second travel distance, weekly flow testing, tepid water (16–38°C), and 15-minute minimum flow. These criteria together ensure the eye wash is immediately accessible and delivers proper flushing during an actual exposure event.
7. A — A depth micrometer or dial depth gauge measures rotor groove depth precisely at multiple points; the deepest reading determines whether the rotor exceeds the manufacturer's maximum groove specification. Visual estimation and tape measures cannot resolve the small dimensional differences that govern rotor service decisions.
8. C — Fire code requires monthly visual inspection (pressure gauge, seal, accessibility, damage) plus annual professional inspection and recharging. Monthly visual checks catch obvious issues, while annual professional service verifies the extinguisher's actual readiness — both are required for code compliance.
9. B — A working-alone procedure must specify all elements that enable timely emergency response: check-in interval, contact person, location, scope, expected completion, and missed-check-in response. Any element missing creates a gap that could delay help if the technician is injured or incapacitated.
10. A — A gauge range of 0–300 psi covers the typical gasoline engine compression range (130–200 psi) with adequate headroom above the highest expected reading for accurate display. Gauges are most accurate in the middle of their range, so 0–300 psi places typical readings in the gauge's optimal zone.
11. D — Manifold vacuum gauges read in inches of mercury (inHg) or kilopascals (kPa), with healthy idle vacuum at 17–22 inHg at sea level. The reading drops approximately 1 inHg per 1000 ft of altitude, which the technician compensates for when interpreting readings at elevation.

12. C — A cylinder leakage tester applies regulated compressed air to a cylinder at TDC compression and compares input pressure to cylinder pressure to report leakage as a percentage. The test isolates where compression is escaping (rings, valves, head gasket) through audible leak location at the intake, exhaust, oil filler, or adjacent cylinder.

13. B — A mechanical oil pressure gauge installed at the sender port directly reads oil pressure independent of the dashboard sender or scan tool PID, both of which can give inaccurate readings if the sender or its circuit has failed. The mechanical gauge provides the reference reading for diagnostic decisions.

14. C — A cooling system pressure tester pressurizes the cooling system to the rated cap pressure (typically 13–18 psi) and observes pressure drop or visible leaks over a 5–15 minute period. Internal leaks, external leaks, and head gasket failures all become detectable through this pressurization test.

15. D — A timing light clamped on cylinder 1's plug wire flashes at each ignition event; aiming the light at the harmonic balancer timing marks while the engine idles at specified RPM shows the timing position. Adjustable timing lights have advance/retard features to measure spark advance values directly.

16. A — An OBD-II scan tool reads the misfire monitor's per-cylinder counts and any cylinder-specific DTCs (P0301, P0302, etc.) to identify which cylinders are misfiring. The monitor counts rough running events at each cylinder firing position, making cylinder identification straightforward.

17. C — A digital storage oscilloscope captures the O₂ sensor's actual switching pattern, allowing the technician to count crossings of the 0.45 V reference voltage in a given time window. A healthy upstream sensor at steady cruise crosses at least 4–6 times in 10 seconds, while a slow sensor shows fewer crossings or rounded waveforms.

18. B — A fuel pressure gauge at the fuel rail's service port reads actual rail pressure during cranking, idle, and load conditions. The gauge must be rated for at least 100 psi and use the appropriate fittings; readings are compared to specification to identify pump, regulator, filter, or injector issues.

19. D — A diagnostic smoke machine introduces low-pressure visible smoke into the intake system; the smoke escapes through any leak, making the leak's location visible. The test resolves leaks that vacuum gauge and fuel trim readings can only confirm exist, but cannot locate precisely.

20. A — A feeler gauge of the specified clearance, inserted between the valve stem tip and the rocker arm/cam follower with the cylinder at TDC compression, is the standard tool for setting valve clearance on solid-lifter engines. The correct blade should slide in with a slight drag, indicating the specified clearance is present.

21. B — A healthy idle vacuum at sea level reads 17–22 inHg, dropping approximately 1 inHg per 1000 ft of altitude. Lower readings indicate engine issues (vacuum leaks, late ignition timing, low compression, exhaust restriction); altitude must always be factored in when interpreting vacuum readings.

22. C — A spark plug socket includes a rubber or magnetic insert that retains the plug during removal and installation, preventing damage to the ceramic insulator and aluminum head. The socket's sizing matches the plug's hex; standard sockets without the retaining feature can drop or damage the plug.

23. A — Plastigauge is a calibrated plastic strip placed across the bearing journal, compressed by the assembled bearing cap torqued to spec, then removed and measured against the supplied scale. The width of the compressed strip indicates clearance in 0.001"/0.025 mm increments, comparing directly to the manufacturer's specification.

24. D — Block heaters range from 400–1500 W, with the specific wattage matched to engine displacement and the manufacturer's recommendation. Too small produces insufficient heating; too large can overheat the coolant locally; the manufacturer's specification matches the heater's output to the engine's thermal mass.

25. C — An infrared pyrometer or contact thermocouple reads the inlet and outlet temperatures of the catalyst, with a healthy converter showing a 25–40°C rise from inlet to outlet at operating temperature. The temperature rise indicates that exothermic catalytic conversion is occurring; a converter that produces no temperature rise has failed.

26. B — A typical 4-cylinder gasoline engine compresses to 130–170 psi per cylinder, with maximum cylinder-to-cylinder variation of 10% (or 15 psi, depending on the manufacturer). Variation beyond spec indicates relative cylinder issues even when absolute pressures are within range.

27. D — Off-vehicle injector testing uses a noid light (or scan tool bidirectional command) to verify proper electrical pulse, then a flow tester to verify opening, spray pattern, and flow volume. The two tests together confirm both electrical and mechanical injector function before installation.

28. A — A differential pressure sensor measures the pressure difference between DPF inlet and outlet, with temperature sensors before and after monitoring catalyst operating range. Rising differential pressure indicates accumulated soot loading, triggering active regeneration when conditions allow.

29. C — A dial indicator mounted to the engine block with the plunger touching the crankshaft snout or harmonic balancer face measures crankshaft endplay precisely. Prying the crankshaft toward each end and reading the total travel gives the endplay value, compared against the manufacturer's specification (typically 0.05–0.30 mm).

30. B — OBD-II Mode 06 shows actual numerical test results, manufacturer-set limits, and pass/fail status for non-continuous monitors (catalyst, EVAP, O₂ sensors). The technician can identify marginal conditions approaching DTC thresholds before a code matures, enabling preventive intervention.

31. A — Spark plug gap is measured with a wire gauge — round wire blades in 0.001" or 0.025 mm increments — inserted between the center and ground electrodes. The blade matching the specified gap should slide through with a slight drag; flat feeler gauges can give misleading readings on rounded electrode surfaces.

32. D — With both batteries disconnected, a DMM in ohms across CAN-H and CAN-L reads approximately 60 Ω on a healthy bus, indicating two parallel 120 Ω terminators. Other readings (40 Ω , 120 Ω , or open) indicate broken bus wiring, missing terminators, or shorts, directing further diagnosis.

33. B — A J2534 pass-through device provides the standardized interface between a PC running the manufacturer's reprogramming software and the vehicle's network. The device allows independent shops to perform OEM reprogramming using the correct calibration file from the manufacturer, without dealer-only proprietary tools.

34. C — DC coupling with 5 V/div voltage scale and 10–50 μ s/div timebase captures the differential CAN signaling pattern between CAN-H and CAN-L. Both wires show inverted patterns relative to the 2.5 V reference (or chassis ground depending on the scope setup); proper scale and timebase resolve the bus traffic.

35. C — The manufacturer's published service information reflects the vehicle's actual harness configuration, connector pinouts, and wire colors. Aftermarket manuals and online forums can contain errors or apply to different model variants; OEM diagrams (via subscription or dealer access) are the authoritative source.

36. B — A TPMS activation tool transmits a 125 kHz LF signal to wake each TPMS sensor in turn, then receives the sensor's RF transmission (315 MHz or 433 MHz depending on region) to read its ID, pressure, and temperature. The data enables relearn procedures and sensor verification.

37. D — LIN operates at up to 19.2 kbit/s — much slower than HS-CAN — using single-wire signaling referenced to chassis ground. It's designed for low-bandwidth body subsystems (window switches, mirror motors, seat memory) where high-speed CAN would be over-specified and unnecessarily expensive.

38. C — Mode 06 shows numerical test results, manufacturer-set limits, and pass/fail status for non-continuous monitors, enabling early detection of marginal conditions before a DTC matures. Mode 06 is most useful for verifying repairs and identifying components trending toward failure.

39. A — A new BCM requires programming with the VIN, option configuration, and any required learn procedures before it will function correctly. The OEM scan tool (or J2534-compliant equivalent) running manufacturer reprogramming software is the required tool; generic code readers cannot perform this configuration.

40. D — A DMM set to DC volts measuring voltage drop from each module's ground terminal to battery negative during operation reveals ground resistance issues. Readings exceeding 0.2 V indicate corrosion, poor connections, or undersized ground paths that cause intermittent communication faults.

41. B — A clamp-on current meter (or DMM in series with a short jumper) measures DC current draw on the negative battery cable after 30–60 minutes of module sleep. Spec is typically less than 80 mA; higher current indicates a module not entering sleep or a parasitic load that must be isolated.

42. A — A healthy active CAN bus shows 2 V differential during dominant state and 0 V differential during recessive state. A DMM averages these states across bus traffic, producing readings between 0.5 V and 1.5 V depending on activity; the scope provides the detailed picture, while the DMM gives a quick sanity check.

43. C — Sensors that produce a pulse-train signal (Hall-effect CKP/CMP, MAF, wheel speed) output a frequency proportional to the physical parameter being measured. A frequency counter or DMM in Hz mode converts frequency to engine RPM, airflow rate, or wheel speed using the sensor's published conversion factor.

44. D — A clutch alignment tool simulates the input shaft diameter and pilot bearing, centering the disc precisely during pressure plate installation. Without alignment, the disc cannot be installed because the transmission input shaft will not enter the misaligned disc splines; eye alignment cannot achieve the required precision.

45. B — Two-piece driveshafts are phased at the factory with U-joints in the same plane to cancel operating angles; reinstalling in any other phase creates uncorrected vibration. Factory match marks or measurements identify the original orientation, which must be preserved during reassembly.

46. C — An inch-pound torque wrench measures the rolling torque required to rotate the pinion: 15–30 in-lb for new bearings, 5–15 in-lb for used bearings (manufacturer specification). The crush sleeve or pinion shim sets preload; readings outside spec indicate the preload requires adjustment.

47. A — A dial indicator mounted to the differential housing with the plunger against a ring gear tooth face, then rocking the ring gear back and forth with the pinion held stationary, reads the total travel. Typical spec is 0.005–0.010" (0.13–0.25 mm); readings outside spec require carrier shim adjustment.

48. D — CV joint inspection covers all four indicators: boot integrity, grease leakage, abnormal joint play, and audible noise under load. Each indicates a different failure mode (boot tear leading to contamination, advancing joint wear, or imminent failure); complete inspection catches early failures while still field-serviceable.

49. B — Transmission line pressure is measured with a pressure gauge rated for at least 300 psi (or manufacturer-specified range), installed at the transmission's test port. Readings at idle, stall, and various drive conditions identify pump output issues, regulator problems, or internal leakage.

50. A — TCC slip is calculated from scan tool data — engine RPM minus transmission input speed (or output speed adjusted for gear ratio). Spec is typically less than 5% slip with TCC commanded on; higher values indicate worn TCC friction or hydraulic apply circuit issues.

51. C — Marking compound (typically Prussian blue or manufacturer-supplied dye) applied to ring gear teeth on both flanks, then rotated under light braking on the pinion, reveals the contact pattern transferred to the painted teeth. Pattern location identifies whether pinion depth or backlash requires adjustment.

52. D — Manual transmissions require the manufacturer-specified gear oil with the correct viscosity, GL rating, and synthetic or conventional formulation. Substituting wrong fluid (engine oil, ATF, wrong GL grade) causes accelerated wear of synchronizers, gears, and bearings; the specification is matched to the transmission's materials.

53. A — A magnetic-base inclinometer (or digital angle gauge) placed on each yoke face — transmission output, driveshaft, and pinion — measures the operating angles with the vehicle at curb weight on a level surface. Operating angle differences at each U-joint should be within the manufacturer's specification to avoid vibration.

54. B — AWD coupling fluid is replaced at the manufacturer-specified interval (typically 50,000–80,000 km) with the specified fluid type. The fluid carries clutch material from the coupling clutches and degrades with use; wrong fluid type causes coupling damage or premature failure.

55. D — U-joint inspection covers hand-applied free play (twisting the driveshaft against the joint), rust streaks at the cap seals (indicating internal wear and lubricant loss), and listening for clicks during rotation under load. Each indicator catches a different failure stage from early wear to imminent failure.

56. C — A seal driver of the correct diameter for the seal, driven by hammer or air hammer, installs the new seal squarely into the bore until it bottoms or reaches the specified depth. The seal is lightly lubricated before installation; driving directly with a hammer face damages the seal.

57. B — Hydraulic clutch systems require the manufacturer-specified DOT brake fluid (typically DOT 3 or 4) because the system shares fluid technology with brake systems. Mineral oils, ATF, or other lubricants destroy the rubber seals in master and slave cylinders, causing rapid system failure.

58. A — The proper clutch bleed procedure: keep the master cylinder reservoir full, depress the clutch pedal slowly, open the slave cylinder bleeder, close the bleeder before pedal release, repeat until clear fluid emerges with no bubbles. The sequence prevents air being drawn back into the system between strokes.

59. D — CV axle nut torque is typically 150–300 Nm (110–220 ft-lb) plus an angle on many vehicles, securing the axle to the hub. The bearing is pre-set in modern designs, so the nut's primary function is retention; the manufacturer's specification ensures proper retention without affecting bearing preload.

60. C — A feeler gauge between the synchronizer ring and the gear's clutch cone measures the engagement gap. Healthy clearance is typically 1.0–1.5 mm; a worn synchronizer ring reduces the gap below 0.5 mm, indicating end of service life and the cause of shift quality issues.

61. B — A 4-wire (Kelvin) milliohmmeter resolves milliohm-level resistance accurately; standard DMM ohm ranges have lead resistance and offset errors that mask such small values. For typical shop work, voltage drop testing during operation gives more useful diagnostic information than direct resistance measurement at milliohm levels.

62. A — A battery conductance tester measures internal resistance in milliohms and compares the measured conductance to the battery's rated CCA. The result reports CCA, state of charge, and state of health; conductance correlates to available capacity without requiring a heavy discharge test.

63. D — Alternator output verification requires a clamp-on DC current meter on the output cable (reading rated amperage at the cable, not battery current) plus a DMM at the battery (confirming 13.8–14.6 V regulation). Engine at 1500–2000 RPM with electrical load applied creates the worst-case operating condition.

64. C — Failed diodes in the alternator's rectifier bridge produce AC ripple voltage in the output. A DSO shows missing humps in the rectified waveform; a DMM in AC volts reads more than 0.5 V peak-to-peak ripple when diodes have failed, indicating the need for alternator replacement.

65. B — A clamp-on DC current meter around the starter's positive cable during cranking reads running current draw, typically 150–250 A for most automotive starters. Excessive draw indicates internal binding or engine load issues; low draw indicates poor electrical connection or open windings.

66. A — A DMM set to DC volts with leads on the battery positive post and the starter input terminal reads voltage drop in the positive starter cable during cranking. Readings exceeding 0.5 V indicate excessive resistance from cable corrosion, poor connections, or undersized cable.

67. C — A headlamp aim alignment kit (mechanical optical or electronic), used at the manufacturer-specified distance (typically 7.6 m / 25 ft) from a vertical aiming target with the vehicle at curb weight on a level surface, verifies proper headlamp aim. Visual estimation cannot achieve the required precision for legal compliance.

68. D — A manifold gauge set (low-side blue, high-side red) connects to the system's service ports to read both side pressures simultaneously. Low side typically reads 30–50 psi and high side 200–300 psi at idle on an ambient day; deviations indicate specific system faults.

69. B — A refrigerant identifier samples the refrigerant and reports its composition (R-134a, R-1234yf, R-22, contaminated mixture) before recovery. Identifying contaminated refrigerant prevents recovery machine cross-contamination, protects the operator, and ensures proper handling per refrigerant regulations.

70. A — An electronic refrigerant leak detector with 5 g/year sensitivity locates small leaks by sensing refrigerant escape near suspect components. UV dye introduced to the system and observed with a UV light identifies the leak point precisely; together the methods locate even slow leaks.

71. D — Open-circuit voltage at 25°C maps to state of charge: 12.6 V is 100%, 12.4 V is approximately 75%, 12.2 V is approximately 50%, 12.0 V is approximately 25%. The vehicle's battery at 12.4 V is at roughly 75% SoC and should accept charging without issue.

72. C — AGM batteries require AGM-specific charging voltage (typically 14.4–14.8 V absorption with temperature compensation) and an AGM-aware charger. Standard flooded-battery profiles cause overcharging in AGM batteries, leading to electrolyte loss and reduced capacity; the AGM-specific profile preserves battery life.

73. A — The IBS measures current through a precision shunt, plus voltage and temperature, reporting via LIN or CAN to the BCM/PCM. The host module calculates state of charge and state of health, adjusts charging voltage by temperature, and authorizes stop-start based on the IBS data.

74. B — Cabin air filters are typically behind the glove box (or in a similar accessible HVAC case location). Airflow direction is marked on the filter frame; correct orientation ensures the filter media catches contaminants on the dirty side rather than allowing reverse migration.

75. D — A failed blower motor resistor (or PWM blower module) breaks the lower-speed circuits, leaving only the high-speed connection (which bypasses the resistor for direct battery voltage). The diagnostic pattern of "only high speed works" specifically points to the resistor or blower module, not the motor itself.

76. C — The scan tool confirms blend door operation is correct, so the failure mode is on the coolant side: low engine coolant, restricted heater core, stuck heater control valve, or failed water pump. These all prevent hot coolant from reaching the heater core despite the blend door being in the correct position.

77. B — Halogen filament temperature reaches approximately 3000°C in operation. Skin oils on the glass envelope create hot spots that thermally stress the quartz, leading to premature failure or shattering; cotton gloves or alcohol cleaning are essential when handling halogen bulbs.

78. A — Halogen housings are designed with optics specific to the halogen bulb's filament position and beam pattern. HID/LED bulbs in halogen housings produce poorly-controlled patterns that scatter light, creating glare for oncoming traffic without improving the driver's visibility — and are illegal in many jurisdictions.

79. D — After wiper motor replacement, the motor is positioned at park (using scan tool data or by cycling and observing where it stops). The wiper arms are then installed with their blades at the manufacturer-specified park location, typically just above the lower edge of the windshield.

80. C — Conductive paint formulated for defroster repair, applied across the break after surface preparation and masking, restores the broken grid line. The paint requires the manufacturer's specified cure time before testing; the repair is permanent when properly performed.

81. A — The window initialization procedure (window fully down with switch held, then fully up with switch held, then ignition cycle) teaches the BCM the new motor's normal current draw and travel range. Without initialization, auto-up and pinch protection cannot function, leaving the customer with reduced features.

82. B — Heated seat element resistance is typically 1–5 Ω for a healthy element. With the harness disconnected and a DMM in ohms, an open reading indicates a broken element wire; readings within spec but malfunction suggest control circuit or sensor issues rather than the element itself.

83. D — The clock spring routes electrical signals (horn, airbag, cruise, steering wheel controls) across the rotating steering wheel via a flat ribbon cable. The cable is wound and unwound as the wheel turns, maintaining continuous electrical connection without slip rings or wires that would twist and break.

84. C — An electronic brake fluid moisture tester uses conductivity or capacitance sensing to estimate water content in the fluid. Readings of 3% or more indicate the need for fluid replacement to maintain proper boiling point, preventing vapor lock under heavy braking and protecting the ABS modulator from corrosion.

85. A — A brake rotor micrometer has thin anvils that fit between the rotor's friction surfaces, measuring thickness directly. The thinnest reading from multiple points around the rotor is compared to the manufacturer's minimum thickness specification (stamped on the rotor or published in service information) to determine machinability or replacement.

86. B — A dial indicator mounted to the steering knuckle or hub, plunger against the rotor's friction surface, then rotating the rotor by hand, measures lateral runout. Spec is typically less than 0.05–0.08 mm (50–80 microns); higher runout causes pedal pulsation that the customer feels at moderate braking.

87. C — Active wheel speed sensors (Hall-effect or magnetoresistive) produce a digital square wave with constant amplitude. Frequency drops with wheel speed but amplitude remains constant down to very low speeds, enabling ABS function during slow rolls or near-stop conditions — a key advantage over passive (variable reluctance) sensors.

88. D — A tread depth gauge inserted into the tread groove reads tread depth in 1/32" or millimeters. Legal minimum is typically 2/32" (1.6 mm) for passenger tires; replacement is recommended at 4/32" (3.2 mm) for wet-weather grip, before the legal minimum is reached.

89. A — A quality tire pressure gauge has ± 1 psi (or $\pm 2\%$) accuracy across its working range and is verified periodically against a reference standard. Setting cold tire pressure to the door jamb placard specification requires this accuracy; significantly inaccurate gauges produce dangerous under- or over-inflation.

90. B — A calibrated torque wrench in a star pattern (cross pattern on 5-lug wheels) tightens each lug nut to the manufacturer's specified torque, after hand-threading to verify clean thread engagement. Impact wrenches cannot achieve consistent torque; the star pattern ensures even seating of the wheel against the hub.

91. D — Wheel alignment is performed against the vehicle manufacturer's published specification (camber, caster, toe, thrust angle) referenced to the specific make, model, and year. Generic specs do not

exist for modern vehicles; the alignment machine's database or OEM service information provides the targets.

92. C — A power steering pressure tester (gauge rated for at least 2000 psi, with shutoff valve for dead-head testing) installed in the high-pressure line reads pump output during operation. Testing at idle, higher RPM, and at steering lock-to-lock verifies the pump meets specification at all operating conditions.

93. A — A scan tool calibrates the SAS with the wheels straight ahead and the ignition cycled per the manufacturer's procedure. The calibration sets the sensor's reference to match the "wheels straight" condition for ESC, ABS, EPS, and ADAS systems that rely on accurate steering angle data.

94. B — A scan tool activates EPB service mode, which retracts the EPB motor's spindle and allows the caliper piston to be safely retracted with a standard tool. After installation, EPB is restored to normal mode and any required bedding or calibration is performed before customer delivery.

95. D — A diagonal-split brake system is bled in the sequence right rear, left front, left rear, right front — bleeding the longest line on each circuit first to flush air toward the bleeder rather than back into the master cylinder. The reservoir is kept full throughout to prevent introducing new air.

96. A — On a SLA suspension with the spring on the lower arm, the lower ball joint is load-bearing and must be inspected with the suspension at ride height. A jack under the lower control arm unloads the joint from the spring's compression force, allowing free movement to be detected with a pry bar between the steering knuckle and control arm.

97. C — Dynamic wheel balancing detects and corrects both static (vertical, up-and-down) imbalance and couple (side-to-side, wobble) imbalance. The wheel is spun on the balancer to develop the centrifugal forces of both imbalance types, and weights are applied at specific rim locations to correct each.

98. B — Wheel bearing condition is evaluated by listening for noise during cornering (an outside-loaded bearing produces louder noise when loaded by weight transfer), feeling for roughness when spinning the wheel by hand with the brake released, and observing for visible play with the wheel raised. The combination of indicators identifies the specific bearing failing.

99. D — Struts are replaced in axle pairs (both front or both rear together) to maintain matched damping across the axle. One new strut paired with one worn strut causes uneven handling, accelerates wear of the newer component, and produces inconsistent vehicle behavior in emergency maneuvers.

100. A — Load index 102 corresponds to a maximum load capacity of 850 kg per tire, looked up against a published load index table. The index is a coded number that maps to kilograms (or pounds) in standardized tables; using the tire at a load exceeding the index rating causes overheating and failure.

101. C — DOT date code "2722" identifies week 27 of year 2022 as the manufacturing date. Tire service life is typically 6–10 years regardless of tread depth; rubber compounds harden and crack over time, reducing wet grip and increasing failure risk, so age governs replacement independent of tread.

102. B — Thrust angle is the angle between the vehicle's geometric centerline and the rear axle's thrust line. A non-zero thrust angle causes the vehicle to "dog-track" (rear wheels following an offset path from the front), and is corrected during a 4-wheel alignment by adjusting rear toe per axle/side as the design allows.

103. D — A collapsed brake hose with an internal flap acts as a one-way valve: pressure passes from the master cylinder to the caliper, but the deteriorated lining prevents pressure release. The caliper stays applied until the system cools, producing a dragging hot wheel as the symptom.

104. A — A new master cylinder requires bench bleeding: filling the reservoir, using short plastic lines to recirculate fluid back into the reservoir from each outlet, and stroking the pushrod until no air bubbles emerge. The procedure primes the master cylinder bore so the system can be bled at the wheels without forcing air through the master.

105. C — New brake pads require a bedding procedure (typically 5–10 moderate stops from 50–80 km/h with brief cool-down periods, then 1–2 firm stops from higher speed). The procedure seats the pads' friction surface to the rotor and develops the optimal friction characteristics that determine final stopping performance.

106. B — Direct TPMS sensors are installed with a torque wrench at the manufacturer-specified torque (typically 4–8 Nm / 35–70 in-lb for the sensor body or valve stem nut). Over-tightening cracks the sensor body; under-tightening allows air leaks at the valve seal — both create premature failures.

107. D — Before SRS work, the negative battery cable is disconnected and the manufacturer-specified discharge time (typically 1–10 minutes) is observed for the SRS module's reserve capacitor to bleed. The capacitor can deploy an airbag even with the battery disconnected; waiting the full time prevents accidental deployment during service.

108. A — A deployed pretensioner is a single-use pyrotechnic device that cannot be reset or refurbished. The complete seat belt assembly is replaced, since reuse risks failure to deploy in a subsequent crash or premature deployment during service — both unacceptable safety outcomes.

109. B — Seat belt assemblies are non-repairable single units. Damaged webbing (cuts, burns, fraying, melted fibers) may fail under crash load, and trimming or fabric repair does not restore the engineered strength. Replacement of the entire assembly is the only safety-compliant option.

110. C — A new clock spring is shipped centered (typically with a locking pin or alignment mark). The steering wheel must be at straight-ahead before installation, and the locking pin is removed only after the clock spring is installed and the steering wheel reattached — preserving the centered state and preventing ribbon cable damage from over-rotation.

111. D — Body structural integrity is verified by measuring at manufacturer-designated control points (specific holes, bolts, or surfaces with published dimensional specifications) using a tram gauge, laser system, or similar tool. The measured dimensions are compared to OEM specifications to confirm the body's geometry has been restored.

112. A — Blocked sunroof drain tubes are the most common cause of water ingress in sunroof-equipped vehicles. Debris (leaves, dirt, insect debris) accumulates in the tubes that route water from sunroof corners through the A-pillars to outlets behind the front fenders; clearing the blocked tubes restores function inexpensively.

113. B — An integrated power mirror replacement requires scan tool configuration to program memory positions, learn blind spot detection zones, enable tilt-down-on-reverse, and verify integrated functions. Without configuration, the customer loses the features they paid for and the system may set DTCs.

114. C — Manufacturer-recommended panel bonding adhesive (formulated for automotive structural bonding) is used with prepared surfaces, mixed in the specified ratio within pot life, applied in the specified bead pattern, and clamped for the full cure period. The procedure preserves crash-energy management; substitutions or shortcuts compromise crashworthiness.

115. D — Front impact crash sensors are inspected for physical damage, verified for proper mounting bolt torque (sensors are orientation-sensitive), and confirmed for fully seated connectors and undamaged harness. Codes are cleared only after the SRS module reports all sensors operational — confirming the safety system's readiness.

116. A — The window initialization procedure (fully down with switch held, then fully up with switch held, then ignition cycle) teaches the BCM the new regulator's travel range and pinch protection thresholds. Without initialization, auto-up function is disabled and pinch protection cannot operate correctly.

117. B — Class 0 (1000 V) HV insulating gloves are inspected visually for cracks, tears, and contamination, then air-tested by rolling the gauntlet cuff toward the fingers to trap and pressurize air inside the glove. Holding the inflated glove near the ear and face detects air leaks; any defect requires immediate glove disposal.

118. C — HV de-energization sequence: vehicle OFF and key/fob removed, wait for HV power-down, remove MSD, wait the manufacturer-specified discharge time for inverter DC bus capacitors to bleed, then verify voltage absence at specified test points with a Cat III/IV-rated DMM before any HV contact.

119. D — A Cat III/IV-rated DMM (with appropriate voltage rating for the system being tested, typically 600 V or 1000 V) survives the transient voltage spikes possible on HV systems. Lower-rated meters can fail catastrophically when exposed to HV transients, creating arc-flash hazards for the technician.

120. A — HV cables on hybrid and EV vehicles are universally colored orange, providing a visual warning recognized worldwide by technicians and first responders. The color coding requires HV-safe handling procedures whenever orange cables are present, regardless of vehicle make or model.

121. B — A healthy HV battery pack shows tight uniformity between cell modules (typically within 50–100 mV of each other) at the cell chemistry's nominal voltage (3.6–3.7 V Li-ion, 7.2 V NiMH module). Significant variation indicates imbalance, individual cell failure, or BMS sense circuit issues requiring further diagnosis.

122. D — A high-voltage insulation tester (megger) at the manufacturer-specified test voltage (typically 500 V or 1000 V DC) measures insulation resistance between each conductor and ground, and between

conductors. A healthy HV cable reads more than 100 MΩ; lower readings indicate insulation degradation requiring cable replacement before the system is re-energized.

123. C — A CCS-1 connector combines J1772 AC charging (top of the connector for Level 1/Level 2) with two additional DC pins below for DC fast charging. The single port supports both AC and DC charging at multiple power levels, simplifying public infrastructure and home charging compatibility on a single vehicle inlet.

124. A — During EV deceleration with the accelerator released, the traction motor operates as a generator: vehicle kinetic energy spins the motor to produce electrical energy that flows back into the HV battery. Friction brakes engage only when more deceleration is needed than regen can supply, with brake-by-wire blending the two transparently.

125. B — A Cat III/IV-rated DMM at the manufacturer's specified test points after de-energization (key off, MSD removed, capacitor discharge wait time observed) verifies voltage absence before any HV contact. The meter must read essentially zero; test lights and bare-hand testing are unsafe and unacceptable on HV systems.