PRACTICE EXAM 11: ASE A6 SIMULATION (50 QUESTIONS

1. A technician measures 2.5 amperes of current flowing through a 6-ohm resistor. What voltage is applied across the resistor?

A. 2.4 volts at steady state

B. 15 volts across the element

C. 8.5 volts during operation

D. 0.42 volts of drop

2. The abbreviation "EMF" in electrical engineering stands for:

A. Excessive mass flow in conductors

B. Engineering metric factor of resistance

C. Electromotive force, equivalent to voltage

D. Electrical measurement factor only

3. A technician measures 0.3 ohms on a wire using a DMM set to the ohms function. This low reading typically indicates:

A. The DMM cannot accurately resolve low resistances; voltage drop testing is more reliable

B. A completely broken wire requiring full replacement

C. A short circuit to chassis ground

D. Normal operation of the DMM's auto-ranging feature

4. When one light bulb in a parallel circuit burns out, the other bulbs in the circuit will:

A. Operate at a reduced brightness from higher resistance

B. Also fail because current is interrupted to all

C. Operate at an increased brightness from current diversion

D. Continue to operate normally at their rated output

5. A wire identified in the schematic as 18 AWG has:

A. A larger cross-section than 10 AWG wire

B. The same cross-section as 12 AWG wire

C. A smaller cross-section than 14 AWG wire

D. A cross-section unrelated to the AWG designation

6. A technician using a lab scope sees a voltage waveform that ramps up gradually and drops down sharply. This waveform pattern is characteristic of:

A. A capacitor being charged and discharged rapidly

B. A PWM signal at 50 percent duty cycle

C. A normal AC sine wave at 60 hertz

D. A logic gate switching between states digitally

7. A soldered splice without any heat-shrink tubing:

A. Is fully protected against environmental moisture

B. Should not be used in automotive applications without proper sealing

C. Is recommended for engine compartment work

D. Meets federal safety standards for any vehicle application

8. Technician A says a short to ground always blows the circuit's protective fuse. Technician B says a short to power will blow the fuse on the power side of the short. Who is correct?

A. Technician A only, shorts to ground typically blow fuses

B. Technician B only, shorts to power blow power-side fuses

C. Both A and B, both create excessive current

D. Neither, because fuses only blow from overloads

9. The formula $P = I^2 \times R$ calculates:

A. Power dissipated by a resistive element

B. Resistance when voltage and current are known

C. Current when power and resistance are known

D. Voltage when power and current are known

10. A technician is troubleshooting a circuit and finds 12 volts at the switch input with the switch closed and 12 volts at the switch output. Zero voltage reaches the load. The fault is located in:

A. The switch itself, which has failed to close

B. The wiring or connection between the load and its ground

C. The wiring between the switch output and the load

D. The battery supply to the switch input

11. Kirchhoff's voltage law states that:

A. Current flowing into a node equals current flowing out

B. Resistance is directly proportional to conductor length

C. Power is proportional to current squared times resistance

D. The sum of voltage drops around a closed loop equals the source voltage

12. A technician wishes to identify which wire in a harness connects to a specific component. The BEST tool for this purpose is:

A. A tone generator and tracer set that signals through the wire

B. A DMM set to continuity and its beeper mode

C. A circuit breaker inline with the suspect wire

D. A logic probe with LED indicators only

13. A ground strap from the engine to the body is essential because:

A. It provides a low-resistance path for current returning to the battery

B. It prevents electromagnetic interference from engine ignition

C. It isolates the engine electrical system from the body

D. It serves as a signal pathway for the ECM communication

14. A vehicle's battery shows 12.4 volts at rest. The state of charge is:

A. Fully charged at 100 percent capacity

B. Approximately 75 percent of full charge

C. 50 percent charged but serviceable

D. Severely discharged, requires immediate charging

15. A battery that shows 1.210 specific gravity is approximately:

A. Fully charged for service

B. Over-charged, requiring inspection

C. At 75 percent state of charge

D. At 50 percent state of charge

16. A parasitic draw test on a modern vehicle should be performed:

A. Immediately after shutting off the ignition switch

B. During engine operation at normal temperature

C. After allowing the vehicle to sleep for 30 minutes

D. While the battery is being charged on a bench

17. A starter cranking current that reads 180 amperes on a vehicle rated for 180 amperes indicates:

A. Normal current draw for the specific application

B. A weak battery limiting starter performance

C. Starter internal damage causing higher current

D. An overcharging system forcing excess current

18. Sulfation in a lead-acid battery is caused by:

A. Rapid charging of a completely discharged battery

B. Long-term storage in a partially discharged state

C. Overcharging at voltages above normal

D. Rapid cycling between full and empty states

19. Before connecting jumper cables to boost a vehicle, the technician should:

A. Start the donor vehicle and allow it to idle at 2000 RPM

B. Disconnect the battery from the dead vehicle completely

C. Remove the ignition key from the discharged vehicle

D. Verify both batteries are the same voltage and type

20. A starter that engages but produces a grinding noise is MOST likely suffering from:

A. A damaged flywheel ring gear or stuck pinion mechanism

B. A completely discharged battery preventing cranking

C. A failed voltage regulator in the alternator

D. A shorted armature winding in the starter motor

21. Cold Cranking Amperes (CCA) is defined at:

A. 0°F (−17.8°C) for 30 seconds at 7.2 volts minimum

B. 70°F for 15 seconds at one-half the rated value

C. 32°F for 60 seconds at a constant draw

D. −40°F for cold-weather cranking applications only

22. Battery registration on a modern vehicle informs the BCM of:

A. The battery's warranty start date for record-keeping

B. The new battery's characteristics so charging strategy updates

C. The battery's physical dimensions for tray verification

D. The manufacturer's recall history for that battery lot

23. A battery load test is considered passed if the battery voltage:

A. Returns to 12.6 volts within 10 minutes of the test

B. Drops no more than 0.5 volts during the test

C. Remains above 12 volts for the full 15 seconds

D. Remains above 9.6 volts at the end of the test period

24. A starter solenoid performs two functions simultaneously: engaging the pinion with the flywheel and:

A. Switching high current to the starter motor windings

B. Timing the fuel injection pulse for smooth starting

C. Regulating the voltage supplied to the ignition system

D. Activating the neutral safety switch for gear confirmation

25. A modern alternator's output voltage is regulated by:

A. Switching between three-phase and single-phase operation

B. Varying the drive belt ratio at the pulley

C. Adjusting the current through the rotor field winding

D. Changing the number of active stator windings electronically

26. Excessive AC ripple measured at the battery terminals indicates:

A. A weak drive belt slipping under electrical load

B. One or more failed rectifier diodes in the alternator

C. An overcharging voltage regulator setpoint issue

D. A healthy alternator operating at peak efficiency

27. A drive belt that is glazed, cracked, or loose causes:

A. Overcharging when the alternator compensates

B. Increased electrical system efficiency

C. No effect on charging system operation

D. Reduced alternator output that mimics an alternator fault

28. A voltage drop test across the alternator B+ cable under load reads 0.15 volts. This reading indicates:

A. Normal cable resistance well within specification

B. Excessive resistance requiring immediate cable replacement

C. A failed voltage regulator causing low charging voltage

D. An open circuit in the alternator output connection

29. A computer-controlled charging system may intentionally:

A. Produce no voltage when the vehicle is parked in the sun

B. Produce exactly 14.7 volts at all engine operating conditions

C. Vary charging voltage based on battery state and electrical load

D. Shut off the alternator entirely at highway speeds for efficiency

30. HID xenon headlights require approximately how long to reach full brightness?

A. Less than 100 milliseconds from activation

B. 10 to 30 seconds for the arc to fully establish

C. 2 to 5 minutes for complete stabilization

D. 15 to 30 minutes of continuous operation

31. A halogen bulb that fails prematurely after installation is MOST commonly caused by:

A. Incorrect wattage rating for the vehicle's circuit

B. Voltage regulator over-charging during operation

C. Skin oil transferred during handling of the envelope

D. Moisture contamination inside the bulb from condensation

32. The Center High-Mount Stop Lamp (CHMSL) functions:

A. Continuously with the headlights as a tail marker

B. Only during brake application, independent of tail lights

C. As a reverse indicator when the transmission is in REVERSE

D. As a turn signal indicator at the rear of the vehicle

33. A turn signal on one side of a vehicle flashes at twice the normal rate. This symptom indicates:

A. A burned-out turn signal bulb on the fast-flashing side

B. A failed hazard flasher relay affecting both sides

C. An open circuit in the brake light wiring system

D. A short to ground in the dome light circuit

34. FMVSS 108 regulates:

A. Engine emissions for light-duty passenger vehicles

B. Battery manufacturer safety production requirements

C. Catalytic converter efficiency standards and reporting

D. Motor vehicle exterior lighting and signaling requirements

35. A modern instrument cluster displays engine RPM based on:

A. A dedicated tachometer signal wire from the distributor

B. A network message broadcast by the engine control module

C. The cluster's internal oscillator connected to spark timing

D. A mechanical cable from the engine camshaft

36. A warning lamp that illuminates during engine operation indicates:

A. A fault condition in the system being monitored

B. A normal condition during the vehicle's warm-up cycle

C. A lamp circuit fault requiring immediate replacement

D. Low battery voltage affecting cluster operation

37. A customer reports the fuel gauge reads empty even after a full fill-up. The sending unit's resistance is verified to be correct at both extremes of its travel. The fault is MOST likely in:

A. The fuel pump drawing excessive current from the tank

B. The fuel pressure regulator limiting fuel system flow

C. The cluster's internal fuel gauge circuit or processing

D. The ground connection at the battery negative terminal

38. A HUD ghost image appearing above the primary display indicates:

A. A weak HUD projector reaching service life end

B. Software corruption in the HUD control module

C. A dirty windshield where the HUD is projected

D. A standard replacement windshield installed on a HUD-equipped vehicle

39. After replacing an instrument cluster, the vehicle will not start. The MOST likely cause is:

A. A disconnected wiring harness at the cluster connector

B. The new cluster requires programming to the vehicle immobilizer

C. The cluster's mounting hardware has damaged internal circuits

D. A blown fuse during the replacement procedure

40. A power window operates only in the DOWN direction but not UP. The motor rotates freely when tested directly. The MOST likely cause is:

A. A failed window regulator cable inside the door

B. A discharged battery affecting only the UP direction

C. A defective window switch or break in the UP-direction wiring

D. A failed pinch protection sensor disabling UP travel

41. Pinch protection in modern power windows works by:

A. Using infrared sensors across the window opening

B. Timing the up-travel cycle against a stored duration

C. Measuring pressure on the glass surface directly

D. Monitoring motor current for a spike from obstruction

42. A rain-sensing wiper system detects precipitation using:

A. Piezoelectric sensors measuring raindrop impact on glass

B. Infrared optical sensors detecting changes in total internal reflection

C. Ultrasonic frequency modulation from surface moisture

D. Humidity sensors within the cabin HVAC air intake system

43. A customer reports that the power seats are stuck in one position and will not move. Scan tool shows no DTCs. The technician should FIRST:

A. Check the seat circuit fuse and power supply

B. Replace the seat control module assembly

C. Perform a memory position relearn procedure

D. Verify the seat belt is properly buckled for safety interlock

44. A horn that sounds weakly is MOST likely caused by:

A. A completely failed horn that requires replacement

B. A stuck steering wheel horn button in the on position

C. Voltage drop in the horn circuit wiring or connections

D. Low battery voltage affecting the entire vehicle

45. A remote keyless entry fob operates at short range but not at longer distances. The MOST likely cause is:

A. A defective radio receiver in the vehicle's module

B. Radio frequency interference from external sources

C. An unsynchronized rolling code between fob and vehicle

D. A weak or depleted battery inside the key fob

46. A rear defogger grid has one horizontal trace that does not heat while others operate normally. The fault is located in:

A. The defogger relay supplying power to the entire grid

B. The specific broken trace on the glass surface

C. The dashboard defogger switch and indicator lamp

D. The body control module timer function for defogger

47. Before performing service on SRS airbag components, the technician MUST:

A. Disconnect the battery and wait the manufacturer-specified time

B. Scan the SRS module for DTCs with ignition on first

C. Remove the steering wheel to access the clock spring

D. Discharge the SRS capacitors by manual key turning

48. A squib connector in an SRS system includes a shorting bar that:

A. Measures squib resistance during normal operation

B. Provides a low-resistance ground reference for testing

C. Reduces electromagnetic interference from the wiring

D. Automatically shorts the squib wires when disconnected

49. A healthy high-speed CAN bus measured across CAN-H and CAN-L with ignition off reads approximately:

A. 240 ohms, representing both terminators in series

B. 120 ohms, representing a single terminator in the bus

C. 60 ohms, representing two parallel 120-ohm terminators

D. 30 ohms, representing three terminators in parallel

50. A gateway module failure on a modern vehicle may cause:

A. Only the infotainment system to fail while others work

B. Multiple seemingly unrelated symptoms across different systems

C. A specific single DTC in one isolated module only

D. Complete failure of the engine starting system only

Practice Exam 11: Answer Key and Explanations

1. B — Applying Ohm's Law, E = I × R, so 2.5 amperes × 6 ohms = 15 volts. This calculation determines voltage across any component when current and resistance are known. Fluency with the three rearrangements of Ohm's Law is fundamental for virtually every automotive electrical diagnostic scenario on the A6 exam.

2. C — EMF stands for electromotive force, which is functionally equivalent to voltage in practical circuit analysis. The term originates from early electromagnetic theory but is still used interchangeably with voltage in technical contexts. Recognizing this terminology ensures proper interpretation of service literature, textbooks, and engineering documentation.

3. A — A DMM's ohms function typically cannot reliably resolve resistances below 0.1-0.5 ohms. A reading of 0.3 ohms is at the meter's resolution threshold and may not accurately reflect the actual wire condition. Voltage drop testing under load is the reliable method for evaluating low-resistance connections, making it preferred for diagnosing high-current circuits.

4. D — In a parallel circuit, each load has an independent path from source to ground. When one load fails (opens), the other loads continue operating normally because their paths remain complete. This is why parallel circuits are used in automotive applications — a single bulb failure doesn't disable the entire lighting system.

5. C — The AWG scale is counterintuitive: larger AWG numbers indicate smaller wire. 18 AWG is thinner and has higher resistance than 14 AWG, which is thinner and higher resistance than 10 AWG. Recognizing this relationship is essential for selecting correct replacement wire and understanding specifications in service information.

6. A — A sawtooth waveform that ramps up gradually and drops sharply is characteristic of a capacitor being charged through a resistor, then discharged rapidly. This pattern appears in some ignition circuits, timer circuits, and analog-to-digital conversion circuits. Recognizing waveform shapes is essential for effective lab scope diagnosis.

7. B — A soldered splice without protection is vulnerable to moisture intrusion, corrosion, and eventual failure. All automotive electrical splices require environmental protection appropriate to the installation location — heat-shrink tubing with adhesive liner for underhood or exposed locations, or at minimum heat-shrink tubing for interior applications. Unprotected splices are not acceptable.

8. A — **Short to ground behavior** — A short to ground bypasses the load, allowing excessive current to flow directly from the power source through the fuse to chassis ground, blowing the fuse. A short to power creates backfeed between circuits, typically causing unintended component operation rather than blowing a fuse. Technician A is correct; Technician B is wrong.

9. A — The formula $P = I^2 \times R$ calculates power dissipated by a resistive element using current and resistance. This is one of three equivalent power formulas ($P = E \times I$, $P = E^2 \div R$, and $P = I^2 \times R$). Understanding all three forms allows calculation of power dissipation from any two known circuit parameters.

10. C — Voltage reaches the switch input and exits through the switch output (confirming the switch is working), but no voltage reaches the load. The fault must be in the wiring between the switch output and the load. Testing voltage at various points in this wiring segment identifies the specific break or high-resistance point requiring repair.

11. D — Kirchhoff's voltage law states that the sum of voltage drops around any closed loop equals the source voltage. Each component in the loop absorbs a portion of the source voltage, and these individual drops must sum to the total. This principle underlies series circuit analysis and is essential for understanding voltage distribution in complex circuits.

12. A — A tone generator and tracer set is specifically designed for identifying wires in harnesses. The generator injects a signal into one end of the wire; the tracer (wand) picks up the signal electromagnetically when held near the wire's path. This tool provides reliable identification without having to physically check continuity from end to end.

13. A — An engine-to-body ground strap provides a low-resistance electrical path for current returning to the battery's negative terminal through the body. Without this strap, current would have to find alternate paths through smaller conductors, causing voltage drop and electrical system problems. Ground strap integrity is essential for proper charging and accessory circuit operation.

14. B — A flooded lead-acid battery reading 12.4 volts at rest is approximately 75% state of charge. The voltage-to-SOC relationship is: 12.6+ V = 100%, 12.4 V = 75%, 12.2 V = 50%, 12.0 V = 25%, below 11.9 V = essentially discharged. Recognizing these thresholds is essential for accurate battery diagnosis.

15. D — A specific gravity of 1.210 indicates approximately 50% state of charge on standard automotive battery scales. At full charge, specific gravity is 1.265; at fully discharged, it approaches 1.100. The reading of 1.210 falls midway between these extremes, representing approximately half the battery's capacity available.

16. C — Parasitic draw testing requires the vehicle to be in its fully asleep state. Modern vehicles take approximately 30 minutes after shutdown for all modules to complete their shutdown sequences and enter standby mode. Testing too soon produces inflated readings that include module wake-up activity, leading to false diagnosis of excessive parasitic draw.

17. A — A starter drawing its rated current is operating normally. Cranking current within specification indicates the starter, battery, cables, and engine are all functioning as designed. Deviations from rated

current (significantly higher or lower) suggest problems requiring diagnosis. Manufacturers publish expected current draw for each application as a baseline reference.

18. B — Sulfation develops when a battery remains in a partially discharged state for extended periods. Lead sulfate crystals harden on the plates over time and eventually stop participating in the charge-discharge reaction. Severe sulfation is permanent and causes reduced capacity, poor cranking performance, and eventual battery failure. Keeping batteries fully charged prevents this damage.

19. D — Before jump-starting, verify that both batteries are the same voltage system (typically 12 volts) and chemistry type. Mismatched voltage systems can damage electronics; different chemistries may have different charging characteristics. Some modern start-stop vehicles have specific jump-start restrictions — always check service information before jumping vehicles with complex electrical systems.

20. A — Grinding noise during starter engagement indicates physical contact between the starter pinion and damaged flywheel ring gear teeth, or a stuck pinion that won't retract properly. Missing or chipped ring gear teeth cause grinding during engagement. Visual inspection of the ring gear is required before installing any replacement starter; a new starter will immediately be damaged by a worn ring gear.

21. A — Cold Cranking Amperes is specified at 0°F (−17.8°C) per SAE J537, simulating worst-case cold-start conditions. The test measures current delivery at this temperature while maintaining at least 7.2 volts for 30 seconds. This rating indicates the battery's ability to deliver sufficient current during cold-weather starting when engine oil is thickest and battery chemistry is slowest.

22. B — Battery registration informs the BCM that a new battery has been installed, allowing the BCM to update its charging strategy to match the new battery's characteristics. The BCM adapts its charging profile over time based on the installed battery's characteristics; without registration, the outdated profile remains, potentially leading to improper charging and premature failure.

23. D — A battery load test is passed if the battery voltage remains above 9.6 volts at the end of the 15-second test at 70°F per SAE J537. A reading below 9.6 volts indicates excessive internal resistance. This threshold is fundamental to battery diagnosis and is one of the most heavily tested specifications on the A6 exam.

24. A — The starter solenoid performs two simultaneous functions: mechanically engaging the pinion with the flywheel ring gear through a plunger mechanism, and electrically switching high battery current

to the starter motor windings. Both happen simultaneously when the ignition is turned to START. This dual-function design makes the solenoid essential to starter operation.

25. C — The voltage regulator controls alternator output by varying the current through the rotor field winding. Stronger field current creates a stronger magnetic field, which induces higher voltage in the stator. Weaker field current produces lower output voltage. This electrical field control enables voltage regulation independent of RPM and load conditions, allowing the alternator to maintain target voltage throughout the operating range.

26. B — A healthy alternator produces less than 100 millivolts of AC ripple at the battery terminals. Excessive AC ripple indicates one or more failed rectifier diodes — the diodes that convert three-phase AC to DC have lost their ability to prevent AC from reaching the output. This requires alternator replacement before excess ripple damages other vehicle electronics.

27. D — Drive belt slippage — from glazing, cracks, or looseness — reduces the torque transferred to the alternator, producing reduced electrical output. This symptom often mimics an alternator fault and is a common oversight in charging system diagnosis. Belt inspection is a critical early step that can identify this inexpensive and common cause before proceeding to more complex electrical diagnosis.

28. A — A voltage drop of 0.15 volts across an alternator B+ cable under load is well within normal specification (typically under 0.5 volts is acceptable). This reading indicates a healthy charging cable with minimal resistance. Higher drops would suggest corrosion or damage requiring repair, but 0.15 volts confirms the cable is operating normally.

29. C — Modern computer-controlled charging systems intentionally vary voltage based on operating conditions. The system analyzes battery state of charge, temperature, and electrical load to determine optimal charging voltage. This adaptive behavior balances charging rate, fuel economy, and battery longevity. Technician confusion about "incorrect voltage" often stems from not understanding this programmed variability.

30. B — HID (high-intensity discharge) bulbs require 10-30 seconds to reach full brightness because the metal halide salts inside must vaporize before the arc fully establishes. This warm-up period is normal and inherent to HID technology, not a fault. LED and halogen technologies reach full brightness much faster — HID's warm-up is characteristic of this specific light source type.

31. C — Skin oils transferred during handling create thermal stress concentration points on halogen bulb glass envelopes, causing premature failure. This is the single most common cause of early halogen bulb failure. Proper installation technique — handling by base or with clean cloth, and cleaning any finger contact with isopropyl alcohol — prevents this problem and allows normal service life.

32. B — The Center High-Mount Stop Lamp functions only during brake pedal application; it is not a tail lamp. This distinguishes it from the other rear lamps which illuminate continuously with headlights. CHMSL has been required on all U.S. passenger cars since 1986 per FMVSS 108 and provides a critical third brake signal to reduce rear-end collisions.

33. A — A fast-flashing turn signal on one side is the flasher circuit's deliberate fault indicator, designed to alert the driver that one of the turn signal bulbs on that side has failed. The reduced current load from the burned-out bulb triggers the flasher to accelerate its flash rate. Replacing the failed bulb on the fast-flashing side restores normal flash rate.

34. D — FMVSS 108 establishes comprehensive requirements for vehicle exterior lighting and signaling — headlights, tail lights, signal lamps, brake lights, CHMSL, and side markers. It specifies photometric output, beam patterns, mounting locations, and color requirements. Aftermarket lighting modifications must comply with FMVSS 108 to be legal for road use in the United States.

35. B — Modern instrument clusters receive engine RPM as a network message broadcast by the engine control module. The ECM reads the crankshaft position sensor, calculates RPM, and transmits the value on the CAN bus. The cluster receives this message and renders the tachometer display. Direct mechanical cables and analog connections are obsolete on modern vehicles.

36. A — A warning lamp illuminated during engine operation indicates a fault condition in the system the lamp monitors. The commanding module — typically the ECM, TCM, or ABS module — has detected a problem and requested the cluster illuminate the lamp. Diagnosis requires reading the DTCs in the commanding module, not replacing the cluster or assuming a lamp fault.

37. C — If the sending unit's resistance is correct at both extremes and the wiring is intact, the fault must be in the cluster's internal fuel gauge circuit or processing. Modern clusters include electronic processing of fuel gauge signals that can fail independently of external components. Cluster repair or replacement is typically required to address these internal electronic failures.

38. D — HUD-equipped vehicles require a special windshield with a wedge-shaped PVB inner layer that prevents ghost imaging. A standard replacement windshield reflects the projected image from both inner and outer glass surfaces, creating the characteristic "ghost" double image. Replacement with the correct HUD-compatible glass is the only fix for this problem.

39. B — Modern clusters store immobilizer authentication data that must match other vehicle modules. A replacement cluster not properly programmed to the vehicle is rejected by the immobilizer, which denies the engine-enable signal and prevents starting. Programming or pre-programmed cluster supply is required on modern vehicle cluster replacement; a simple physical swap alone is insufficient.

40. C — A window that operates in one direction but not the other, with a working motor, indicates the fault is in the control wiring for the failing direction. A defective switch contact or break in the wiring for the UP direction prevents the circuit from commanding UP motor rotation, even though the motor itself is functional. Switch or wiring repair is required.

41. D — Modern pinch protection monitors motor current through the H-bridge driver during up-travel. An obstruction causes a sudden current spike that the module detects, immediately reversing motor direction to prevent injury. This function is federally mandated on auto-up windows and protects occupants from pinching hazards. Current monitoring is the most practical and responsive sensing method.

42. B — Rain-sensing wiper systems use infrared optical sensors that measure changes in total internal reflection from the windshield. Water droplets on the outer glass surface reduce the reflected signal; the sensor interprets this as precipitation and commands wiper activation. This is the dominant rain-sensing technology on modern vehicles, and the sensor requires a clean windshield and proper optical coupling for accurate operation.

43. A — Before proceeding to complex diagnosis, always verify the basics first. A power seat that doesn't operate and shows no DTCs suggests a power-related issue. Checking the seat circuit fuse and power supply is the first diagnostic step — the simplest and most common cause. This systematic approach prevents unnecessary component replacement.

44. C — Reduced horn volume indicates voltage drop somewhere in the horn circuit — corroded ground, degraded wire, or failing switch contacts. Voltage drop testing from the battery positive to the horn connector during operation reveals the location of unwanted resistance. The horn itself is rarely the fault when volume is merely reduced; wiring and grounds are typically the cause.

45. D — A fob working at short range but failing at longer distances is the classic signature of a weak battery. The transmitter output is reduced, shortening effective range. This is the simplest and most common RKE complaint; battery replacement almost always restores normal range. Try this before proceeding to receiver or programming diagnosis.

46. B — A defogger grid has multiple parallel horizontal traces; one broken trace disables only that one line while others continue operating normally. A voltmeter walking along the broken trace locates where voltage drops abruptly from battery voltage to zero. Small breaks can be repaired with silver-ceramic paint kits; larger damage requires glass replacement.

47. A — Every SRS requires a manufacturer-specified disabling procedure including battery disconnection and a waiting period (typically 1-10 minutes) for deployment-energy capacitors to discharge. Accidental airbag deployment during service causes severe injury. Scanning DTCs or disconnecting only the airbag connector is not sufficient; the full system must be de-energized before physical service.

48. D — Squib connectors include a mechanical shorting bar that automatically shorts the two squib wires together when the connector is disconnected. This prevents stray voltages from static electricity, inadvertent battery contact, or test equipment from triggering accidental airbag deployment. When the connector reconnects, the bar retracts to allow normal operation. This is a critical safety feature during service.

49. C — A healthy high-speed CAN bus uses two 120-ohm termination resistors at its physical endpoints. Measured across CAN-H and CAN-L with the ignition off, these two resistors appear in parallel, giving a combined reading of approximately 60 ohms. This measurement is a fundamental CAN diagnostic check; significant deviation indicates missing or shorted terminators or wire faults.

50. B — Gateway module failures affect message translation between network types, causing multiple seemingly unrelated modules to lose communication with each other. Symptoms appear across systems that don't share obvious functional connections — cluster, infotainment, climate, and safety systems can all exhibit issues simultaneously. Recognizing this pattern quickly saves significant diagnostic time.