PRACTICE EXAM 10: RED SEAL 310S SIMULATION (125 QUESTIONS)

1. A vehicle is brought in for service. The technician discovers a wallet on the front passenger seat. The correct action is to:

A. Take the wallet personally and hold it in the technician's tool box until the customer returns to pick up the vehicle

B. Lock the wallet inside the vehicle's glove box and continue with the work order

C. Document the customer property on the repair order, secure it per shop protocol, and inform the service advisor for the customer's records

D. Open the wallet to identify the owner and contact them directly through the contact information

2. To accurately diagnose and repair modern vehicles, a technician needs access to:

A. Generic aftermarket repair manuals only, which cover most vehicles in the shop

B. The technician's accumulated experience and knowledge of similar vehicles seen before

C. The customer's own owner's manual, which contains all repair information needed

D. Manufacturer service information (e.g., OEM service portals, ALLDATA, Mitchell), with TSBs, wiring diagrams, repair procedures, and torque specifications for the specific vehicle

3. A vehicle is brought in for a brake job estimated at $400. During disassembly the technician finds a seized caliper that will add $250 to the repair. The correct procedure is:

A. Complete the repair and present the additional charges on the final invoice for payment

B. Stop work, contact the customer, explain the additional finding, and obtain authorization before proceeding

C. Skip the caliper replacement to stay within the estimate, even though the brake repair will be incomplete

D. Replace the caliper without notifying the customer because brake safety is paramount over price

4. After completing a brake or steering repair, the technician should:

A. Perform a quality control road test to verify the repair is correct and safe before returning the vehicle to the customer

B. Return the vehicle to the customer immediately, advising them to test the repair on their own commute

C. Drive the vehicle to a remote location for an unmonitored road test by the technician alone

D. Skip the road test if the repair involved only parts replacement with no diagnosis

5. A lockout/tagout (LOTO) lock applied by one technician on a piece of equipment can be removed by:

A. Any other technician who needs to use the equipment immediately

B. The shop owner or supervisor at any time without notification to the original applier

C. Only the technician who applied the lock, except under specific authorized procedures (e.g., supervisor with worker's documented absence) following the shop's written LOTO program

D. The customer who owns the vehicle being serviced when the work is interrupted

6. In the Canadian automotive trade, "SAE" refers to:

A. The Society of Automotive Engineers, which develops technical standards (e.g., SAE J1979 for OBD-II, SAE 5W-30 for oil viscosity)

B. The Standards Association for Engineers, a Canadian government regulatory body

C. The Safety Authority of Employees, a workplace safety organization

D. The Service Advisor Examination, a national customer-service certification

7. A Red Seal automotive service technician (310S) apprenticeship in Canada typically requires:

A. Only a college diploma with no work experience requirement

B. Only on-the-job hours with no formal classroom training required

C. A high school diploma with no further education or work experience required

D. A combination of on-the-job training hours and in-school technical training periods over multiple years, culminating in a certifying exam

8. When explaining a complex repair to a customer with no technical background, the technician should:

A. Use full technical terminology to demonstrate professional expertise

B. Use plain language with simple analogies, supplemented by visual aids (the worn part, a diagram) when helpful

C. Refer the customer to read the manufacturer's service manual for detail

D. Avoid explanation; the customer only needs to know the price

9. A vehicle arrives for service with an open manufacturer recall. The shop should:

A. Ignore the recall because it was not the reason the customer brought the vehicle in

B. Charge the customer for the recall repair if the shop is not the original selling dealer

C. Inform the customer of the open recall, since recall repairs are performed at no cost to the customer at any authorized dealer

D. Refuse to perform any other service until the recall is completed first

10. An engine "short block" assembly typically includes:

A. A complete engine ready for installation, with all accessories attached

B. The cylinder head and valve train only, without the block

C. The cylinder head, intake manifold, exhaust manifold, and all gaskets

D. The block, crankshaft, pistons, connecting rods, and oil pump — without cylinder heads or external accessories

11. During the break-in period of a freshly rebuilt engine, the technician should:

A. Vary engine speed and load (avoiding sustained high-speed cruise and very light load), use the specified break-in oil, and follow the engine builder's specific procedure for the first hundreds of kilometres

B. Run the engine at idle for the first 1,000 km only, with no load applied

C. Drive at constant highway speed for the first 1,000 km with no variation

D. Drive at maximum throttle and high RPM for the first 1,000 km to seat the rings forcefully

12. During engine assembly, the technician staggers piston ring end gaps around the piston circumference to:

A. Allow oil flow through the gaps for better cylinder lubrication

B. Prevent the ring gaps from aligning, which would create a direct gas leak path past the rings

C. Provide a balance weight distribution around the piston during operation

D. Match the spacing of the piston cooling jets in the block

13. Excessive crankshaft endplay (axial movement) typically indicates:

A. Worn main bearings on the centre journals of the crankshaft

B. Worn rod bearings on multiple connecting rods of the crankshaft

C. A bent crankshaft from impact damage during the engine's previous service

D. Worn or damaged crankshaft thrust bearing, the bearing that controls axial movement of the crank

14. During a cylinder leakdown test, air is heard escaping from the crankcase oil filler. This indicates:

A. Worn piston rings or scored cylinder walls, allowing compressed test air to bypass the rings into the crankcase

B. A burned exhaust valve, allowing test air to escape through the exhaust system

C. A burned intake valve, allowing test air to escape through the intake manifold

D. A blown head gasket, allowing test air to enter the coolant passages

15. On an oil container labelled "5W-30," the "5W" represents:

A. The maximum operating temperature in degrees Celsius the oil can withstand

B. The percentage of viscosity modifier additive in the formulation

C. The cold-temperature viscosity rating (lower number means thinner flow at low temperatures, easier cold starts)

D. The number of months the oil should be used before changing

16. The bypass valve in an oil filter or filter mounting is designed to:

A. Vent crankcase pressure to the intake manifold during operation

B. Open and allow oil to bypass the filter element if the element becomes restricted (or in cold start when oil is thick), preventing oil starvation to the engine

C. Direct oil flow to the engine's oil cooler during normal operation

D. Trap metal debris from the engine for analysis at the next service

17. A "block test" (combustion leak test) on the coolant uses a chemical that changes colour when exposed to:

A. Engine oil contamination of the coolant from a failed oil cooler

B. Excessive coolant moisture content from improper mixing of antifreeze

C. Old coolant that has lost its corrosion inhibitor protection

D. Combustion g 17. A "block test" (combustion leak test) on the coolant uses a chemical that changes colour when exposed to:

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C. Old coolant that has lost its corrosion inhibitor protection

D. Combustion gases (CO_2 and hydrocarbons) in the coolant, from a head gasket leak or cracked head

18. A thermostat stuck in the open position will typically cause:

A. Engine overheating shortly after start-up at any condition

B. Coolant boiling out of the radiator overflow during operation

C. Slow engine warm-up, low operating temperature in cold weather, and heater blowing cool air at idle

D. Excessive coolant pressure that ruptures the radiator hoses

19. An intake manifold gasket on a V-engine with coolant passages through the manifold can fail as a vacuum leak or as a coolant leak. A coolant leak that enters the intake manifold may:

A. Cause hydrolock if liquid coolant pools in a cylinder, plus rough running, white exhaust smoke, and possible engine damage

B. Improve engine cooling by adding coolant directly to the combustion chamber

C. Reduce intake air temperature by humidifying the incoming air

D. Have no observable effect because the coolant evaporates in the hot intake

20. A traditional vacuum-referenced fuel pressure regulator (on older port-injected engines) varies fuel pressure with intake manifold vacuum to:

A. Increase fuel pressure under high vacuum (idle) for more atomization

B. Maintain a constant pressure difference between rail and manifold, so a fixed injector pulse delivers consistent fuel mass

C. Reduce fuel pressure when the engine is cold for easier starting in cold weather

D. Disconnect fuel flow to the rail during deceleration to conserve fuel

21. An engine operating in "closed loop" fuel control is:

A. Running on a fixed fuel map without sensor feedback adjustment

B. Operating with the EGR valve closed for performance benefit

C. Running on the calculated open-loop map only, with no sensor input

D. Adjusting fuel injection based on real-time feedback from the upstream oxygen sensor, maintaining air-fuel ratio near stoichiometric (14.7:1)

22. For gasoline combustion, the "stoichiometric" air-fuel ratio (by mass) is approximately:

A. 5:1 — five parts air to one part fuel for cold start operation

B. 9:1 — nine parts air to one part fuel for maximum power production

C. 14.7:1 — the ratio at which all fuel and oxygen are theoretically consumed completely

D. 22:1 — the ratio at which combustion is lean enough to prevent any emissions

23. The OBD-II catalyst efficiency monitor compares the activity of:

A. The downstream oxygen sensor signal to the upstream oxygen sensor — a healthy catalyst flattens the downstream signal

B. The MAF sensor signal to the calculated air mass during operation

C. The fuel pressure to the commanded pressure at the rail during operation

D. The exhaust temperature before and after the catalytic converter

24. A turbocharger wastegate controls maximum boost pressure by:

A. Restricting the air intake to limit airflow to the compressor

B. Routing some exhaust gas around the turbine when boost reaches the target, limiting turbine speed and thus boost pressure

C. Adding cold air to the intercooler when boost exceeds the limit

D. Closing a valve in the compressor housing during high-boost conditions

25. A Variable Geometry Turbocharger (VGT) on a diesel engine adjusts:

A. The intercooler airflow path between two cooling cores during operation

B. The fuel injection timing across the engine's RPM range

C. The compressor wheel diameter mechanically during operation

D. The angle of the turbine inlet vanes, controlling exhaust flow speed to the turbine and producing useful boost across a wider RPM range

26. The "cetane number" of a diesel fuel measures:

A. The fuel's volumetric energy content per litre at standard temperature

B. The fuel's ignition quality — how readily it ignites under compression; higher cetane produces easier starts and smoother combustion

C. The fuel's resistance to knock during high-compression operation

D. The fuel's sulphur content, which determines emissions compliance

27. A diesel engine's glow plugs are energized:

A. Before and shortly after engine start in cold conditions, to heat the combustion chambers and aid cold-start ignition

B. During every compression stroke continuously throughout normal operation

C. Only during DPF active regeneration to raise exhaust temperature

D. By the driver pressing a separate dashboard button before starting

28. A modern vehicle with two electric cooling fans (primary and auxiliary) typically operates them in stages based on:

A. Vehicle speed only, with both fans running above 60 km/h regardless of temperature

B. The engine RPM signal from the crankshaft sensor only

C. Engine coolant temperature and A/C high-side pressure, with the primary fan activating at a lower threshold and the auxiliary at a higher one

D. The driver's manual selection from the dashboard during operation

29. Air in the cooling system (coolant aeration) after a coolant change typically produces:

A. Improved heater output due to better coolant flow through the heater core

B. No symptoms because the cooling system self-purges automatically

C. Higher coolant temperature only at idle, with normal temperature during driving

D. Heater blowing cool air despite warm engine, inconsistent temperature readings, dashboard gurgling, and possible localized overheating

30. On a diesel engine without glow plugs, cold-start assistance is often provided by:

A. A spark plug installed in the intake manifold for fuel ignition during cold start

B. An intake air heater (grid heater) that warms incoming air during cold start, raising compression temperature enough to ignite the fuel

C. An EGR cooler that cools the intake during cold start operation

D. A separate auxiliary battery dedicated to cold-weather starting

31. The EVAP canister purge valve, commanded open by the PCM, allows fuel vapours stored in the charcoal canister to flow into the:

A. Intake manifold, where they are drawn into the engine and burned during normal operation

B. Exhaust system upstream of the catalytic converter for thermal disposal

C. Atmosphere through a vent on the canister housing

D. Fuel tank back through the vent line, recovering the vapour as liquid fuel

32. Under SAE J1962 (OBD-II), the Data Link Connector (DLC) on a passenger vehicle must be located:

A. In the engine compartment, accessible from above the engine

B. In the trunk, accessible from the cargo area only

C. In the passenger compartment, within 600 mm of the steering wheel, accessible without tools

D. Under the vehicle's frame, accessible from beneath the vehicle

33. Compared to high-speed CAN (typically 500 kbps with ~2.5V resting), low-speed CAN (typically 125 kbps):

A. Uses identical voltage levels but operates at a slower data rate

B. Operates at different voltage levels (typically resting near 0V and 5V when recessive) and is single-wire fault tolerant

C. Uses no terminating resistors compared to high-speed CAN's 120-ohm terminators

D. Uses optical fibre rather than electrical wires to transmit data

34. Modern vehicle ECU reprogramming uses cryptographic signing of software updates to:

A. Reduce the file size of the update for faster download to the module

B. Compress the calibration data to fit in smaller memory

C. Generate a unique vehicle ID for each programmed module

D. Verify that the software has not been tampered with and comes from an authorized source before the module accepts it

35. Modern vehicles include cybersecurity measures because:

A. Customer data theft is the only realistic threat to a vehicle's operation

B. The vehicle's headlights can be turned off remotely by an unauthorized party

C. Insurance companies require cybersecurity protocols before issuing coverage

D. Connected vehicles are exposed to remote attack via cellular and Wi-Fi interfaces, with potential to affect safety-critical functions if unprotected

36. Over-the-air (OTA) software updates on modern vehicles typically:

A. Operate only when the vehicle is being driven at highway speeds

B. Replace the vehicle's entire operating software in a single quick step

C. Download in the background via cellular or Wi-Fi, then install during a vehicle-off period (often with battery support) after driver acceptance

D. Require the vehicle to be brought to the dealer for any update installation

37. Vehicle telematics systems collect data about the vehicle and driver. The technician should:

A. Always sell this data to third parties for additional revenue when servicing vehicles

B. Respect the customer's privacy and the manufacturer's data-handling policies, which are governed by privacy legislation (e.g., PIPEDA in Canada)

C. Disable all telematics functions on customer vehicles to ensure privacy at all times

D. Reset the telematics module at every oil change to clear accumulated data records

38. To measure a vehicle's parasitic current draw correctly, the technician should:

A. Connect the meter immediately after the battery is reconnected, then read the value within seconds

B. Run the engine at idle for 10 minutes, then read the parasitic current at the battery

C. Connect the meter in parallel with the battery negative cable while the vehicle is running

D. Connect the meter in series with the battery negative cable, then wait the required network sleep time (typically 20-60 minutes per manufacturer) before reading

39. Modern vehicles often use multiple network protocols (CAN-HS, CAN-LS, LIN, FlexRay, MOST, Ethernet) on the same vehicle because:

A. Different subsystems have different bandwidth, cost, and safety requirements; using the right protocol for each subsystem optimizes performance and cost

B. Vehicle manufacturers cannot agree on a single standard, so each system is a different brand

C. Each module manufacturer requires its own dedicated network protocol exclusively

D. The vehicle's age determines which protocol is in use, with older protocols being phased out completely

40. On the OBD-II Data Link Connector (DLC), pin 16 typically provides:

A. Ground reference for the scan tool's electrical circuit

B. The CAN-H signal for high-speed CAN communication

C. Battery positive (B+) voltage to power the scan tool

D. The K-line signal for ISO 9141 communication protocol

41. A CAN module that has entered the "bus-off" state typically recovers after:

A. Several minutes of idle time on the network with no power cycle required

B. An ignition cycle (key off then on) that resets the module's transmit error counters

C. Replacement of the module, since bus-off is a permanent fault condition

D. A complete vehicle battery disconnect for at least 24 hours

42. Adaptive cruise control radar sensors typically communicate their data to the ADAS module through:

A. An analog voltage signal that varies with detected object distance

B. The OBD-II port, sharing diagnostic bandwidth with all other modules

C. A wireless Bluetooth link to the ADAS module

D. A dedicated high-speed network connection (CAN-FD, FlexRay, or automotive Ethernet), suitable for the radar's high data rate

43. Forward-facing ADAS camera modules typically send image data to the central processing module through:

A. Automotive Ethernet (e.g., 100BASE-T1 / 1000BASE-T1) — the bandwidth required for live video processing far exceeds CAN capacity

B. Standard CAN at 500 kbps, with frame splitting for the video data stream

C. The LIN bus, which is sufficient for camera-to-module communication

D. Analog composite video over coaxial cable, similar to security camera systems

44. A clutch friction disc with a "ceramic" or "sintered metallic" lining differs from a standard "organic" lining because:

A. The ceramic lining produces less heat than organic during normal operation

B. The organic lining is required for all turbocharged engines specifically

C. The ceramic/sintered lining handles higher heat and torque capacity but engages more aggressively, often with reduced street comfort compared to organic

D. The organic lining is used only in heavy-duty truck applications

45. A Concentric Slave Cylinder (CSC), mounted around the transmission input shaft and replacing both the throw-out bearing and the external slave cylinder, requires:

A. Annual replacement regardless of operating condition for warranty compliance

B. Transmission removal for service or replacement, since the CSC is inside the bell housing

C. External bleeding through a port without transmission removal

D. No service throughout the vehicle's life because it is sealed for life

46. Modern automatic transmission "adaptive shift learning" exists to:

A. Reduce the transmission's gear ratio range over time for fuel economy

B. Eliminate the need for a transmission control module entirely

C. Limit the transmission to lower gears to protect against driver abuse

D. Compensate for clutch and band wear over time, maintaining consistent shift quality as the transmission ages

47. A modern automatic transmission marked as "filled for life" with ATF:

A. Generally still benefits from periodic ATF service per the severe-service schedule, with "lifetime" reflecting expected fluid life under normal driving, not absolute permanence

B. Should never have its fluid changed, even at very high mileage, because the fluid is permanent

C. Has no transmission filter and requires no service of any kind

D. Refers to a vehicle whose transmission cannot be serviced and must be replaced as a unit if it fails

48. ATF that is dark brown or black with a burned smell indicates:

A. Normal ATF after a few thousand kilometres of operation

B. Contamination with engine oil from a failed transmission cooler

C. ATF that has overheated, oxidized, and may have damaged internal friction components — inspection is required, and a fluid change alone may not restore transmission operation

D. ATF that needs only an additive to restore its proper properties

49. A drive shaft that is out of balance produces a vibration that is best diagnosed and corrected by:

A. Replacing the drive shaft with a new one without further testing

B. Performing an electronic vibration analysis (reed tach, strobe, or vibration analyzer) and applying balance weights at the position the analysis identifies

C. Tightening all U-joint U-bolts to specification, which removes most vibration

D. Adjusting the driveshaft angle at the transmission tail housing

50. On a typical single-piece driveshaft with a U-joint at each end, the operating angles at the two joints should:

A. Each be exactly 0°, with the driveshaft perfectly straight

B. Each be at the maximum angle the joint can tolerate, around 30°

C. Differ by at least 5° to prevent driveshaft resonance during operation

D. Be approximately equal and opposite (within 1° of each other), so the speed variations introduced by each U-joint cancel out

51. On a typical FWD vehicle, the inner (transmission-side) CV joint is most commonly a:

A. Tripod (or "plunge") joint, which accommodates both angular movement and the axial in-and-out motion required as the suspension travels

B. Rzeppa (ball-and-cage) joint, identical in design to the outer wheel-side joint

C. Cardan (universal) joint with cross-trunnion needle bearings

D. Constant velocity slip yoke without any angular motion capability

52. During differential setup, the contact pattern is acceptable but the gear backlash is measured below specification (too tight). The technician should:

A. Move the ring gear toward the pinion to reduce backlash further

B. Adjust the pinion depth shim to push the pinion deeper into the ring gear

C. Move the ring gear away from the pinion (via carrier bearing shim shift or threaded carrier adjuster)

D. Reduce the carrier bearing preload to allow more lash

53. Modern wheel hub bearings are supplied in two configurations: pressed-in (separate inner/outer races requiring press tools) or pre-assembled unitized hub assemblies. Compared to pressed-in bearings, unitized hub assemblies:

A. Require complete vehicle suspension disassembly for service in all cases

B. Are user-rebuildable in the shop with simple hand tools

C. Are heavier and more complex than pressed-in bearings

D. Bolt onto the steering knuckle as a sealed unit (often including the wheel speed sensor); the entire unit is replaced when the bearing fails

54. A leaking transmission output shaft seal (at the rear of an RWD/4WD transmission, where the driveshaft connects) is typically replaced by:

A. Disassembling the entire transmission to access the seal from the inside

B. Removing the driveshaft, prying out the old seal from the rear of the transmission case, and installing the new seal flush with the case

C. Adding a sealing additive to the transmission fluid to swell the existing seal

D. Replacing the entire rear extension housing as the seal is not separately serviceable

55. During automatic transmission fluid service, replacing the filter:

A. Is required because the filter has trapped wear debris and contaminants that would otherwise circulate with the new fluid

B. Is optional because the filter is permanent and lasts the life of the transmission

C. Damages the transmission because the new filter is too restrictive for the pump

D. Is performed only when the transmission has been overhauled, not during routine service

56. A transmission shift solenoid can be tested electrically by:

A. Visual inspection of the solenoid body for damage with no further measurement

B. Tapping the solenoid lightly with a screwdriver while listening for clicks

C. Measuring the engine RPM change when the shift command is given

D. Measuring coil resistance with an ohmmeter against specification, and energizing the coil to confirm it clicks open

57. In a typical manual transmission, the countershaft (cluster shaft):

A. Is the same as the output shaft, with the gears driving the wheels directly

B. Rotates only when the transmission is in reverse gear

C. Receives power from the input shaft through the constant-mesh input gear, then delivers it through the selected ratio to the output shaft

D. Connects the engine flywheel directly to the differential pinion

58. After differential service that included LSD clutch pack replacement, the manufacturer typically recommends a break-in procedure of:

A. Driving on the highway at constant 100 km/h for the first 1,000 km

B. Several gentle figure-eight turns in a parking lot, allowing the clutches to seat properly without overheating

C. Disabling the AWD system for the first 5,000 km after the service

D. Driving the vehicle only in reverse for the first 100 km

59. During manual transmission inspection, a worn synchronizer cone (the conical friction surface that matches input and output speeds during a shift) typically shows:

A. Worn ring teeth or cone friction surface, visible as flattened or shiny patches where the cone should be textured

B. Cracks across the gear teeth from impact loading during shifting

C. Bent shift fork showing the fork's contact face out of square with the synchronizer collar

D. Pitting on the bearing journals supporting the gear set

60. Manual transmission lubricant fill level is checked by:

A. A dipstick on the side of the transmission case similar to engine oil

B. Removing the drain plug at the bottom and observing fluid flow

C. Listening for transmission noise during operation and topping up if noisy

D. Removing the fill plug on the side of the case and checking that lubricant is at the bottom edge of the fill hole (or per the manufacturer's procedure)

61. To measure the voltage drop in a starter ground cable, the technician connects:

A. One DMM lead to the battery positive and the other to the starter motor body

B. The DMM in voltage mode with one lead on the battery negative post and the other on the starter body (or engine block), while the starter is being cranked

C. The DMM in resistance mode across the cable with the battery disconnected

D. The DMM in current mode in series with the cable during cranking

62. An inductive amp clamp measures current through a wire by:

A. Cutting into the wire to insert the meter in series with the load

B. Measuring the voltage drop across a known resistance in the meter

C. Detecting the magnetic field around the current-carrying wire (without requiring electrical contact)

D. Tapping into the wire's insulation with a needle probe for direct contact

63. When replacing a vehicle's battery, the technician should select a battery with:

A. The correct group size (physical dimensions and terminal position) and a CCA rating equal to or greater than the original specification

B. The smallest physical size available regardless of CCA rating

C. The highest CCA rating available, regardless of fit or group size

D. Any battery the customer prefers, regardless of dimensions or rating

64. Vehicles with engine stop-start systems typically require a battery that is:

A. A standard flooded lead-acid battery, identical to any conventional vehicle

B. A small auxiliary lithium-ion battery alongside the main battery

C. A nickel-metal hydride battery similar to hybrid vehicle batteries

D. An AGM or Enhanced Flooded Battery (EFB), designed for the high cycle counts of frequent stop-start operation

65. A smart battery sensor (or Intelligent Battery Sensor, IBS) mounted at the battery negative terminal monitors:

A. The vehicle's tire pressures through wireless communication

B. Battery current, voltage, and temperature, allowing the BCM/PCM to calculate state of charge and state of health and adjust charging system output

C. The exhaust gas composition at the catalytic converter

D. The vehicle's ambient air temperature for HVAC control

66. A modern LED headlight assembly that goes from full output to no output suddenly typically has:

A. A burned-out LED diode that requires replacing the entire bulb

B. A failed cooling fan inside the LED assembly during operation

C. A failed LED driver (electronic ballast) module, which converts vehicle 12V into the constant-current LED supply

D. A failed lens that has cracked and shorted internally

67. A High Intensity Discharge (HID) headlamp uses a ballast to:

A. Provide the high-voltage start pulse (often 20,000+ V) to ignite the arc, then regulate the steady-state operating current at lower voltage

B. Convert AC current from the alternator into DC current for the bulb

C. Cool the HID bulb during operation with a small fan

D. Generate the required ultraviolet light directly without needing a bulb

68. A typical 12V automotive door lock actuator (DC motor with internal cam) draws current:

A. Continuously while the door is locked, holding the cam in position

B. Only during initial pulse, then zero current for hours of operation

C. At full battery current at all times when the door is closed

D. Briefly during the lock/unlock motion (typically 0.5-2 amps for 0.5-1 second), then zero current at rest

69. After replacing a memory seat module or disconnecting the battery on a vehicle with memory seats, the technician should:

A. Drive the vehicle for 100 km before any seat adjustments are made

B. Reinitialize the seat memory positions per the manufacturer's procedure (often by cycling the seat to its limits)

C. Replace all of the seat motors at the same time

D. Send the seat memory module to the manufacturer for factory recalibration

70. The A/C compressor clutch coil resistance, measured at the connector with the system off, is typically:

A. Less than 0.1 ohm — a near-short circuit

B. Open circuit — the coil is not part of a complete electrical path until energized

C. Several ohms (typically 3-5 ohms), with significant out-of-spec readings indicating a failed coil

D. Several hundred ohms, like a sensor resistance

71. An A/C system's "pressure-temperature chart" is used to:

A. Compare measured refrigerant pressures (at known ambient temperatures) against expected pressures for a properly charged system, identifying under/overcharge or faults

B. Calculate the volume of refrigerant present in the system in litres

C. Determine the engine's coolant temperature during A/C operation

D. Set the cabin temperature setpoint on the climate control system

72. When recharging an A/C system, the technician should:

A. Charge by weight to manufacturer specification using an electronic recovery/recharge machine that measures dispensed refrigerant

B. Charge by visual observation of the sight glass on the receiver-drier

C. Charge to a target low-side pressure regardless of ambient temperature

D. Charge until the high-side pressure stops rising during the addition

73. Coolant flows through the heater core:

A. Only when the cabin temperature is set to maximum heat

B. Only when the engine is below operating temperature

C. Whenever the engine is running, with cabin temperature controlled by a blend door directing air over the heater core (or a coolant valve on some vehicles)

D. Reversed during A/C operation to provide cooling instead of heating

74. A "combination" cabin air filter differs from a standard particulate cabin filter because:

A. The combination filter is replaced more often than the particulate filter

B. The combination filter contains an activated charcoal layer that absorbs odours and gaseous contaminants in addition to the particulate-trapping fibre layer

C. The combination filter is for use only in cold climates with specific humidity

D. The combination filter is a heater core protective screen, not a cabin filter

75. The "mode door" in a vehicle's HVAC case directs cabin airflow to:

A. Different outlets (face vents, floor, defrost) based on the driver's mode selection, with intermediate positions blending two destinations

B. Recirculation or fresh air intake at the front of the HVAC case only

C. The blend between heater core and evaporator for temperature control

D. The blower motor speed during fan operation

76. To adjust a vehicle's headlamp aim, the technician should:

A. Stand in front of the vehicle and visually estimate the beam pattern at night

B. Position the vehicle on a level surface at the manufacturer-specified distance from a wall, then adjust the beam pattern to reference points using the aim adjusters

C. Loosen the headlamp mounting bolts and shift the entire housing for desired aim

D. Replace the headlamp bulb with a higher-wattage bulb to improve aim

77. An "automatic high-beam" or "high-beam assist" feature uses:

A. The driver's voice command processed through the infotainment system

B. The vehicle's wheel speed sensors to determine when to switch beams

C. The vehicle's GPS to know when entering an urban area for low beams

D. A forward-facing camera (often the same used for lane keeping) that detects oncoming headlights or preceding taillights, dimming the high beams automatically

78. A power seat memory module stores:

A. Seat position parameters (cushion height, fore/aft, recline, lumbar, mirror on some vehicles) associated with each memory button, recalled when pressed

B. The total time the seat has been occupied by each driver

C. The total weight applied to the seat over its service life

D. The seat heater duty cycle history for diagnostic purposes

79. In a typical North American automotive wiring diagram, a wire labeled "BLK/WHT":

A. Indicates a wire that is black on one end and white on the other end

B. Indicates a wire that carries an alternating black/white digital signal

C. Indicates a wire with black insulation and a white tracer (stripe), with this colour combination identifying a specific circuit

D. Indicates a wire that connects only black-coded and white-coded components

80. An insulation resistance (megger) test on body wiring is used to:

A. Measure the wire's current-carrying capacity at maximum load

B. Verify the wire's insulation has not degraded by applying a high test voltage (500V or 1,000V DC) and measuring leakage to ground; high resistance indicates good insulation

C. Calculate the voltage drop across the wire under normal operation

D. Test the wire's mechanical strength against pulling forces

81. A 12V-to-120V power inverter installed in a vehicle must be:

A. Connected only at the dashboard cigarette lighter outlet for all loads

B. Charged separately from a wall outlet before each use

C. Operated only when the engine is running at exactly idle speed

D. Properly grounded to the vehicle chassis and sized for the intended load, with safe wiring to handle the high 12V-side current

82. Vehicles use relays in the headlamp circuit to:

A. Switch the high-current headlamp circuit through a relay coil driven by the lower-current headlamp switch, reducing voltage drop and switch wear

B. Convert the 12V battery voltage to the higher voltage required for headlamps

C. Filter the signal to the headlamp to remove DC ripple from the alternator

D. Detect headlamp failure and report it through the network to the dashboard

83. On a typical alternator, the charging warning lamp:

A. Is powered directly from the battery without any reference to alternator output

B. Lights only when the battery has dropped below 8 volts of charge

C. Is connected between ignition-switched power and the alternator's "L" terminal; the lamp lights when there's a voltage difference and goes out when alternator output matches ignition voltage

D. Lights when the alternator is producing maximum output during heavy load

84. Brake fluid boiling point is critical because:

A. Cold brake fluid boils at low temperature and reduces braking effectiveness in winter

B. If brake fluid boils at the caliper (during heavy braking), the resulting vapour compresses under pedal pressure and the brakes lose effectiveness (brake fade)

C. Boiling brake fluid is the normal condition during operation that proves the system is working

D. Brake fluid boiling point only matters during the initial vehicle break-in period

85. DOT 5 brake fluid differs from DOT 4 and DOT 5.1 because:

A. DOT 5 has a lower boiling point than DOT 4

B. DOT 5 must be used in vehicles with ABS systems exclusively

C. DOT 5 is the new industry standard, replacing DOT 4 and DOT 5.1 entirely

D. DOT 5 is silicone-based (not glycol-based), is hydrophobic, and is NOT compatible with DOT 4 or DOT 5.1 systems — mixing them causes brake system damage

86. A soft, spongy brake pedal that improves slightly with repeated pumping typically indicates:

A. Air in the hydraulic system, which compresses under pedal pressure and gradually compacts with each pump

B. A failed brake booster reducing pedal effort assistance

C. Glazed brake pads producing reduced friction at the rotor

D. A failed proportioning valve restricting brake pressure to the rear

87. On a healthy vehicle, the ABS warning lamp:

A. Should always be on whenever the engine is running

B. Should never illuminate at any time

C. Illuminates briefly during the bulb check at key-on, then goes out as the ABS module completes its self-test; a lamp that stays on after start indicates an ABS fault

D. Illuminates only when the ABS is actively pumping during a stop

88. A vehicle's "hill-start assist" or "hill-hold" feature:

A. Increases engine power on inclines automatically through the throttle position sensor

B. Briefly maintains brake pressure (after the driver releases the brake pedal) until the driver applies the accelerator, preventing the vehicle from rolling backward on an incline

C. Engages the parking brake automatically whenever the vehicle is on a hill

D. Disables the transmission's automatic shift up during hill ascents

89. A brake-by-wire system on a modern hybrid or EV:

A. Uses an electronic actuator to generate hydraulic pressure based on a pedal sensor input (rather than a direct hydraulic link from pedal to master cylinder), enabling regenerative blending and other advanced functions

B. Eliminates all hydraulic components in favour of electric motors at each wheel

C. Operates only when the vehicle is moving above 30 km/h

D. Uses wireless communication between the pedal and the brake calipers

90. On a vehicle with an Electronic Parking Brake (EPB), before pressing the caliper piston back for brake pad replacement, the technician must:

A. Disconnect the battery for at least 30 minutes before opening the caliper

B. Apply maximum manual force to the caliper to retract the piston mechanically

C. Drain the brake fluid completely before servicing the caliper assembly

D. Activate the EPB's service mode through the scan tool (or per manufacturer procedure), which retracts the EPB motor and allows the piston to be pressed back

91. A mechanical brake pad wear indicator (the "squealer" type) produces audible noise when:

A. The brake fluid level drops below the minimum mark in the reservoir

B. The brake pads have been replaced with the wrong size pads for the caliper

C. The pad has worn down to expose a metal tab that contacts the rotor, producing a high-pitched squeal as an audible warning

D. The pads have not been properly bedded in after replacement service

92. On a brake rotor, the "minimum thickness" and the "discard thickness" specifications:

A. Are identical values, with no difference between the two

B. Differ: discard thickness is the minimum safe thickness for continued use; minimum thickness after machining is slightly thicker, leaving some material for wear before discard

C. Both specify the same rotor diameter for service

D. Apply only to brake drums, not to disc rotors

93. A flexible brake hose must be installed with:

A. Sufficient length and free movement to allow suspension and steering travel without binding, kinking, or rubbing; positioned to avoid twisting during cycling

B. Maximum tension at all suspension positions to prevent any movement of the hose

C. The hose connections crossed left-to-right to provide redundancy

D. Cable ties securing the hose tightly to the strut for stability

94. On a typical ABS-equipped vehicle, the ABS module performs a self-test:

A. Only during emergency braking events when ABS is activated

B. Only when the technician commands it through a scan tool

C. Once during the vehicle's first start-up after manufacturing, then never again

D. At each key-on (with the ABS lamp briefly illuminating), and a dynamic self-test at low vehicle speed (around 7 km/h) where the pump and valves are exercised

95. An Electric Power Steering (EPS) system uses a torque sensor mounted on the steering column or steering rack to:

A. Measure the vehicle's speed at the steering wheel during operation

B. Detect the angle of the steering wheel during normal driving

C. Measure the driver's steering input torque, with the EPS module providing proportional assist through the electric motor

D. Determine the position of the steering rack within its full travel range

96. Variable-assist (speed-sensitive) power steering provides:

A. The same assist regardless of vehicle speed for consistent feel at all speeds

B. More assist at low speeds (parking, slow maneuvers) and less at higher speeds, for parking ease and stable highway feel

C. Power steering only when the engine is at full operating temperature

D. Manual steering at low speeds and assisted steering only at highway speeds

97. A tire that is consistently under-inflated typically wears:

A. On both outer edges (shoulders) of the tread, because the under-inflated tire flexes and contacts the road more on the shoulders than in the centre

B. In the centre of the tread only, with the edges showing little wear

C. Uniformly across the tread, identical to a properly inflated tire

D. In a diagonal pattern from corner to corner of the tread

98. A tapered wheel bearing seal is installed with:

A. The seal lip facing outward (away from the bearing) to keep dust out

B. The seal flush with the hub surface only, with no specific orientation

C. The seal pressed in backwards to allow lubricant to flow outward

D. The seal lip facing inward (toward the bearing and lubricant), so the lip's spring force keeps lubricant in and contamination out

99. A tire's "load index" — the two- or three-digit number on the sidewall (e.g., "95") — represents:

A. The minimum inflation pressure required for the tire in psi

B. The tire's age in years from the date of manufacture

C. The maximum load capacity of the tire in kilograms (or pounds) at its specified inflation, looked up in a table (e.g., 95 = 690 kg)

D. The tire's speed rating in km/h

100. A tire's "speed rating" — the letter on the sidewall (e.g., "H") — represents:

A. The minimum inflation pressure required for the tire's operation

B. The maximum sustained speed the tire can carry its rated load (e.g., H = 210 km/h, V = 240 km/h, Z = above 240 km/h)

C. The tire's tread depth when new from the factory

D. The traction class of the tire (e.g., A, B, C) under UTQG specifications

101. A vehicle has a steering wheel oscillation (shimmy) that begins around 80 km/h and worsens with speed, accompanied by a vibration in the seat. The most likely cause is:

A. A failed brake booster reducing pedal effort assistance during operation

B. Worn engine mounts that allow engine vibration to travel to the steering

C. A failed alternator that has affected the steering system electrical supply

D. Out-of-balance front tires/wheels (or wheel runout, or worn front suspension/steering components that allow movement at speed)

102. A worn outer tie rod end is detected by:

A. Grasping the tire at 3 and 9 o'clock and rocking side-to-side; play felt at the tie rod ball stud indicates wear

B. Rotating the steering wheel through its full range and listening for noise

C. Driving the vehicle at highway speed and checking for vibration

D. Replacing the tie rod and checking if the steering improves after replacement

103. On a parallelogram steering system (older RWD vehicles), the center link's condition is inspected by:

A. Driving the vehicle on uneven pavement and listening for noise

B. Removing the center link from the vehicle for bench inspection only

C. With wheels on the ground and suspension loaded, checking each ball joint or socket on the center link for play, plus inspecting the link itself for bending or damage

D. Measuring the centre link's electrical resistance for continuity

104. To verify that a contaminated brake fluid is actually petroleum-contaminated (and not just darkened by age), the technician can:

A. Boil a sample to verify the boiling point is normal

B. Place a few drops on paper and observe for an oily ring or smell, or use a tester confirming hydrocarbon contamination; rubber seals near the fluid will swell

C. Filter the fluid through a paper filter to remove any debris first

D. Add a stabilizing additive and verify the fluid clears within 24 hours

105. A vehicle has a brake pedal that is rock-hard, with minimal pedal travel and very high effort required to stop. The most likely cause is:

A. Excessive air in the hydraulic system at all four wheels

B. Glazed brake pads producing low coefficient of friction

C. A failed master cylinder allowing fluid bypass

D. Loss of brake booster vacuum (e.g., failed booster, broken vacuum line, or failed check valve), removing the power assist that normally amplifies pedal effort

106. A vehicle's steering column lock (engaged when the key is removed) is unlocked by:

A. Inserting the key (or pressing start) while gently rocking the steering wheel to release preload, allowing the ignition cylinder to turn

B. Disconnecting the battery to electrically release the lock

C. Removing the steering wheel for access to the lock mechanism

D. Heating the steering column to expand the metal and release the lock

107. Modern airbag inflators have transitioned from older sodium azide chemistry to newer chemistries (e.g., guanidine nitrate) because:

A. The newer chemistry produces a larger airbag fill for better occupant protection

B. The newer chemistry is significantly less expensive to manufacture

C. The newer chemistry is more stable, produces fewer toxic byproducts, and has fewer long-term safety concerns; sodium azide is highly toxic

D. The newer chemistry deploys more slowly to reduce occupant injury

108. A side curtain airbag deploys when the SRS module detects:

A. A side impact (from sensors in the doors or B-pillars) above a calibrated severity threshold, or a rollover event detected by a roll-rate sensor

B. A frontal impact above a calibrated severity threshold during normal operation

C. The driver pressing a manual deployment button on the dashboard

D. The vehicle exceeding 100 km/h continuously for more than 30 minutes

109. A seat belt with visible fraying, cuts, or burn marks on the webbing:

A. Can be repaired by sewing a patch over the damaged area

B. Will function normally for several more years before requiring replacement

C. Is normal wear and tear that does not affect the belt's function in a crash

D. Must be replaced as a complete assembly (webbing, retractor, anchor); damaged webbing may not hold occupant loads in a crash

110. A seat belt retractor that automatically locks the belt when sharp vehicle deceleration occurs (or when the belt is pulled rapidly) but allows free movement during normal use is:

A. A manual retractor (MR) — the driver must lock the belt by hand

B. An automatic locking retractor (ALR) — the belt is locked at any drawn position

C. An emergency locking retractor (ELR) — the most common type on modern vehicles, locking only when a crash or rapid pull is detected

D. A pre-tensioning retractor (PTR) — locks only after airbag deployment

111. LATCH (Lower Anchors and Tethers for Children) child seat anchor points are:

A. Installed by the dealer at the customer's request when a child seat is needed

B. Built into the vehicle's structure at specified locations (often between seat cushion and seat back), rated for child seat weights up to a specified maximum

C. Removable connectors that the child seat carries and clips into the vehicle floor

D. Only available on vehicles built since 2020 model year

112. Federal motor vehicle safety standards in Canada and the United States require power window pinch protection on:

A. All power windows in all vehicles built since 1980

B. Power windows with one-touch (auto-up) operation, which must reverse direction if an obstruction is detected before the window fully closes

C. Only the driver's window, with no protection required on the other windows

D. Only vehicles with manual transmission, where the driver may be distracted

113. During collision repair, structural body adhesive (panel bonding adhesive) is typically:

A. Applied with hand-mixing the two components in a paper cup

B. Cured with a heat gun at high temperature for rapid setting

C. Dispensed from a two-part cartridge through a static mixer nozzle, applied to clean prepared surfaces per the manufacturer, and cured for the specified time

D. Used only for non-structural trim attachment, not for any structural panels

114. A vehicle's heated exterior mirror typically uses:

A. A glow plug similar to a diesel engine glow plug for heating

B. Hot coolant routed through small tubes inside the mirror housing

C. A small electric fan inside the mirror to blow warm air across the glass

D. A resistive heating grid bonded to the back of the mirror glass, powered through the mirror's wiring when the rear defrost (or heated mirror switch) is activated

115. An auto-dimming (electrochromic) rear-view or side mirror uses:

A. A forward-facing photodiode that detects ambient light and a rearward-facing photodiode that detects glare; the mirror's electrochromic gel darkens when glare exceeds ambient

B. A liquid crystal display that the driver adjusts manually with a dial

C. A motor that physically tilts the mirror downward when glare is detected

D. A separate camera that displays a video feed instead of using mirrored glass

116. After replacing a sunroof glass panel, the technician should:

A. Drive the vehicle for 100 km before testing the sunroof's seal performance

B. Apply additional silicone sealant around the glass for additional water sealing

C. Adjust the glass position to ensure even gap and flush alignment with the roof, then verify the seal performs correctly through a water test

D. Leave the new glass in its factory position with no adjustment required

117. High-voltage cables on a hybrid or EV are typically shielded with a metallic braid that:

A. Carries the return current from the load back to the battery

B. Provides electromagnetic shielding to contain EMI from the HV switching circuits, preventing interference with low-voltage electronics and external equipment

C. Provides mechanical strength to the cable against road impacts

D. Acts as the primary HV conductor with the inner wire as the return

118. EV battery packs use three common cell formats: cylindrical (e.g., 18650, 21700), prismatic (rectangular hard case), and pouch. Compared to cylindrical and prismatic cells, pouch cells:

A. Have the highest internal pressure tolerance of the three formats

B. Have rigid metal cases that are easy to manage thermally

C. Are most commonly used in tools and small electronics rather than EVs

D. Have flexible foil packaging without a rigid case, providing high energy density and design flexibility, but requiring careful pack-level mechanical and thermal management

119. Modern EV traction motors are commonly cooled by:

A. A liquid cooling system (water/glycol or oil) circulated through passages around the stator and through the rotor on some designs, removing heat from windings and magnets

B. A small electric cooling fan blowing air directly over the motor housing

C. The vehicle's engine cooling system shared with the gasoline engine

D. Passive convection only, with no active cooling system at all

120. A modern EV's high-voltage battery capacity is rated in:

A. Amp-hours (Ah) only, representing the total charge the battery can hold

B. Cubic centimetres (cc) of cell volume in the pack

C. Kilowatt-hours (kWh) — total energy capacity, approximately pack voltage × Ah; typical EVs range from 40 kWh (compact) to 100+ kWh (large)

D. Kilometres of estimated range only, with no underlying energy measurement

121. An EV's driving range typically decreases significantly in cold weather (e.g., -20°C) because:

A. The battery's chemical reactions become more efficient at cold temperatures

B. Cold reduces lithium-ion battery performance (lower power, less usable capacity), and the cabin heater plus battery preconditioning draw significant power, both reducing range

C. The motor's efficiency drops to near zero at cold temperatures

D. Cold air contains less oxygen, reducing motor combustion efficiency

122. Modern DC fast chargers (Level 3) deliver power at levels typically ranging from:

A. 1-3 kW, similar to a standard household outlet load

B. 7-11 kW, similar to a Level 2 home charger

C. 22-30 kW, available at most public Level 2 stations

D. 50-350 kW (and higher in newer installations), with charging rates limited by the vehicle's maximum DC capability and the charger's output

123. In the past several years, most North American automakers have announced adoption of the NACS (North American Charging Standard) connector, which:

A. Replaces Level 1 AC charging at residential outlets only

B. Eliminates the J1772 connector for AC charging permanently

C. Originally developed by Tesla and opened to industry adoption, providing a smaller, lighter connector with both AC and DC charging through a single port

D. Provides only AC charging and cannot deliver DC fast charging

124. When responding to an EV after a collision, first responders (and technicians who arrive at the scene) should:

A. Treat the HV system as energized until verified safe; consult the Emergency Response Guide, avoid contact with orange HV cables and damaged battery, and ventilate enclosed spaces

B. Cut all orange HV cables to de-energize the system immediately

C. Pour water on the high-voltage battery to discharge it before extraction

D. Disconnect the 12V battery and assume the HV system is safe to handle

125. When towing a disabled EV with damaged or stuck drive wheels, the technician should:

A. Tow with the drive wheels on the ground using a tow rope at any speed

B. Disconnect the high-voltage battery before towing for safety always

C. Tow with all four wheels off the ground (flatbed) or per manufacturer procedure; driving the drive wheels while systems are off can damage motors, regen circuits, or the battery

D. Place the vehicle in neutral and tow normally, as all EVs tow safely on the ground

Practice Exam 10: Answer Key and Explanations

1. C — Customer property must be documented and secured. Documenting the wallet on the repair order creates a record of the shop's possession, and securing it per shop protocol (typically a locked drawer at the service desk) plus informing the advisor protects both the customer's belongings and the shop from liability if items go missing during service.

2. D — Manufacturer service information contains the exact specifications, procedures, wiring diagrams, and TSBs for the specific vehicle being repaired. Generic manuals lack the depth and current updates required for modern computerized vehicles, and owner's manuals contain only operating information, not repair procedures or torque specs.

3. B — When the actual repair cost will exceed the authorized estimate by more than the regulated threshold (varies by province, often around 10 percent), the technician must stop, contact the customer, and obtain authorization before continuing. Provincial consumer protection legislation makes unauthorized work non-billable, regardless of how necessary the repair was.

4. A — A quality control road test verifies the repair functions correctly under real driving conditions before the vehicle leaves the shop. Brakes, steering, suspension, and driveline repairs all require dynamic verification — catching a defect on the test drive prevents a comeback and protects the customer from being released in an unsafe vehicle.

5. C — Each worker applies their own LOTO lock and is the only person authorized to remove it, with rare written exceptions when the worker is genuinely unavailable (sick, off-shift, away). The rule prevents anyone from energizing equipment another worker is still inside or working on, the central safety principle of any LOTO program.

6. A — SAE is the Society of Automotive Engineers, the international engineering standards body for ground vehicles and aerospace. SAE standards cover everything from OBD-II diagnostic protocols (J1979, J1962) to oil viscosity grades (5W-30), threaded fasteners, and J2534 reprogramming interfaces.

7. D — Red Seal apprenticeships in Canada combine on-the-job training hours (typically several thousand) with periodic in-school technical training blocks over multiple years, ending with a certification exam. Both elements are required: hours alone produce a competent worker but not a certified one, and schooling alone produces no shop experience.

8. B — Customer comprehension determines whether they make an informed decision about the recommended repair. Plain language with concrete analogies and visual aids (showing the worn part, pointing at a diagram) communicates the diagnosis without intimidating jargon and helps the customer understand why the repair is needed.

9. C — Manufacturer safety recalls are performed at no cost to the customer at any authorized dealer of that brand, regardless of where the vehicle was purchased or how old it is. Informing the customer of an open recall is part of professional customer service and ensures the safety concern is addressed.

10. D — A "short block" includes the engine block, crankshaft, pistons, connecting rods, and oil pump — the rotating assembly inside the block. A "long block" adds the cylinder heads and valve train; a "complete" or "dressed" engine adds external accessories.

11. A — Engine break-in seats piston rings against cylinder walls, beds in bearings, and conditions the friction surfaces. Variable speed and load (avoiding both extremes — sustained highway cruise and very light load) produces the cylinder pressure variation needed to seat rings, with the specific break-in oil and procedure dictated by the engine builder.

12. B — Aligned ring gaps create a single straight path for combustion gases to blow past the rings into the crankcase, destroying compression and ring seal. Staggering the gaps (typically at clock positions specified by the engine builder) ensures each ring covers the gap of the others, maintaining cylinder pressure.

13. D — The thrust bearing is the bearing (or bearing shell) that constrains the crankshaft's axial movement, typically located at one main bearing position. Wear of the thrust bearing produces excessive endplay, often caused by riding the clutch in manual transmissions or torque converter issues in automatics.

14. A — Air bypassing the piston rings escapes into the crankcase and exits at the lowest pressure opening, often the oil filler cap. Other escape locations would point to different faults: intake (intake valve), exhaust (exhaust valve), radiator (head gasket), and adjacent cylinder (head gasket between cylinders).

15. C — The W rating ("winter") describes the oil's flow at low temperature; lower numbers mean thinner flow at cold start, enabling oil to reach critical surfaces before damaging dry friction occurs. The second number (30) is the operating-temperature viscosity at 100°C, controlling film thickness when the engine is warm.

16. B — The bypass valve protects the engine when the filter cannot pass full oil flow — either because the element is restricted by accumulated debris or because cold-thick oil exceeds the filter's flow capacity. Bypassing dirty oil is better than starving the engine of all oil, the worse of the two failure modes.

17. D — The block test fluid changes colour (typically blue to yellow or green to yellow) when exposed to combustion gases (CO_2, hydrocarbons) in the coolant vapour space. A positive result indicates combustion is breaching the cooling system through a head gasket, cracked head, or cracked block.

18. C — A thermostat stuck open allows coolant to circulate through the radiator continuously, so the engine cannot reach operating temperature in cold weather. The driver typically notices a temperature gauge that never reaches normal, poor heater output at idle, and increased fuel consumption due to extended open-loop fuel control.

19. A — Coolant entering the intake manifold flows into one or more cylinders during intake strokes; small amounts produce white exhaust steam and rough running, but liquid pooling at engine-off creates a non-compressible volume that causes hydrolock and bent connecting rods on the next start attempt.

20. B — A fixed injector pulse delivers a consistent fuel mass only when fuel rail pressure stays constant relative to intake manifold pressure. By referencing manifold vacuum, the regulator subtracts

from rail pressure when vacuum is high (idle) and adds when vacuum is low (WOT), keeping the injector differential constant.

21. D — Closed-loop control means the PCM closes the feedback loop with the upstream O2 sensor, continuously adjusting fuel trim to hold the air-fuel ratio at the stoichiometric target (14.7:1 for gasoline). Open loop, used during cold start, WOT, and other limited conditions, runs without O2 feedback.

22. C — Stoichiometric is the mass ratio at which the available oxygen exactly oxidizes all the fuel — for gasoline, 14.7 parts air to 1 part fuel by mass. Modern closed-loop fuel control targets this ratio because three-way catalyst efficiency for HC, CO, and NOx is highest near stoichiometric.

23. A — A healthy three-way catalyst stores oxygen, which damps the rich/lean oscillation of the exhaust gases. The downstream sensor signal therefore appears as a relatively flat line near 0.65 V while the upstream sensor still switches rapidly between rich and lean — the ratio of switch counts (or signal amplitude) quantifies catalyst efficiency.

24. B — When boost pressure reaches the setpoint, the wastegate opens an exhaust bypass around the turbine, reducing turbine drive energy and limiting compressor speed. Boost can therefore be capped without restricting the intake, preserving response and efficiency below the setpoint.

25. D — VGT moves a ring of pivoting vanes around the turbine inlet, varying the effective nozzle area. Closed vanes accelerate exhaust flow onto the turbine for boost at low RPM, while open vanes relax flow at high RPM, broadening the useful boost range compared to a fixed wastegated turbo.

26. B — Cetane number rates a diesel fuel's readiness to autoignite under compression; higher cetane means a shorter ignition delay between injection and combustion. Short ignition delay produces smoother combustion, lower noise, easier cold starts, and reduced unburned-fuel emissions.

27. A — Glow plugs are resistive heaters inside the prechamber or combustion chamber that raise local temperature to assist cold compression-ignition. They are energized briefly before cranking (the "wait to start" lamp) and continue afterglow for a short period after start to stabilize combustion until the engine warms.

28. C — Modern cooling fan control responds to both engine cooling demand (ECT, intake air temperature, transmission temperature) and A/C demand (high-side pressure, which proxies cooling needed at the condenser). The primary fan handles light loads; the auxiliary stages in when temperature or pressure climbs further.

29. D — Air trapped in the cooling system interrupts coolant flow through the heater core (causing cold heater output) and prevents stable circulation around the engine, producing erratic temperature gauge behaviour and gurgling sounds in the dashboard. Proper bleeding through a bleed port or vacuum-fill tool removes the air.

30. B — Modern direct-injection diesels often use an intake-grid heater rather than glow plugs, heating incoming air during cranking and the first minutes after start. Raising the air temperature increases the temperature at the end of compression, allowing reliable ignition without glow plugs in the combustion chamber.

31. A — The purge valve opens a path from the EVAP canister to the intake manifold during specific PCM-controlled conditions (typically with engine warm and in closed-loop). Manifold vacuum draws stored vapours out of the charcoal, into the engine, and into the combustion chamber where they burn with the normal fuel charge.

32. C — SAE J1962 requires the DLC to be located in the driver's compartment, within 600 mm (about 24 inches) of the steering wheel, and accessible without tools. This standardization means scan tools from any manufacturer can be plugged in quickly during diagnosis or emissions testing.

33. B — Low-speed CAN typically runs in a fault-tolerant mode where each wire normally rests at one supply rail (around 0 V and 5 V) and signals dominant by pulling closer together. The single-wire fallback lets the bus continue working at reduced speed if one wire opens or shorts, which is impossible on high-speed differential CAN.

34. D — Cryptographic signatures verify both the integrity (the file has not been altered) and the authenticity (it came from the manufacturer's signing key) of an update before the target module accepts it. Without signing, any party could load malicious or unauthorized software into a vehicle module.

35. D — Connected vehicles expose attack surfaces (cellular modem, Wi-Fi, Bluetooth, OBD-II, third-party telematics dongles) that an attacker can use to reach internal networks. Because some internal

networks control safety-critical functions (brakes, steering, throttle), cybersecurity protections on those interfaces directly protect occupants.

36. C — OTA updates download through cellular or Wi-Fi in the background, then prompt the driver to authorize installation. The install runs during a vehicle-off period (with battery support or while plugged in) because flashing a live module while operating safety-critical functions would create unacceptable risk.

37. B — Telematics data is regulated by privacy legislation (PIPEDA federally, with provincial laws in some provinces) and by the manufacturer's data-handling policies. The technician should not access, copy, sell, or alter telematics data beyond what is necessary for the authorized repair.

38. D — Parasitic current flows only after the vehicle's modules go to sleep, which can take 20-60 minutes depending on the manufacturer's network design. Measuring before sleep captures wake-up current, not parasitic current, so the meter is connected in series with the negative cable and the technician waits for the sleep period to expire.

39. A — Different in-vehicle subsystems have very different requirements: LIN suits cheap, slow body-control endpoints; CAN-LS and CAN-HS suit general-purpose control; FlexRay or CAN-FD suits time-critical safety; MOST/Ethernet suits multimedia and ADAS. Using the right protocol per subsystem optimizes cost, bandwidth, and reliability.

40. C — Pin 16 on the J1962 DLC is the unswitched battery positive (B+) supply that powers the scan tool when plugged in. Pin 4 is chassis ground, pin 5 is signal ground, and pins 6 and 14 carry CAN-H and CAN-L on CAN-equipped vehicles.

41. B — A CAN module enters "bus-off" when its transmit error counter exceeds 255, indicating it cannot communicate reliably. The standard recovery requires the module to be reinitialized, which an ignition cycle accomplishes by power-cycling the module and resetting its error counters.

42. D — Radar sensors produce high data rates because they report multiple object tracks (range, velocity, angle, intensity) at several hertz. Dedicated CAN-FD, FlexRay, or automotive Ethernet provides the bandwidth and determinism the ADAS module needs to fuse radar data with camera and other sensors in real time.

43. A — Live camera image data far exceeds CAN's data rate, so ADAS cameras use automotive Ethernet (100BASE-T1, 1000BASE-T1) running over a single twisted pair. Ethernet provides the throughput, low latency, and switching capability required for real-time vision processing.

44. C — Ceramic and sintered metallic linings tolerate higher temperatures and clamp loads than organic, making them suited to performance and heavy-duty applications. The trade-off is harder engagement, more noise/chatter at idle, and accelerated flywheel wear, which is why street vehicles typically run organic linings.

45. B — A CSC is integrated with the throw-out bearing and lives inside the bell housing, around the input shaft. Service or replacement requires removing the transmission (or at least separating engine and transmission) to access it, so a CSC failure is a major labour event rather than a quick part swap.

46. D — As clutches and bands wear, the apply timing changes, which would produce harsh or slipping shifts if uncompensated. The TCM measures shift quality (engine speed flare, slip time) and adjusts solenoid pressures and timing to keep shifts consistent over the transmission's life.

47. A — "Filled for life" is a marketing claim, not an absolute. Severe-service schedules (towing, heat, stop-and-go) still call for periodic ATF service, and high-mileage transmissions with original fluid frequently benefit from a fluid and filter service performed before failure occurs.

48. C — Dark brown/black ATF with a burned smell is oxidized fluid from sustained overheating, often signalling that internal clutches and bands are already heat-damaged. The technician inspects further (pan debris, scan data, road test) before promising a fluid change alone will restore normal operation.

49. B — Driveline imbalance is corrected by placing balance weights at the position and magnitude determined from an analyzer (reed tach, strobe, or electronic vibration analyzer) under live driving conditions. Random weight placement or replacing the shaft without diagnosis often fails to address the actual imbalance location.

50. D — Each U-joint introduces a sinusoidal speed variation in its output proportional to its operating angle. When the two joints' angles are equal and opposite (within about 1°), the speed variation of one cancels the other and the wheels see constant velocity, eliminating second-order driveline vibration.

51. A — The inner CV joint on most FWD vehicles is a tripod (plunge) joint, which uses three rollers on a spider sliding in a housing with three tracks. The plunge action accommodates the changing distance between the transmission and the wheel as the suspension cycles.

52. C — Backlash is set by the position of the ring gear relative to the pinion, which is controlled by the carrier bearing preload shims (or threaded adjusters). Shifting shims (or rotating adjusters) so the ring gear moves away from the pinion increases backlash, while moving it toward the pinion decreases it.

53. D — Unitized hub assemblies bolt to the steering knuckle as a sealed, pre-loaded unit, often integrating the ABS tone ring and wheel speed sensor. The unit is replaced as a whole when the bearing fails — simpler than pressing in separate races but the whole assembly is the part number.

54. B — The rear extension housing seal lives around the output shaft (or slip yoke) at the back of the transmission. Replacing it requires only removing the driveshaft, prying out the old seal, and driving in the new seal flush — no internal transmission disassembly is needed.

55. A — The filter has captured wear metal, clutch friction debris, and varnish from the previous service interval; reinstalling it with new fluid sends that debris back through the new oil. The filter is therefore replaced (or the screen cleaned) every time the fluid is serviced.

56. D — Solenoid coils are tested by checking resistance against the specification (open or shorted windings indicate failure) and by energizing the solenoid with the appropriate voltage off the vehicle to confirm it clicks open. Both tests together separate electrical from mechanical failure modes.

57. C — The countershaft is the secondary shaft in a manual transmission, driven by the input gear at engine speed and carrying the various gear pairs. Power flows from the input shaft to the countershaft, then back up through the selected gear pair to the output shaft at the chosen ratio.

58. B — New LSD clutch plates need to seat against their reaction surfaces with controlled friction, and several gentle figure-eight turns work the clutches without overheating them. Heavy or prolonged use before seating causes clutch chatter and accelerated wear.

59. A — Worn synchronizers show damage on the friction cone (smooth, polished, or burned where the cross-hatched friction surface should be) and on the engagement teeth that lock the synchronizer ring to the gear. Wear here causes grinding on shift even with proper clutch operation.

60. D — Manual transmission lubricant is checked by removing the side-mounted fill plug; correct level is at the bottom edge of the fill hole. Some recent transmissions specify alternative procedures (level checks at temperature, or sealed-for-life with no service), so the manufacturer's procedure is always referenced first.

61. B — Voltage drop is measured in voltage mode under load: one lead on the source side (battery negative post), the other on the load-side reference point (starter case), while current flows through the cable. A high reading reveals resistance in the cable, ground point, or connection that an ohms check cannot detect.

62. C — A current-carrying wire produces a magnetic field proportional to the current. The inductive clamp's split core captures that field as the wire passes through the open jaw, converting it to a meter reading without breaking the circuit or contacting the conductor.

63. A — Group size assures correct physical fit (length, width, height, and terminal arrangement) for the battery tray and cable layout; CCA at or above the original rating guarantees adequate cranking power in the coldest expected conditions. Substituting on either dimension causes installation or performance problems.

64. D — Stop-start systems crank the engine many more times per trip than conventional vehicles and continue to run accessory loads from the battery during each restart. AGM and EFB batteries are specifically designed for the deeper cycling and faster recharge demanded by this duty.

65. B — The IBS measures battery current (through a precision shunt), voltage, and temperature, sending the data to the BCM/PCM. With this data the vehicle calculates state of charge and state of health, adjusts charging voltage, and triggers stop-start permission or restart-protection as needed.

66. C — A modern LED headlamp's diodes themselves have very long life; the most common failure is in the LED driver, the electronic module that converts 12V into the constant-current supply the LEDs need. Replacing the driver (or driver-bulb assembly) typically restores operation without changing individual diodes.

67. A — HID arc bulbs require thousands of volts to strike the initial arc, then sustain operation at much lower voltage and tightly regulated current. The ballast performs both functions: an ignition transformer produces the start pulse, and a switching regulator maintains operating current after the arc establishes.

68. D — Modern door lock actuators run for less than a second to drive the cam through its lock or unlock travel, drawing 0.5-2 amps during that brief motion and then drawing nothing while the door is at rest. Continuous current would overheat the motor and drain the battery overnight.

69. B — After a memory module replacement or battery disconnect, the seat must be cycled to relearn its travel limits (and the customer must store new preset positions on the memory buttons). The procedure varies by manufacturer but always involves an initialization sequence rather than ordinary driving.

70. C — An A/C compressor clutch coil is a single solenoid winding with a resistance of a few ohms (typically 3-5). Significantly higher resistance indicates open or partially burned windings; near-zero resistance indicates a shorted coil — either failure prevents proper clutch engagement and is grounds for replacement.

71. A — The pressure-temperature chart cross-references ambient temperature to the expected low-side and high-side pressures for a correctly charged system. Measured pressures that fall outside the expected range at a given temperature point to specific faults: undercharge, overcharge, restriction, inefficiency, or non-condensables.

72. A — Modern A/C systems are charged by weight (typically 400-900 g, depending on vehicle) using a recovery/recharge machine that measures the refrigerant dispensed. Charging by pressure or sight glass is unreliable because system pressures vary with ambient temperature and load.

73. C — Coolant flows continuously through the heater core whenever the engine is running on most vehicles. Cabin temperature is controlled by a blend door that proportions cool evaporator air and warm heater-core air; a coolant control valve, where fitted, gates flow when no heat is requested.

74. B — A combination filter adds a layer of activated charcoal (or similar adsorbent) to the standard particulate fibre layer, capturing odours, hydrocarbons, and gaseous pollutants in addition to dust and pollen. The cost premium buys noticeably better cabin air quality in urban driving.

75. A — Mode doors route the cabin airflow to the dash vents, the floor outlets, the defrost outlets, or combinations thereof, based on the driver's mode selection. Intermediate positions blend air between two destinations, such as the "bi-level" position that delivers air to both vents and floor.

76. B — Headlamp aim is set by positioning the vehicle on a level surface at the manufacturer-specified distance from a wall or aiming screen, then adjusting the beam pattern (cutoff line, hot-spot location) to the reference points using the aim adjusters on the housing. Visual or seat-of-the-pants estimation does not produce a legal pattern.

77. D — High-beam assist uses the forward-facing camera (often the same one used for lane keeping and traffic-sign recognition) to detect oncoming headlights and preceding taillights. When traffic is detected within the relevant range, the system commands low beams; when the road clears, high beams return automatically.

78. A — The memory seat module stores the seat position parameters (cushion height, fore/aft, recline, sometimes lumbar and outside-mirror position) for each driver memory button. Pressing a memory button retrieves the stored values and drives the motors to those positions.

79. C — North American automotive wiring uses a base colour and a tracer (stripe). "BLK/WHT" means a wire with black insulation and a white tracer, identifying a specific circuit on the wiring diagram. Two-colour codes provide more unique combinations than single colours alone.

80. B — A megger applies a high test voltage (500 V or 1,000 V DC are common) and measures the leakage current to ground. Healthy insulation shows very high resistance (megohms); degraded insulation shows much lower resistance and allows leakage that low-voltage ohmmeters cannot detect.

81. D — Inverter installation requires a properly sized ground to the vehicle chassis (the AC neutral path), and the 12V input cabling and fuse rated for the inverter's peak draw. Undersized wiring or poor grounding causes voltage drop, overheating, and potential shock hazards on the AC output.

82. A — Switching the headlamp current through a relay coil — driven by the lower-current dashboard headlamp switch — reduces voltage drop in the headlamp circuit and prolongs switch life. The high-current path runs short and direct from the supply through the relay contacts to the headlamps.

83. C — The "L" terminal lamp circuit is wired between ignition-switched power and the alternator's L terminal. With the alternator producing output, the L terminal sits near system voltage, no current flows through the bulb, and the lamp is dark; with no output, the alternator side falls toward ground, current flows, and the lamp lights.

84. B — Hard braking heats the caliper, which heats the brake fluid; if the fluid boils, the resulting vapour compresses under pedal pressure rather than transmitting it to the pads. This produces brake fade — a soft pedal and dramatically reduced braking force exactly when the driver needs the brakes most.

85. D — DOT 5 is silicone-based and hydrophobic, where DOT 3, 4, and 5.1 are glycol-based and hydrophilic. The two families are not miscible: mixing them creates a contaminated, non-functional brake fluid and damages seals, so DOT 5 systems must be kept entirely separate from glycol systems.

86. A — Air in the hydraulic system is compressible; when the pedal is pumped, the bubbles compress and consolidate, briefly improving pedal firmness. Bleeding all four corners (in the correct sequence) is the proper repair; other causes produce different pedal symptoms.

87. C — On a healthy vehicle, the ABS lamp illuminates briefly at key-on as a bulb check while the module runs its power-on self-test, then extinguishes. A lamp that stays on indicates a stored ABS fault; a lamp that never lights at key-on indicates a bulb or warning circuit fault.

88. B — Hill-start assist holds brake pressure for a brief interval (typically 1-3 seconds) after the driver releases the brake pedal on an incline, giving them time to move to the accelerator without rolling backward. Once the accelerator is applied, brake pressure releases and the vehicle moves forward.

89. A — Brake-by-wire replaces the direct hydraulic link between the brake pedal and master cylinder with a pedal force/position sensor and an electronic actuator that generates the actual hydraulic pressure. The arrangement enables regenerative-braking blending and other advanced functions impossible with a purely mechanical system.

90. D — An EPB caliper has an electric motor that drives a spindle to apply the parking brake; pressing the piston back during pad service requires retracting that spindle first. The service mode (commanded by a scan tool or the manufacturer's specific procedure) retracts the motor so the piston can be pushed back safely.

91. C — The mechanical wear indicator is a small metal tab attached to the pad backing plate, positioned at the minimum-thickness reference. When the pad wears down to that level, the tab contacts the rotor and produces a high-pitched squeal as an audible warning to the driver.

92. B — The two specifications are distinct: discard thickness is the minimum allowed thickness for continued service of the rotor (replace at or below this value); minimum-after-machining is slightly thicker, leaving a margin for in-service wear after refinishing. Both values are stamped on the rotor or listed in the service information.

93. A — A brake hose must move freely as the suspension and steering travel through their full ranges, without binding, kinking, twisting, or contacting nearby components. Improper routing causes premature wear or restriction; correct routing preserves hose life and full brake function at every wheel position.

94. D — Modern ABS modules perform a static self-test at every key-on (the brief ABS lamp illumination) and a dynamic self-test once the vehicle reaches about 7 km/h, briefly exercising the pump motor and valves to confirm hydraulic function. A failure at either stage sets a DTC and illuminates the lamp.

95. C — The EPS torque sensor (typically a torsion bar with optical or magnetic sensing) measures the driver's steering input torque. The EPS module reads that torque, applies the assist curve programmed for vehicle speed and other inputs, and commands the electric motor to provide the calculated assist.

96. B — Variable-assist (speed-sensitive) steering provides high assist at low speeds for easy parking and reduced assist at higher speeds for road feel and stability. The system uses vehicle speed as the primary input, with some systems also using steering angle and yaw rate.

97. A — An under-inflated tire flexes more than it should, allowing the shoulders to carry more of the load while the centre rolls in slightly. The result is accelerated wear on both outer edges (shoulders) of the tread, with the centre relatively less worn — the opposite of over-inflation wear.

98. D — The seal lip must face the lubricant it is sealing, with its spring-loaded lip riding on the shaft to keep grease or oil contained. Installing the seal backwards lets lubricant escape and contamination enter, the worst-case outcome for a wheel bearing.

99. C — The load index is a coded number that looks up to a maximum mass per tire in a standard table (load index 95 = 690 kg, for example). Combined with the inflation pressure specification, the load index defines the maximum load capacity the tire is rated for.

100. B — The speed rating letter (S, T, H, V, W, Y, Z) specifies the maximum sustained speed the tire can safely carry its rated load — H = 210 km/h, V = 240 km/h, Y = 300 km/h, and so on. Replacement tires should match or exceed the OEM rating for the vehicle.

101. D — A speed-dependent shimmy plus seat vibration is the classic signature of front wheel/tire imbalance, lateral runout, or worn components (tie rods, ball joints, wheel bearings) that allow the wheel to oscillate at speed. The diagnosis proceeds from balance and runout checks to a hands-on suspension inspection.

102. A — Rocking the tire at the 3 and 9 o'clock positions loads the steering linkage horizontally, which is where tie rod ends carry load. Felt or visible play at the tie rod ball stud during the rocking confirms wear; the same test loaded at 6 and 12 o'clock evaluates the ball joints and wheel bearings.

103. C — The centre link is loaded by steering forces, so it is inspected with the suspension at ride height and the wheels on the ground. Each ball-and-socket connection is checked for play, and the link itself is inspected for bending, cracking, or damage from impact.

104. B — Petroleum contamination produces an oily ring and characteristic smell on a paper-towel test and triggers visible swelling of brake rubber components (master cylinder seals, caliper seals, flexible hoses). Confirmation by these means tells the technician the entire hydraulic system's rubber must be replaced after a flush.

105. D — The brake booster amplifies pedal effort using engine vacuum (or in many EVs, an electric vacuum pump or hydraulic pressure source). Loss of that assist produces a rock-hard pedal because the driver is now pushing the master cylinder unassisted, with very high effort required to generate pressure.

106. A — The lock pin in a column lock can preload against the steering shaft if the wheel is at the edge of its travel when the key was removed. Inserting the key while rocking the wheel gently releases that preload, allowing the cylinder to turn and disengage the lock.

107. C — Sodium azide propellants are highly toxic and have been linked to long-term degradation issues (the Takata recall, most notably). Guanidine nitrate and similar newer chemistries are more stable, produce less toxic byproducts, and have a safer service life, which is why the industry has transitioned away from azide-based inflators.

108. A — Side curtain deployment is triggered by side-impact sensors (in the doors or B-pillars) detecting a calibrated severity threshold, or by a roll-rate sensor detecting a rollover. Frontal-only inputs do not deploy side curtains, which protect the occupant's head specifically against side impacts and rollovers.

109. D — Seat belts are crash-load components: damaged webbing may not hold the occupant's load in a crash. They cannot be repaired by sewing or patching and must be replaced as a complete assembly per the manufacturer's procedure, which often also requires retractor replacement after a deployment.

110. C — An ELR allows free belt motion during normal driving (the occupant can lean forward to reach the radio) and locks only when the vehicle decelerates sharply or the belt is pulled rapidly, indicating a crash. ELR is the standard retractor on modern passenger vehicles.

111. B — LATCH anchors are structural mounting points built into the vehicle, located at specified positions (often between the seat cushion and seat back) and rated for a maximum child seat weight (typically 29 kg / 65 lb combined child and seat). Exceeding the rated weight requires using the seat belt routing instead.

112. B — FMVSS 118 and CMVSS 118 require pinch protection on any one-touch (auto-up) power window. The window must detect an obstruction and reverse direction before fully closing, protecting fingers, hands, and pets from injury. Windows that require continuous switch hold are exempt.

113. C — Panel bonding adhesive is supplied as a two-part epoxy in a dual cartridge, dispensed through a static mixer nozzle that combines the components as they exit. The adhesive is applied to clean, prepared surfaces per the manufacturer's bonding procedure and allowed to cure for the specified time before further work.

114. D — A heated mirror uses a resistive heating grid bonded to the back of the mirror glass, energized through wiring in the mirror harness. The heat clears frost, ice, and condensation; activation is often tied to the rear defrost switch, with a separate switch on some vehicles.

115. A — An electrochromic mirror uses two photodiodes — one forward-facing (ambient), one rearward-facing (glare) — to determine when headlights behind exceed ambient brightness. The mirror's electrochromic gel layer darkens proportionally, reducing glare without driver intervention or motor action.

116. C — A new sunroof glass panel must be aligned so its gap to the surrounding roof skin is even and its surface flush with the roof, both for appearance and for proper seal compression. A water test after alignment verifies the seal performs correctly before the vehicle is returned to the customer.

117. B — High-voltage cables generate significant EMI from the rapid switching of the inverter and motor currents. The braided shield around the cable contains this EMI, preventing it from interfering with low-voltage electronics in the vehicle and with external equipment (AM radio, sensitive medical devices).

118. D — Pouch cells use a flexible aluminum-laminate foil casing with no rigid container, achieving very high energy density and design flexibility. The trade-off is that pack-level engineering must provide the mechanical containment and thermal management that the cell case does not, with careful attention to swelling and puncture protection.

119. A — EV traction motors generate significant heat in the stator windings and (in some designs) the rotor magnets, both of which lose efficiency or fail outright if overheated. Liquid cooling (water/glycol coolant or oil) flowing through dedicated passages around and through the motor maintains the required operating temperature range.

120. C — EV battery capacity is rated in kilowatt-hours (kWh), representing the total energy the pack can store. Multiplying nominal pack voltage by total amp-hours gives kWh; typical EVs range from about 40 kWh (compact city EVs) to over 100 kWh (long-range and luxury models).

121. B — Cold reduces lithium-ion battery performance through slower ion mobility (less usable capacity, lower power capability), and the cabin heater plus battery preconditioning draw significant additional energy. Both effects combine to reduce EV range substantially at low temperatures, often by 20-40 percent.

122. D — Level 3 DC fast chargers typically deliver 50 kW (older units), 150-250 kW (modern units), or up to 350 kW (newer high-power units). The actual charging rate is limited by the lower of the charger's output capability and the vehicle's onboard DC charging acceptance rate.

123. C — NACS (originally Tesla's connector) was opened to industry adoption around 2022-2023, and most major North American automakers have committed to NACS for new vehicles. The connector is smaller and lighter than CCS, with both AC and DC charging through a single port, simplifying the charging experience.

124. A — After an EV collision, the HV system is treated as energized until verified safe with manufacturer-specified procedures and a Cat III/IV meter measurement. Emergency Response Guides (accessible online or via QR codes on the vehicle) identify cut points, MSD location, and battery hazards specific to that model.

125. C — Some EVs cannot be towed with the drive wheels on the ground without damaging the motors, regen circuits, or battery, even with the vehicle "off." Flatbed towing (all four wheels off the ground) is the universally safe approach; manufacturer procedures must be consulted for any other tow configuration.