PRACTICE EXAM 12: ASE L3 SIMULATION (45 Questions)

1. A hybrid vehicle's HV battery pack must be removed for service. Before lifting the pack out of the vehicle, the technician must:

A. Disconnect the orange three-phase AC cable from the inverter end of the cable first

B. Remove the service disconnect and verify zero voltage at all HV terminals on the pack

C. Drain all coolant from the inverter loop using the OEM-approved drain plug on the radiator

D. Disconnect the 12-volt negative battery cable for at least 60 minutes minimum before lifting

2. A hybrid vehicle that uses a parallel hybrid configuration with a small motor sandwiched between the engine and the transmission is most commonly described as a:

A. Mild hybrid that provides limited electric assist and cannot operate on electric power alone

B. Series hybrid in which the engine drives a generator that powers the wheels through a motor

C. Plug-in hybrid that can be charged from an external AC source for extended EV-only range

D. Full hybrid that switches between engine, electric, and combined operation seamlessly always

3. Two technicians are discussing torque sensors on hybrid electric power steering systems. Technician A says the torque sensor measures hydraulic pressure in the steering rack assembly. Technician B says the steering assist motor receives a constant current regardless of driver input force applied. Who is correct?

A. Technician A only

B. Technician B only

C. Both A and B

D. Neither A nor B

4. The pedal stroke sensor on a hybrid brake-by-wire system measures:

A. The amount of hydraulic pressure being generated by the master cylinder during braking

B. The angular position of the regenerative braking actuator at the rear of the master cylinder

C. The position and rate of brake pedal travel so the brake control module can calculate demand

D. The mechanical force transmitted through the pedal pushrod to the brake booster assembly

5. A hybrid vehicle is being towed. Towing with the drive wheels on the ground may:

A. Damage the transaxle because the drive motor is rotated without lubrication or cooling

B. Improve regenerative braking capability by spinning up the high-voltage battery state of charge

C. Have no effect on the vehicle since the hybrid system disengages automatically when towed

D. Charge the high-voltage battery pack through the regenerative function during the entire tow

6. The Honda Integrated Motor Assist (IMA) system places its motor-generator:

A. At the rear of the transmission directly coupled to the differential ring gear assembly

B. Between the engine crankshaft flywheel and the transmission input shaft as a thin disc

C. Inside the engine cylinder head replacing the conventional valvetrain camshaft drive

D. Mounted on the frame rail with a belt drive that powers a separate accessory pulley

7. A hybrid vehicle uses a CCS Combo charging connector. This connector accepts:

A. Only Level 1 AC charging from a standard household outlet receptacle source connection

B. Only DC fast charging from a high-power station through dedicated DC pins only at all times

C. Both AC charging (J1772 portion) and DC fast charging (added DC pins below the AC portion)

D. Only three-phase AC charging from a commercial industrial service receptacle source connection

8. A hybrid vehicle's onboard charger has a maximum AC input rating of 6.6 kW. When connected to a 240-volt Level 2 EVSE, the maximum charging current the vehicle will draw is approximately:

A. 80 amps because the EVSE provides maximum current regardless of vehicle limits set in the OBC

B. 12 amps because that is the typical Level 1 maximum current draw from household outlet receptacles

C. 40 amps because that is the typical maximum for any home Level 2 charging installation rating

D. 27.5 amps because 6.6 kW divided by 240 volts is the maximum current the OBC can accept

9. A technician is using an OEM-approved insulated tool kit to service a hybrid HV system. The insulation rating on these tools must be at minimum:

A. 600 volts AC for general use on any electrical service work performed in a shop environment

B. 1,000 volts AC to provide adequate protection above the typical hybrid pack operating voltage

C. 12 volts DC because the orange cables only carry low-voltage signal current to the inverter

D. 480 volts AC because hybrid systems are classified as commercial industrial service equipment

10. The proper torque specification for a hybrid HV battery pack terminal connection is:

A. Found in the OEM service information and is specific to the bolt size and torque pattern used

B. The same as any conventional 12-volt battery terminal of approximately 8 to 10 newton-meters

C. As tight as the technician can make it using standard hand tools to ensure low resistance

D. Within plus or minus 50 percent of the original factory specification for cost-effective service

11. A hybrid HV battery pack uses prismatic cells stacked in a rigid module assembly. Compared to cylindrical cells, prismatic cells:

A. Have higher energy density per unit volume and weigh less in a comparable module configuration

B. Are cheaper to manufacture in low volume and require simpler battery management circuit boards

C. Pack more efficiently into rectangular spaces but require careful pressure control to prevent swelling

D. Provide higher per-cell voltage so fewer total cells are needed to reach pack-level system voltage

12. A hybrid vehicle's HV battery shows a higher than normal cell delta voltage after sitting overnight. The most likely cause is:

A. The 12-volt auxiliary battery is fully charged and balancing the HV pack through the converter

B. The regenerative braking system has overcharged the highest-voltage cells during the last drive

C. One or more cells have higher self-discharge rate than the others due to internal aging or fault

D. The battery management system is performing a scheduled cell discharge cycle during the rest

13. Two technicians are discussing the DC link capacitors inside a hybrid inverter. Technician A says they smooth the DC bus voltage between the battery and the IGBTs. Technician B says they store enough energy to deliver a fatal shock for many minutes after the pack is isolated. Who is correct?

A. Technician A only

B. Technician B only

C. Neither A nor B

D. Both A and B

14. A hybrid vehicle's powertrain control module commands the engine to run continuously even when ambient temperature, SOC, and load conditions would normally allow auto-stop. The most likely cause is:

A. The HV battery pack temperature is exactly at the middle of the allowable operating range

B. A DPF regeneration or another emissions control routine is requiring the engine to remain running

C. The vehicle has been driven less than 5 miles since the last full HV battery charge cycle began

D. The cabin temperature is exactly equal to the driver-selected climate control setting at the moment

15. A scan tool displays the HV battery pack current with the manufacturer's convention of positive current indicating discharge. During steady cruise, the displayed value is +35 amps. This means the pack is:

A. Receiving regenerative braking current at a steady moderate rate during deceleration phases

B. Charging at a steady rate of 35 amps from the engine-driven generator during normal cruise

C. Supplying 35 amps to the inverter to assist with vehicle propulsion at the present moment

D. Holding state of charge with zero net current flow in either direction at the present moment

16. A typical hybrid vehicle's HV battery main contactors are designed to:

A. Be operated only with no current flowing through them; the precharge contactor handles inrush current

B. Switch under full load conditions thousands of times during normal vehicle operation each day

C. Disconnect automatically whenever the regenerative braking circuit sends current to the pack

D. Stay permanently closed during all phases of vehicle operation including the off-key state

17. A hybrid vehicle has been involved in a flood. The high-voltage system should be:

A. Operated normally because the orange cables are sealed and waterproof under all conditions

B. Drained of water by running the engine for several minutes to dry out the inverter loop completely

C. Powered up immediately to test whether any isolation faults have set during the flooding event

D. Treated as potentially compromised; the vehicle should not be powered up until inspected first

18. The Toyota hybrid system uses an electrically variable transmission (eCVT). The "continuously variable" aspect of this transmission comes from:

A. A pair of conical pulleys with a steel push belt that vary the effective drive ratio mechanically

B. Variable speed control of MG1, which alters the ratio between engine speed and output shaft speed

C. A computer-controlled hydraulic clutch pack that allows continuously slipping operation always

D. A magnetic powder coupling between the engine and final drive that varies torque transmission

19. A hybrid vehicle's high-voltage interlock loop is sometimes called the:

A. Safety current return path because it bonds the HV system to the chassis at multiple points

B. Pilot signal loop because it negotiates current capacity between the vehicle and the EVSE charger

C. Safety loop or HV safety circuit because its function is to detect connector disturbance immediately

D. Ground monitoring circuit because it detects isolation breakdown between HV and chassis ground

20. A hybrid vehicle has a recall related to the inverter. The most appropriate action for the customer is to:

A. Contact the dealer to schedule the recall repair at no cost as required by the recall program

B. Have an independent shop perform the repair using aftermarket parts to save on parts cost

C. Delay the repair until the inverter actually fails so warranty coverage can be invoked then

D. Disregard the recall notice if the vehicle is operating normally without any warning lamps

21. A hybrid vehicle's electric water pump on the engine cooling loop is suspected of failure. The system shows engine overheating with no codes set. The technician should:

A. Replace the engine coolant thermostat first since it is more likely to fail than the water pump

B. Pinch the upper radiator hose and feel for flow restriction caused by a partially blocked pump

C. Drive the vehicle for an extended period to allow the system to perform a diagnostic learn cycle

D. Verify pump operation with a scan tool bidirectional command or by listening at the pump body

22. The output of a hybrid drive motor's resolver is typically:

A. A digital pulse train counted by the motor control module to determine motor RPM only

B. A pair of sine and cosine signals that the inverter decodes into precise rotor angular position

C. A square wave whose duty cycle indicates the motor's instantaneous torque output to the wheels

D. A frequency-modulated signal whose carrier frequency indicates motor coolant temperature only

23. A hybrid vehicle's battery management system performs a "rest" measurement on cell voltages. This measurement is most accurate when:

A. The pack has been at rest with no current flow for an extended period — typically several hours

B. The vehicle is being driven at highway speed with the cruise control engaged on a level road

C. The regenerative braking system is sending maximum charge current to the pack at the moment

D. The HV system has just been keyed on after sitting overnight in a cold ambient temperature

24. The term "stranded energy" on a hybrid or electric vehicle refers to:

A. Energy remaining in a damaged HV battery pack that cannot be safely discharged after a collision

B. Reserve energy that the BMS reserves to ensure cold-weather starting after extended parking time

C. Energy that the inverter dumps to ground during a controlled shutdown of the hybrid system run

D. Excess energy from regenerative braking that cannot be stored due to high battery state of charge

25. During a hybrid system idle test, the engine starts and stops at frequent intervals while the vehicle is parked in ready mode. This behavior is:

A. Always abnormal and indicates a failing HV battery pack that requires immediate replacement

B. Always abnormal and indicates a failing inverter assembly that requires immediate replacement

C. Normal only if the engine has been operating for more than 30 minutes continuously prior to idle

D. Normal as the system manages HV battery state of charge and engine emissions control routines

26. A hybrid vehicle's HV battery cooling system uses refrigerant from the air conditioning system through a chiller. Failure of the A/C system on such a vehicle would most likely cause:

A. Loss of cabin heat output during cold weather operation regardless of engine temperature reached

B. Reduced HV battery performance and possible BMS-induced power derating during hot weather

C. Failure of the inverter and power electronics due to loss of the same cooling path through chiller

D. Engine overheating because the engine cooling loop shares coolant with the battery chiller loop

27. The "ready" indication on a hybrid vehicle's dash means:

A. The 12-volt auxiliary battery is fully charged and ready to support the hybrid control modules

B. The engine has reached normal operating temperature and the catalytic converter is fully warm

C. The HV system is energized and the vehicle is prepared to drive, even though the engine may be off

D. The vehicle's diagnostic systems have completed self-test routines with no faults found in any modules

28. A hybrid vehicle's transaxle fluid shows signs of metallic contamination during a routine service. The most likely cause is:

A. Wear or damage inside the transaxle, possibly affecting MG1/MG2 bearings or planetary gears

B. Cross-contamination from the engine oil pan due to a damaged transmission cooler line seal

C. Normal accumulation of magnetic debris that is captured by the fluid filter during operation

D. Excessive regenerative braking that has thrown metallic particles from the brake rotor pads

29. A hybrid vehicle's HV battery pack receives a software update from the BMS via the OEM scan tool. After the update, the technician must:

A. Disconnect the 12-volt battery for 30 minutes to allow all modules to clear their software cache

B. Drive the vehicle at highway speed for at least 100 miles to allow the new software to calibrate

C. Replace the high-voltage service plug fuse to match the new software's revised current limits

D. Verify the update completed successfully and perform any required relearn or initialization steps

30. A hybrid vehicle's drive motor has been removed for inspection. Before reinstallation, the technician should:

A. Inspect the motor's resolver mounting and verify the resolver-to-stator alignment is correct

B. Apply dielectric grease to all three motor phase terminals to improve electrical conductivity

C. Replace the motor's permanent magnets with a fresh set since they degrade during storage time

D. Test the motor by spinning it with a corded drill and measuring the AC voltage output produced

31. A hybrid vehicle uses a brushless DC motor for one of its accessories. Compared to a brushed DC motor, a brushless DC motor:

A. Requires regular brush replacement at scheduled service intervals throughout its service life

B. Uses electronic commutation through a controller and offers longer life with less maintenance

C. Operates at higher noise levels due to the brushes contacting the commutator during operation

D. Cannot operate in reverse direction because the brushes are fixed to one rotation direction only

32. A hybrid vehicle's high-voltage cable has been repaired by a previous shop using a heat-shrink splice. This repair is:

A. Acceptable if the heat-shrink splice is rated for at least 600 volts and contains adhesive lining

B. Acceptable if the technician documented the repair on the customer's service repair work order

C. Acceptable if the splice has been pressure-tested using a dielectric breakdown tester at 1,000 volts

D. Not acceptable; HV cables cannot be field-spliced and the entire cable assembly must be replaced

33. A hybrid vehicle has been involved in a fire. After the fire is extinguished and the vehicle is cool, the technician should:

A. Treat the HV battery pack with extreme caution because thermal damage may have compromised isolation

B. Power up the HV system to verify whether any damage has occurred to the orange cables during the fire

C. Replace only the inverter assembly since the battery is sealed and protected from fire damage at all times

D. Discharge any remaining HV through a heavy-gauge jumper wire connected to chassis ground for safety

34. A hybrid vehicle exhibits a "Check Hybrid System" message after a recent battery replacement performed by another shop. The technician should suspect:

A. A failed inverter assembly caused by improper polarity during the previous battery replacement

B. A failed orange HV cable damaged during removal of the original battery from the vehicle frame

C. Improper pack initialization or BMS reset/relearn procedure not performed after the replacement

D. A failed engine PCM that has lost its configuration data during the previous battery replacement

35. When measuring resistance through a hybrid drive motor's three-phase windings, the technician should expect:

A. Each winding to read open circuit because the windings are normally not electrically connected

B. Wildly different resistance values across each winding to ensure proper phase shift in operation

C. Resistance values that increase steadily with temperature throughout the testing procedure timeline

D. Very low and nearly equal resistance values across all three phase-to-phase measurements

36. A hybrid vehicle's HV battery shows a slowly decreasing state of health (SOH) over time. This is:

A. Always abnormal and indicates a failing battery management system that requires replacement now

B. Normal aging of any rechargeable battery and is expected throughout the pack's service lifetime

C. Caused exclusively by improper charging by the vehicle's onboard charger during plug-in sessions

D. Reversible through a full discharge and recharge cycle performed by the dealer with a special tool

37. The HVIL signal voltage on a typical hybrid vehicle is approximately:

A. 200 to 300 volts DC, matching the high-voltage bus level during normal vehicle operation states

B. 24 volts DC sourced from a dedicated DC-DC converter inside the battery management module

C. 5 or 12 volts DC, sourced from the 12-volt system through the hybrid control module pull-up

D. 480 volts AC, sourced from the inverter output to monitor the connection integrity at all times

38. A hybrid vehicle's HV battery pack allows specific gravity testing on each module. This vehicle most likely uses:

A. Lead-acid batteries in the HV pack, which is uncommon but used in some early hybrid designs

B. Lithium-ion cells where specific gravity readings indicate cell state of charge through electrolyte

C. Nickel-metal hydride cells where specific gravity correlates directly with cell internal resistance

D. Solid-state cells where the electrolyte sample is taken from a special sensing port on the module

39. A hybrid vehicle's regenerative braking is most effective at:

A. Highway speeds during steady cruise on a level road with no significant deceleration occurring

B. Very low speeds approaching a complete stop, where the motor's back-EMF is minimal in nature

C. The exact instant the brake pedal is released and the vehicle begins coasting on level ground

D. Moderate-to-highway speeds during deceleration when motor RPM produces significant back-EMF

40. A hybrid vehicle's HVAC system uses a cabin heater that runs on high-voltage current rather than engine coolant. This component is most commonly called a:

A. Heat exchanger pump that recirculates engine coolant through the cabin core under HVAC control

B. PTC (positive temperature coefficient) heater that draws current from the HV battery for cabin heat

C. Glow plug heater that warms the air through resistive heating from the 12-volt accessory system

D. Heat pump compressor that uses refrigerant to extract heat from ambient air for the cabin core

41. A hybrid vehicle's drive motor is producing a clicking noise during operation. The technician should:

A. Inspect the motor's rotor for damage, the bearings for wear, and the resolver for proper mounting

B. Replace the entire transaxle assembly as a single unit because individual motor service is impossible

C. Add a special friction modifier to the transaxle fluid to quiet the noise without further inspection

D. Disregard the noise as a normal operating characteristic of all hybrid drive motors during cold start

42. A hybrid vehicle's HV battery pack uses pouch cells. Compared to cylindrical cells, pouch cells:

A. Have a rigid metal casing that protects against external impact and prevents internal damage

B. Provide higher per-cell voltage so the total pack uses fewer individual cells to reach pack voltage

C. Offer high energy density and flexible packaging but require external structural support to function

D. Have built-in thermal management because the flexible casing transfers heat to the surrounding air

43. A hybrid vehicle's HV battery has been replaced with a remanufactured unit. After installation, the technician should:

A. Drive the vehicle for at least 500 miles before performing any system diagnostic test or scan

B. Replace the 12-volt auxiliary battery at the same time because both batteries always fail together

C. Disconnect the 12-volt battery for 24 hours to allow all modules to fully reset their software memory

D. Perform the OEM-specified initialization, isolation testing, and verification procedures completely

44. A hybrid vehicle's inverter coolant has been contaminated and shows discoloration during a service. The most likely contaminant introduced during a previous service is:

A. Air bubbles from improper bleeding that have oxidized the coolant additives during operation

B. Conventional engine coolant containing standard glycol with conductive corrosion inhibitor additives

C. Brake fluid from a cross-contamination event during a brake service performed at the same shop

D. Refrigerant from the air conditioning system that has leaked into the dielectric coolant loop

45. A hybrid vehicle's HV battery pack has reached the end of its service life. Proper disposal requires:

A. Crushing the battery pack with heavy equipment to ensure no usable cells remain at the salvage yard

B. Discharging the pack to zero volts by shorting the main terminals together through a heavy resistor

C. Returning the pack to a certified hybrid battery recycler through the OEM or approved channels

D. Placing the pack in standard automotive waste oil disposal containers for general scrap processing

ANSWER KEY — PRACTICE EXAM 12 (Q1–Q45)

1. B — Service disconnect removal physically opens the HV pack's internal series circuit, and verification of zero voltage at all HV terminals with a CAT III meter confirms the system is safe to handle. Skipping either step risks contact with stored or stuck charge. This live-dead-live verification is mandatory before any hands-on HV battery work.

2. A — A mild hybrid uses a small motor-generator placed between the engine and transmission to provide brief electric assist during acceleration and engine restart. It cannot drive the wheels on electricity alone because the motor lacks sufficient power and isolation. Honda IMA is a classic example of this architecture.

3. D — A hybrid EPS torque sensor measures driver input torque at the steering shaft, not hydraulic pressure, and the assist motor's current varies in proportion to that input rather than remaining constant. Both technicians describe the system incorrectly, so neither is correct. Understanding the torque-sensor-to-motor-control relationship is critical for diagnosing steering complaints.

4. C — The pedal stroke sensor reports brake pedal position and the rate of pedal travel so the brake control module can calculate driver deceleration demand and command the appropriate regen/friction blend. Pressure transducers and pushrod force sensors are separate components. Without an accurate stroke signal, the controller cannot compute demand and the regen blend becomes inconsistent.

5. A — Towing a hybrid with its drive wheels on the ground forces the drive motor to spin without the lubrication and cooling provided by the powered hybrid system, which can damage bearings, seals, and internal components. OEMs almost always specify flatbed transport or wheels-up towing. Ignoring this guidance results in costly transaxle damage.

6. B — The Honda Integrated Motor Assist (IMA) motor-generator is a thin disc-shaped unit mounted between the engine crankshaft flywheel and the transmission input shaft. This packaging gives mild hybrid assist with minimal driveline modification. Knowing the location is essential for any IMA service procedure.

7. C — The CCS Combo connector includes the J1772 AC pins above and adds two large DC pins below, allowing the same physical port to accept Level 1/2 AC and Level 3 DC fast charging. The vehicle's onboard charger handles AC; the off-board station handles DC. The Combo design is widely adopted in North America and Europe.

8. D — Maximum vehicle current draw equals the OBC power rating divided by the AC supply voltage: 6,600 W / 240 V = 27.5 A. The vehicle commands the EVSE to deliver no more than what its OBC can accept. Exceeding the OBC's rating is not possible because the OBC sets the upper limit.

9. B — Insulated tools for hybrid HV work must be rated at minimum 1,000 volts AC, which provides protection above the typical hybrid pack operating voltage range of roughly 200–650 V DC. Tools rated for lower voltages can fail under fault conditions. The 1,000 V rating is the industry standard for HV automotive service.

10. A — HV battery terminal torque is OEM-specific and depends on the bolt size, material, and joint design used by the manufacturer; the spec is found in the service information. Generic torque values risk loose connections that cause heating and arcing, or stripped threads. Following the published spec is non-negotiable.

11. C — Prismatic cells pack efficiently into rectangular spaces, giving good volumetric efficiency for automotive packs, but their flat envelope requires careful mechanical pressure control to prevent swelling that distorts cell chemistry over time. Module designs include compression frames for this reason. Loss of compression accelerates aging.

12. C — A growing cell delta voltage after a long rest period points to one or more cells with abnormally high self-discharge — typically caused by internal aging or a developing fault. Healthy cells discharge at nearly identical rates when no current flows. Trending rest voltages over time isolates the failing module.

13. D — DC link capacitors smooth the bus voltage between the battery and the IGBTs to provide stable input for switching, and they also store enough energy to deliver a fatal shock for minutes after the pack is isolated. Both technicians describe correct aspects of the same component. The bleed-down wait time exists specifically because of this stored capacitor energy.

14. B — DPF regeneration and similar emissions control routines require sustained engine operation regardless of other inputs, so the PCM blocks auto-stop until the routine completes. The customer often perceives this as a malfunction, but it is intended behavior. Verifying the regeneration state is part of the diagnostic process.

15. C — Under the manufacturer convention that positive current indicates discharge, +35 A during steady cruise means the pack is supplying current to the inverter, which converts it to AC for propulsion through MG2. A negative reading would indicate charging from regen or engine-driven generation. Reading the sign convention correctly is critical for interpreting BMS data.

16. A — Main contactors are designed to be opened and closed with no current flowing through them, while a smaller precharge contactor and resistor pair handles the inrush current that charges the bus capacitors before the main contactor closes. Switching the main contactor under load welds or pits the contacts. The precharge step protects the contactor for the life of the pack.

17. D — A flooded hybrid must be treated as potentially compromised because water can defeat the HV system's isolation barriers and create unpredictable fault paths. Powering up the system before inspection risks shock, arcing, and damage to control electronics. OEM procedures specify a careful inspection before any re-energization attempt.

18. B — In a Toyota eCVT, MG1's speed is electronically varied through the planetary gear set, which continuously changes the ratio between engine speed and the output shaft without belts, pulleys, or hydraulic clutches. This is what makes the transmission "electrically variable." Understanding the planetary kinematics is central to diagnosing power-flow concerns.

19. C — The HVIL is commonly called the safety loop or HV safety circuit because its sole purpose is to immediately command the contactors open when any orange HV connector is disturbed. Pilot signals and

ground monitoring are separate functions on separate circuits. Confusing these systems leads to misdiagnosis.

20. A — Manufacturer recalls are repaired at no cost to the customer at an authorized dealer, regardless of vehicle age or symptoms. Independent shops generally cannot perform recall work, and aftermarket parts are not accepted for recall claims. Delaying a recall repair is unsafe and may void related warranty coverage.

21. D — Electric water pumps are best verified through scan tool bidirectional commands that energize the pump on demand, with confirmation by sound, hose temperature change, or current draw on the supply lead. Pinching a hose or applying battery voltage directly bypasses the control circuit and may damage the pump. Bidirectional testing isolates the pump from its control logic.

22. B — A resolver outputs a pair of sine and cosine signals that, when decoded together, provide a high-resolution analog measurement of rotor angular position and speed. The inverter uses this position to synchronize three-phase commutation with the rotor. Loss of either signal leaves the inverter unable to correctly drive the motor.

23. A — A meaningful cell rest measurement requires the pack to have been idle with no current flow for an extended period — typically several hours — so surface charge and polarization effects dissipate and the open-circuit voltage reflects true state of charge. Readings taken during or shortly after current flow are distorted. Rest measurements are the basis of accurate SOC estimation.

24. A — Stranded energy refers to electrical energy that remains trapped in a damaged HV battery pack that cannot be safely discharged through normal means after a crash, fire, or submersion. This trapped energy poses an ongoing shock and re-ignition hazard. First responder protocols specifically address stranded-energy management.

25. D — Frequent engine start/stop cycles while the vehicle sits in ready mode are normal as the hybrid control module manages HV battery state of charge, runs emissions control routines, and conditions catalyst and oil temperature. Treating this as a fault leads to unnecessary parts replacement. The behavior is part of the system's energy management strategy.

26. B — When the A/C system also cools the HV battery through a chiller, an A/C failure removes battery cooling capability, causing the BMS to derate the pack and reduce performance during hot weather. The customer often reports loss of acceleration on hot days. Diagnosing the A/C side resolves the battery complaint.

27. C — The ready indicator means the HV system is energized and the vehicle is prepared to drive; the engine may be running or off depending on conditions. It is the hybrid equivalent of a conventional engine running at idle. Drivers unfamiliar with hybrids sometimes assume the vehicle is off because the engine is silent.

28. A — Metallic debris in transaxle fluid indicates internal wear or damage, possibly to MG1 or MG2 bearings, planetary gears, or the differential gear teeth. Cross-contamination and brake-rotor sources are

not realistic given fluid circulation paths. Pan and magnet inspection together with lab analysis identifies the source.

29. D — After any HV battery software update, the technician must confirm the update completed successfully and perform any required relearn, calibration, or initialization routines specified by the OEM. Skipping the verification step leaves the system in an indeterminate state. Documentation of the procedure is also typically required.

30. A — Resolver-to-stator alignment is critical because the inverter uses the resolver output to commutate the motor; a mismounted or rotated resolver causes the inverter to apply current at the wrong rotor angle, producing rough operation or no-start. Verifying alignment per OEM procedure is part of any motor reinstallation. The other listed steps are not part of correct service.

31. B — Brushless DC motors use electronic commutation through a controller that switches the windings in sync with rotor position, eliminating brushes entirely. The result is longer life, less maintenance, and quieter operation than a brushed motor. Brushless designs are now standard in hybrid auxiliary applications.

32. D — High-voltage cables cannot be field-spliced under any circumstances; the insulation system and shielding must remain continuous along the entire length to maintain rated dielectric strength and EMI containment. The only acceptable repair is replacement of the complete cable assembly. Any heat-shrink splice represents a safety hazard and must be remediated.

33. A — A post-fire hybrid must be treated with extreme caution because thermal damage may have compromised HV isolation, melted insulation, or weakened cell separators that could lead to re-ignition. The pack should not be powered up until OEM inspection protocols have been completed. Stranded energy and thermal runaway are real post-fire risks.

34. C — A "Check Hybrid System" message after a battery replacement most often results from skipping the OEM-required initialization, BMS reset, or relearn procedure. The new pack's parameters must be written into the control modules and any learned data updated. Without those steps, the system flags the mismatch immediately.

35. D — A healthy three-phase motor shows very low and nearly equal phase-to-phase resistance readings because the three windings are wound identically and connected in a balanced configuration. Significant imbalance indicates a shorted or open winding. This static resistance check is a quick first-pass diagnostic before deeper testing.

36. B — All rechargeable batteries lose usable capacity over time due to chemical aging, cycle wear, and calendar life, so a slow SOH decline is normal and expected throughout a hybrid pack's service life. SOH is monitored to track this aging. A sudden drop, by contrast, would indicate a fault that warrants investigation.

37. C — HVIL signal voltage is a low-voltage signal — typically 5 V or 12 V — sourced from the 12-volt system through a pull-up resistor inside the hybrid control module. The loop draws only milliamps of

signal current. Measuring HVIL with the wrong scale or expecting HV-level voltage leads to misdiagnosis.

38. A — Specific gravity testing is only meaningful on flooded lead-acid batteries because the electrolyte's density changes with state of charge. NiMH, lithium-ion, and solid-state chemistries lack a sample-able liquid electrolyte. A hybrid that allows SG testing therefore uses lead-acid in the HV pack, an uncommon but historically used design.

39. D — Regenerative braking is most effective at moderate-to-highway speeds during deceleration because the motor's rotational speed produces substantial back-EMF that the inverter can harvest as charge current. At very low speeds, back-EMF is too low for effective regen, and the friction brakes take over. Knowing this helps explain why regen blending feels different near a complete stop.

40. B — A PTC (positive temperature coefficient) heater is the most common HV-powered cabin heater on hybrids; it heats resistively, draws current from the HV bus, and self-regulates as its resistance climbs with temperature. PTC heat is necessary when the engine cannot supply enough waste heat during EV-only or auto-stop operation. This is essential for cabin comfort in cold weather.

41. A — A clicking noise from a hybrid drive motor warrants inspection of the rotor for damage, bearings for wear, and resolver mounting for any looseness or interference. These are the components most likely to produce clicking under load. Skipping inspection or accepting the noise as normal leads to progressive damage.

42. C — Pouch cells offer high gravimetric and volumetric energy density and flexible packaging, but their soft polymer envelope provides no structural rigidity, so the module must supply external support and compression to keep cell geometry stable. Loss of support causes swelling, internal damage, and accelerated aging. This format is widely used in modern automotive packs.

43. D — A replacement HV battery requires the full OEM-specified initialization, isolation testing, and verification procedure before the vehicle is released. Skipping these steps leaves the system in an unsafe or improperly calibrated state and risks immediate fault codes. Documentation of the procedure is also typically required.

44. B — Conventional engine coolant introduced into a dielectric inverter cooling loop is the most common service-induced contamination; engine coolant's higher electrical conductivity creates leakage paths that eventually set isolation faults. The system must be flushed and refilled with the OEM-specified dielectric coolant. Using the right coolant from the start prevents this damage.

45. C — End-of-life HV batteries must be returned to a certified hybrid battery recycler through the OEM or another approved channel because of chemical hazards, stranded energy, and recoverable metals. Crushing, shorting, or general-waste disposal are unsafe and typically illegal. Proper recycling is part of the hybrid service supply chain.