

# SECTION F: T6 — ELECTRICAL/ELECTRONIC SYSTEMS SIMULATION EXAMS

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Section F contains eight full-length simulation exams for the T6 — Electrical/Electronic Systems certification test. Each simulation contains 50 scored questions with a recommended completion time of 60 minutes — matching the official ASE T6 examination scored question count exactly. T6 covers the complete electrical and electronic architecture of medium and heavy-duty commercial trucks, from foundational circuit theory and battery diagnosis to advanced multiplexed data networks and electronic module programming.

Every T6 simulation in this section delivers questions across the five official ASE domains in the precise weighting used on the actual test:

Domain	Topic	Questions per Simulation
A	General Electrical/Electronic Systems Diagnosis	14
B	Battery and Starting Systems Diagnosis and Repair	8
C	Charging System Diagnosis and Repair	5
D	Lighting Systems Diagnosis and Repair	7
E	Gauges, Warning Devices, Driver Information Systems, and Related Circuits	16
	<b>Total</b>	<b>50</b>

The eight simulations together provide 400 practice questions covering the complete T6 task list. Domain E (gauges, warning devices, driver information systems, and related circuits) at 32 percent and Domain A (general electrical diagnosis) at 28 percent together account for 60 percent of every test, reflecting the central role that data networks, instrumentation, and foundational circuit reasoning play in modern heavy-duty truck service. Pay particular attention to Ohm's Law applications under load, voltage drop testing methodology, parasitic draw isolation, J1939 and J1587 data bus diagnosis, multiplexed lighting and chassis modules, AGM and lithium-ion battery service procedures, brushless alternator diagnosis, and the integration of electronic instrumentation with the truck's multiplexed network architecture.

The questions use all five ASE question formats in proportions that match the real exam: direct questions, Technician A and Technician B questions, EXCEPT questions, LEAST likely questions, and completion questions. Electrical-specific question patterns appear throughout — interpreting digital multimeter readings, reasoning through voltage drop test results, distinguishing open-circuit from high-resistance faults, recognizing scan tool DTC patterns specific to chassis multiplexing, applying load testing principles to batteries and starters, and using oscilloscope waveform analysis on alternator diodes and data bus signals.

The content reflects current ASE T6 task list specifications, including current heavy-duty electrical architectures from Daimler, Volvo, Paccar, Navistar, and Mack, multiplexed chassis nodes with sleeper and trailer integration, brushless alternator designs from Delco, Bosch, and Leece-Neville, lithium-ion auxiliary power and battery monitoring systems, electronic instrument clusters with telematics integration, and the diagnostic procedures supporting OBD and J1939 service tools used in fleet shop operations.

Each simulation in this section progressively builds your diagnostic reasoning across the full T6 task list. Earlier exams establish a strong baseline across all five domains. Later exams introduce more complex multi-circuit scenarios, partial-data diagnostic situations, and standards-based reasoning that reflect the depth of knowledge required for confident performance on the real exam. Track your performance by domain to identify where your knowledge is strongest and where additional review will deliver the highest return on your study time.

The real ASE T6 exam is 50 scored questions. Across this section you have 400 practice questions ahead of you. Use every one of them.

# PRACTICE EXAM 1: T6 SIMULATION

## (50 QUESTIONS)

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1. A circuit with 12 volts applied and 4 ohms of resistance will draw how much current?
  - A. 0.33 amps
  - B. 3 amps
  - C. 8 amps
  - D. 48 amps
  
2. Tech A says voltage drop testing is performed with the circuit energized and under load. Tech B says voltage drop testing requires the circuit to be de-energized for accurate readings. Who is correct?
  - A. Both Tech A and Tech B
  - B. Tech B only
  - C. Neither Tech A nor Tech B
  - D. Tech A only
  
3. The maximum acceptable voltage drop across a high-current circuit cable in a 12-volt system is typically:
  - A. 0.5 volts or less
  - B. 1.5 volts or less
  - C. 3.0 volts or less
  - D. 6.0 volts or less

4. A digital multimeter set to measure DC voltage shows 12.6 volts at the battery terminals. The same meter shows 11.4 volts at the load side of a relay with the circuit energized. The voltage drop across the relay is:

- A. 0.6 volts
- B. 0.8 volts
- C. 1.2 volts
- D. 24.0 volts

5. Which of the following is the LEAST likely cause of high resistance in a heavy-duty truck electrical circuit?

- A. Insulation damage on the wire jacket
- B. Corroded terminal connections
- C. Loose ground strap fasteners
- D. Damaged splice connections

6. A parallel circuit with three branches drawing 2 amps, 3 amps, and 5 amps respectively has a total current of:

- A. 2 amps
- B. 3 amps
- C. 5 amps
- D. 10 amps

7. Tech A says a short to ground will blow the protective fuse in the circuit. Tech B says an open circuit will blow the protective fuse in the circuit. Who is correct?

- A. Both Tech A and Tech B

- B. Tech A only
- C. Tech B only
- D. Neither Tech A nor Tech B

8. The proper procedure for diagnosing a parasitic battery drain on a heavy-duty truck is to:

- A. Disconnect the negative cable and observe the dome light
- B. Connect a test light between the positive terminal and cable
- C. Connect an ammeter in series with the disconnected cable
- D. Connect a voltmeter across the disconnected battery cable

9. A heavy-duty truck circuit shows continuous battery voltage at a load with the switch in the OFF position. The most likely cause is:

- A. A short to power feeding the load through another circuit
- B. An open ground at the load device
- C. High resistance in the switch contacts
- D. A blown fuse in the protected circuit

10. Which of the following will NOT cause a circuit to fail with no current flow?

- A. Open in the power side of the circuit
- B. Open ground at the load device
- C. Blown circuit protection device
- D. Excessive battery voltage at the source

11. A series circuit contains three resistors of 2 ohms, 4 ohms, and 6 ohms. The total resistance of the circuit is:

- A. 12 ohms
- B. 6 ohms
- C. 4 ohms
- D. 1.09 ohms

12. The proper method for testing continuity in a wire that has been disconnected from both ends is:

- A. Apply 12 volts to one end and check for output voltage
- B. Connect a test light at one end and check for illumination
- C. Use a digital multimeter set to ohms or continuity mode
- D. Connect an ammeter in series with the disconnected wire

13. Tech A says a relay isolates a high-current load from a low-current control circuit. Tech B says a relay can be tested by jumping the load terminals with a fused jumper wire. Who is correct?

- A. Tech A only
- B. Both Tech A and Tech B
- C. Neither Tech A nor Tech B
- D. Tech B only

14. The correct way to scope-trace a J1939 data bus signal on a heavy-duty truck is to:

- A. Connect both leads to ground and measure voltage
- B. Connect the positive lead to power and the negative to ground
- C. Connect the leads across the chassis ground straps

D. Connect the leads across the CAN-H and CAN-L wires

15. The proper test sequence for a heavy-duty truck battery is:

A. Open-circuit voltage, then load test, then state-of-charge verification

B. Load test, then open-circuit voltage, then specific gravity check

C. Specific gravity check, then load test, then open-circuit voltage

D. Cranking test, then specific gravity, then open-circuit voltage

16. A flooded lead-acid battery shows an open-circuit voltage of 12.4 volts. The state of charge is approximately:

A. 100 percent fully charged

B. 25 percent charged

C. 75 percent charged

D. 0 percent fully discharged

17. Tech A says AGM batteries can be tested using the same load tester as flooded lead-acid batteries. Tech B says AGM batteries require a specific charging profile different from flooded batteries. Who is correct?

A. Tech A only

B. Tech B only

C. Neither Tech A nor Tech B

D. Both Tech A and Tech B

18. A heavy-duty truck cranks slowly with all batteries showing full charge. The voltage at the starter motor during cranking is 8.5 volts while the battery voltage is 11.2 volts. The most likely cause is:

- A. Failed starter motor with internal damage
- B. Excessive voltage drop in the starter cable circuit
- C. Discharged batteries with insufficient cranking capacity
- D. Failed starter solenoid with internal contact damage

19. The recommended load test current for a flooded lead-acid heavy-duty truck battery is approximately:

- A. The full CCA rating of the battery for 30 seconds
- B. Twice the CCA rating of the battery for 15 seconds
- C. Half the CCA rating of the battery for 15 seconds
- D. The Reserve Capacity rating of the battery for 30 seconds

20. The proper sequence for connecting jumper cables between two trucks is:

- A. Positive to dead, positive to good, negative to good, negative to dead chassis ground
- B. Negative to dead, negative to good, positive to good, positive to dead battery terminal
- C. Positive to good, negative to good, positive to dead, negative to dead battery terminal
- D. Negative to good, positive to good, negative to dead, positive to dead chassis ground

21. A starter motor draws excessive current during cranking and turns the engine slowly. The most likely cause is:

- A. High resistance in the battery cable circuit causing voltage drop
- B. Discharged batteries unable to deliver cranking current properly
- C. Failed starter motor with bearing wear or shorted armature windings

D. Failed starter solenoid unable to engage the pinion gear assembly

22. Tech A says battery cables should be inspected at every PM for corrosion, damaged insulation, and loose connections. Tech B says cables passing visual inspection do not require voltage drop testing. Who is correct?

A. Tech A only

B. Tech B only

C. Both Tech A and Tech B

D. Neither Tech A nor Tech B

23. A heavy-duty truck alternator produces 14.2 volts at 1,500 RPM with no electrical load. With headlights, fan, and accessories on, voltage drops to 13.0 volts. The most likely condition is:

A. The alternator is operating normally under load conditions

B. The voltage regulator has failed to maintain regulated output

C. The alternator has internal diode damage reducing output

D. The alternator output capacity is below load requirements

24. The proper test for excessive AC ripple from a heavy-duty truck alternator uses:

A. A digital multimeter set to DC voltage scale

B. A digital multimeter set to AC voltage scale

C. An analog ammeter set to DC current scale

D. A test light connected to the output terminal

25. Tech A says a brushless alternator uses a stationary field winding and rotating armature. Tech B says brushless designs eliminate brush wear as a service issue. Who is correct?

- A. Both Tech A and Tech B
- B. Tech A only
- C. Tech B only
- D. Neither Tech A nor Tech B

26. The maximum acceptable AC ripple voltage from a properly functioning heavy-duty alternator is:

- A. 0.05 volts AC
- B. 0.20 volts AC
- C. 0.50 volts AC
- D. 1.50 volts AC

27. A heavy-duty alternator output test shows 13.8 volts at full electrical load. The OEM specification calls for 13.8 to 14.2 volts at full load. The conclusion is:

- A. The alternator output is below specification and requires service
- B. The alternator output is within specification and is functioning correctly
- C. The alternator output exceeds specification and requires regulator adjustment
- D. The alternator output cannot be evaluated without a load bank test

28. A heavy-duty truck headlight circuit has one headlight inoperative. The other headlight works normally. The LEAST likely cause is:

- A. Burned-out headlight bulb on the inoperative side
- B. Open in the power feed to the inoperative headlight

- C. Open ground at the inoperative headlight
- D. Blown fuse protecting both headlight circuits

29. Tech A says LED headlights draw less current than incandescent bulbs of the same lumen output. Tech B says LED headlights typically have built-in driver circuits that require specific voltage regulation. Who is correct?

- A. Both Tech A and Tech B
- B. Tech A only
- C. Tech B only
- D. Neither Tech A nor Tech B

30. A multiplexed lighting system on a heavy-duty truck uses which method to control individual lamp circuits?

- A. Direct switch-to-load wiring with no module involvement
- B. Relay-controlled circuits driven from the main fuse panel
- C. Network commands from a body controller to chassis nodes
- D. Resistor-divider circuits modulated by a main switch panel

31. The proper procedure for aiming heavy-duty truck headlights uses:

- A. An optical aimer or aiming wall at OEM-specified distance and height
- B. Visual estimation comparing left and right beam patterns
- C. Measurement of beam height at 100 feet using a tape measure
- D. The truck's automatic headlight aiming system without external tools

32. A heavy-duty truck trailer lighting system shows all lights on the trailer inoperative. The tractor lights work normally. The LEAST likely cause is:

- A. Damaged seven-way connector at the tractor or trailer
- B. Open ground in the trailer wiring harness
- C. Open power feed in the trailer pigtail
- D. Burned-out bulbs in all trailer lighting positions

33. Tech A says heavy-duty truck stop lamps are typically wired in parallel so one bulb failure does not affect others. Tech B says stop lamp circuits include a separate ground at each lamp position. Who is correct?

- A. Tech A only
- B. Tech B only
- C. Both Tech A and Tech B
- D. Neither Tech A nor Tech B

34. A heavy-duty truck has flickering marker lights. The lights work but vary in intensity randomly. The most likely cause is:

- A. High resistance in the lighting circuit ground or power feed
- B. Failed body controller module commanding the lamps incorrectly
- C. Open in the marker lamp circuit interrupting power flow
- D. Excessive battery voltage from the alternator output

35. A heavy-duty truck temperature gauge reads in the red zone but the engine shows normal operating temperature. The most likely cause is:

- A. Engine actually overheating despite other indications

- B. Failed temperature sender with shorted internal element
- C. Failed gauge with internal damage to the movement
- D. Open circuit between the sender and the gauge cluster

36. Tech A says J1939 data bus operates at 250 kbps on most heavy-duty trucks. Tech B says J1587 was a predecessor protocol used on older heavy-duty trucks. Who is correct?

- A. Tech A only
- B. Tech B only
- C. Neither Tech A nor Tech B
- D. Both Tech A and Tech B

37. A scan tool connected to a heavy-duty truck displays "no communication" on all modules. The most likely cause is:

- A. A single failed module disconnecting from the data bus
- B. A failed sensor providing incorrect data to the network
- C. A data bus wiring fault or terminating resistor failure
- D. A failed scan tool incompatible with the truck protocol

38. The two terminating resistors on a heavy-duty truck J1939 data bus each have a value of:

- A. 120 ohms
- B. 60 ohms
- C. 240 ohms
- D. 1,000 ohms

39. With both J1939 terminating resistors connected in parallel, the resistance measured between CAN-H and CAN-L with the system de-energized should be:

- A. 120 ohms
- B. 60 ohms
- C. 240 ohms
- D. 12,000 ohms

40. A heavy-duty truck instrument cluster receives sensor data through which communication method on a 2020 model year vehicle?

- A. Direct analog voltage from each sensor to the gauge
- B. Pulse-width modulated signals from each sensor to the gauge
- C. Digital data over the J1939 bus from controlling modules
- D. Resistance signals from each sensor to the gauge

41. Tech A says heavy-duty truck warning lamps are typically driven by the body controller through multiplexed network commands. Tech B says warning lamp logic is determined by the engine ECU and other modules sending status messages on the data bus. Who is correct?

- A. Tech A only
- B. Tech B only
- C. Neither Tech A nor Tech B
- D. Both Tech A and Tech B

42. The proper diagnostic approach for a complaint of "all gauges erratic" on a heavy-duty truck is to first:

- A. Replace the instrument cluster as the most likely failure point

- B. Check power and ground at the instrument cluster connectors
- C. Replace each sensor in sequence until the issue resolves
- D. Reflash the engine ECU to restore proper data transmission

43. A heavy-duty truck low-air pressure warning buzzer activates intermittently during normal operation when air pressure is verified within specification. The most likely cause is:

- A. Faulty low-air pressure switch with intermittent contact issues
- B. Failed air compressor unable to maintain system pressure
- C. Restricted air dryer affecting downstream pressure readings
- D. Failed buzzer assembly activating without input signal

44. The recommended diagnostic tool for reading and clearing fault codes on a heavy-duty truck with J1939 architecture is:

- A. An OBD-II scan tool used on light-duty vehicles
- B. A digital multimeter set to read DC voltage signals
- C. A heavy-duty scan tool with J1939 protocol support
- D. An analog test light connected to the diagnostic connector

45. Tech A says heavy-duty truck ABS warning lamps are driven by the ABS module through direct hardwiring. Tech B says ABS status is also broadcast on the data bus to other modules including the instrument cluster. Who is correct?

- A. Tech A only
- B. Tech B only
- C. Neither Tech A nor Tech B
- D. Both Tech A and Tech B

46. A heavy-duty truck driver reports that the fuel gauge reads full continuously regardless of actual fuel level. The most likely cause is:

- A. Open circuit in the fuel sender wiring to the cluster
- B. Shorted fuel sender stuck at the full position
- C. Failed instrument cluster with damaged movement
- D. Failed body controller misreading sender data

47. The proper procedure for replacing a heavy-duty truck instrument cluster on a 2021 model year truck typically requires:

- A. Programming the new cluster with truck-specific configuration data
- B. Direct plug-and-play installation with no programming needed
- C. Reflashing the engine ECU after cluster installation
- D. Recalibrating each individual gauge using a service tool

48. A heavy-duty truck check engine lamp is illuminated. The proper first diagnostic step is:

- A. Replace the engine ECU because lamp illumination indicates ECU failure
- B. Disconnect the battery to clear the lamp before further diagnosis
- C. Connect a scan tool and retrieve the active fault codes
- D. Inspect the wiring harness for visible damage at the engine

49. Tech A says heavy-duty truck telematics systems typically receive data from the J1939 bus through a gateway module. Tech B says telematics modules can transmit fault codes and operational data to fleet management software remotely. Who is correct?

- A. Tech A only
- B. Tech B only
- C. Neither Tech A nor Tech B
- D. Both Tech A and Tech B

50. A heavy-duty truck shows multiple fault codes from different modules following a recent battery replacement. The most likely cause is:

- A. Permanent damage to multiple modules from the battery replacement
- B. Voltage transients during disconnect or reconnect of the battery
- C. Coincidental simultaneous failure of multiple modules
- D. Improper battery terminal torque after the replacement service

# PRACTICE EXAM 1: ANSWER KEY AND EXPLANATIONS

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1. B — 3 amps by Ohm's Law ( $I = V \div R$ ). With 12 volts applied across 4 ohms of resistance, current equals  $12 \div 4 = 3$  amps. Ohm's Law is the foundation of all heavy-duty electrical diagnosis and must be applied confidently for circuit analysis.
2. D — Tech A only. Voltage drop testing must be performed with the circuit energized and under load because resistance only manifests as voltage drop when current is flowing. A de-energized circuit shows no voltage drop regardless of internal resistance, making the test useless for identifying high-resistance faults.
3. A — 0.5 volts or less. Industry standard for high-current circuit cables in 12-volt systems specifies 0.5 volts or less voltage drop, since higher drops indicate excessive resistance that reduces load voltage and component performance. Voltage drop above this threshold requires investigation and correction.
4. C — 1.2 volts. Voltage drop is calculated as the difference between source voltage and load-side voltage with the circuit energized:  $12.6 - 11.4 = 1.2$  volts. This drop across a single component exceeds typical specifications and indicates a high-resistance fault requiring service.
5. A — Insulation damage on the wire jacket. Damaged insulation creates short-circuit conditions or grounds, not high-resistance faults, since the conductor itself remains intact. High resistance is caused by corroded terminals, loose fasteners, or damaged splices that create poor electrical contact at connection points.
6. D — 10 amps. In a parallel circuit, total current equals the sum of all branch currents:  $2 + 3 + 5 = 10$  amps. Each parallel branch operates independently with its own current path, and the total represents the combined load on the source.
7. B — Tech A only. A short to ground creates a low-resistance path that allows excessive current to flow, blowing the protective fuse to prevent wire damage or fire. An open circuit interrupts current flow entirely, so no current flows through the fuse and the fuse remains intact.
8. C — Connect an ammeter in series with the disconnected cable. Parasitic draw measurement requires a series ammeter to read the current flowing from battery to chassis with all systems off. Test lights and voltmeters do not measure current and cannot quantify draw within the milliamp range that typical specifications allow.

9. A — A short to power feeding the load through another circuit. Continuous voltage at a load with the controlling switch in the OFF position indicates an unintended power source reaching the load, typically through a short or wiring error from another circuit. Open grounds, switch resistance, and blown fuses all cause loss of power, not unwanted continuous power.
10. D — Excessive battery voltage at the source. Higher-than-normal battery voltage causes over-current and component damage but does not stop current flow in a circuit. Open circuits on either side of the load and blown protection devices all interrupt current flow completely.
11. A — 12 ohms. In a series circuit, total resistance is the sum of all individual resistances:  $2 + 4 + 6 = 12$  ohms. Series resistance always adds because all current flows through each resistor sequentially.
12. C — Use a digital multimeter set to ohms or continuity mode. Continuity testing on a disconnected wire requires the meter to source its own test current and measure the wire's resistance, which is what the ohms or continuity mode does. Applying voltage or using a test light on a disconnected wire produces no useful information.
13. B — Both Tech A and Tech B. A relay isolates a high-current load circuit from a low-current control circuit, allowing a small switch or module to control a large load safely. Bench-testing a relay by jumping the load terminals with a fused jumper wire bypasses the relay coil and verifies that the load circuit itself is functional.
14. D — Connect the leads across the CAN-H and CAN-L wires. J1939 data bus signals are differential — the message is the voltage difference between CAN-H and CAN-L, not either wire to ground. Scoping across these two wires displays the actual signal waveform; measuring to ground displays only individual wire reference values.
15. A — Open-circuit voltage, then load test, then state-of-charge verification. The proper test sequence starts with open-circuit voltage to establish baseline state of charge, proceeds to load testing if voltage is adequate, and concludes with state-of-charge verification. Testing in this order prevents misdiagnosing a discharged battery as failed and avoids load testing batteries that need recharge first.
16. C — 75 percent charged. A flooded lead-acid battery at 12.4 volts open-circuit indicates approximately 75 percent state of charge per the standard voltage-to-SOC table. 12.6 volts represents 100%, 12.4 represents 75%, 12.2 represents 50%, and 12.0 represents 25% on the typical scale.
17. D — Both Tech A and Tech B. AGM batteries can be tested using standard heavy-duty load testers because internal chemistry produces similar load response characteristics. AGM batteries do require a specific charging profile (lower voltage limits, different absorption stage) to prevent damage from overcharging that flooded batteries can tolerate.

18. B — Excessive voltage drop in the starter cable circuit. A 2.7-volt drop between battery and starter (11.2 - 8.5) indicates excessive resistance in the cable circuit, which reduces voltage available at the starter and causes slow cranking. The other failures would not produce this specific voltage-drop pattern with the batteries showing full charge.
19. C — Half the CCA rating of the battery for 15 seconds. Standard load test procedure applies a load equal to half the CCA rating for 15 seconds, with a passing battery maintaining at least 9.6 volts at 70°F at the end of the test. Loading at full CCA or twice CCA damages the battery without providing useful information.
20. C — Positive to good, negative to good, positive to dead, negative to dead chassis ground. The recommended sequence connects positive to good battery, positive to dead battery, then negative to good battery, and negative to dead chassis ground (away from the battery to prevent ignition of hydrogen gas).
21. C — Failed starter motor with bearing wear or shorted armature windings. Excessive current draw with slow cranking indicates internal starter motor failure — bearing wear or shorted armature windings produce mechanical drag and electrical short paths that increase current while reducing rotational speed. High cable resistance would reduce both voltage and current; discharged batteries produce normal current at low voltage.
22. A — Tech A only. Battery cables must be inspected at every PM for corrosion, damaged insulation, and loose connections per TMC RP, since visible defects predict service failures. Tech B is incorrect because visual inspection alone misses internal corrosion and high-resistance connections that only voltage drop testing detects under load.
23. D — The alternator output capacity is below load requirements. Voltage dropping from 14.2 to 13.0 volts when loads are added indicates the alternator cannot maintain regulated output at the demanded current level, meaning output capacity is below load requirements. A properly sized alternator maintains regulated voltage across its rated load range.
24. B — A digital multimeter set to AC voltage scale. AC ripple from a charging system is measured with the meter set to AC volts because ripple is the alternating component superimposed on the DC output. DC voltage scale shows only the average output and cannot detect ripple from failed diodes.
25. A — Both Tech A and Tech B. Brushless alternators use a stationary field winding and a rotating armature, eliminating the need for brushes and slip rings. This design eliminates brush wear as a service issue, which is a significant advantage in heavy-duty service where brush wear historically required regular maintenance.
26. C — 0.50 volts AC. The maximum acceptable AC ripple from a properly functioning heavy-duty alternator is 0.5 volts AC, with values above this threshold indicating diode failure within the

rectifier bridge. Higher ripple voltage damages electronic components and disrupts data bus communications.

27. B — The alternator output is within specification and is functioning correctly. An output of 13.8 volts at full load is at the lower limit of the 13.8 to 14.2 volt specification, which is within range and indicates normal operation. No service is required when readings fall within specification.
28. D — Blown fuse protecting both headlight circuits. A blown fuse protecting both headlights would render both inoperative, not just one, so this is the least likely cause of a single inoperative headlight. Bulb failure, open power feed, and open ground are all common single-side failure modes.
29. A — Both Tech A and Tech B. LED headlights draw less current than incandescent bulbs of equivalent lumen output due to higher electrical efficiency, and they typically have built-in driver circuits that require specific voltage regulation to function correctly. Both characteristics affect heavy-duty truck retrofit and replacement decisions.
30. C — Network commands from a body controller to chassis nodes. Multiplexed lighting on modern heavy-duty trucks uses network commands from a body controller to chassis nodes that drive individual lamp circuits, eliminating point-to-point wiring between switches and loads. This architecture reduces wire count and enables advanced features like lamp-out detection.
31. A — An optical aimer or aiming wall at OEM-specified distance and height. Proper headlight aiming requires either an optical aimer or an aiming wall set to the OEM-specified distance and height, providing repeatable accuracy for beam pattern verification. Visual estimation and tape measurement methods do not produce consistent results meeting safety standards.
32. D — Burned-out bulbs in all trailer lighting positions. Simultaneous failure of every bulb on a trailer is highly unlikely, making it the least likely cause of complete trailer lighting loss. Connector damage, open ground, and open power feed all produce loss of all trailer lighting through a single fault point.
33. C — Both Tech A and Tech B. Heavy-duty stop lamps are wired in parallel so that one bulb failure does not affect other lamps in the circuit, and each lamp position typically includes a separate ground connection for reliability. Both design features are standard practice in commercial vehicle lighting systems.
34. A — High resistance in the lighting circuit ground or power feed. Flickering with random intensity variation is the signature of intermittent high-resistance connections in either the ground or power feed, where contact resistance varies with vibration and temperature. Module failures typically produce on/off behavior rather than flicker, and excessive battery voltage produces increased brightness, not variation.
35. B — Failed temperature sender with shorted internal element. A red-zone gauge reading with normal actual engine temperature indicates the gauge is receiving an incorrect signal — typically

from a shorted sender that simulates high temperature. Verification with an infrared thermometer or scan tool confirms actual engine temperature before sender replacement.

36. D — Both Tech A and Tech B. J1939 data bus operates at 250 kbps on most heavy-duty trucks, providing the bandwidth needed for engine, transmission, ABS, and body control communication. J1587 was the predecessor protocol used on older heavy-duty trucks before the industry transitioned to the higher-bandwidth J1939 standard.
37. C — A data bus wiring fault or terminating resistor failure. "No communication" on all modules indicates a system-wide bus failure, most commonly a wiring fault or terminating resistor failure that prevents any module from communicating. Single module failures only affect that module; sensor and tool issues produce different symptom patterns.
38. A — 120 ohms. J1939 specification requires two 120-ohm terminating resistors, one at each end of the bus, to prevent signal reflections that would corrupt data transmission. These resistors are critical to bus operation and their failure is a common cause of communication faults.
39. B — 60 ohms. Two 120-ohm resistors connected in parallel measure 60 ohms total ( $120 \div 2 = 60$ ), and this is the standard reading at the diagnostic connector with the system de-energized. A reading of 120 ohms indicates one terminating resistor is missing or open; readings outside 60 ohms indicate a bus fault.
40. C — Digital data over the J1939 bus from controlling modules. Modern heavy-duty truck instrument clusters receive sensor data as digital messages over the J1939 bus from the modules that own each sensor (engine ECU for coolant temperature, ABS module for wheel speed, etc.). Direct analog wiring is not used on contemporary multiplexed trucks.
41. D — Both Tech A and Tech B. Heavy-duty warning lamps are driven by the body controller through multiplexed network commands, with the body controller receiving status messages from the engine ECU and other modules over the data bus. Both technicians correctly describe parts of the warning lamp logic chain in modern multiplexed trucks.
42. B — Check power and ground at the instrument cluster connectors. A complaint of "all gauges erratic" most commonly traces to power or ground supply problems at the cluster, since multiplexed clusters depend on stable supply voltage to interpret network data correctly. Verifying power and ground is faster and cheaper than replacing the cluster or sensors.
43. A — Faulty low-air pressure switch with intermittent contact issues. Intermittent warning activation with verified normal air pressure indicates the warning switch itself is providing false signals, typically from intermittent contact issues within the pressure switch. Compressor, dryer, and buzzer failures produce different symptom patterns.
44. C — A heavy-duty scan tool with J1939 protocol support. Heavy-duty trucks use the J1939 protocol (not light-duty OBD-II), so the diagnostic tool must support J1939 to read and clear fault

codes. Light-duty OBD-II tools, multimeters, and test lights cannot communicate with heavy-duty modules.

45. D — Both Tech A and Tech B. ABS warning lamps are driven by the ABS module through direct hardwiring as a redundant safety circuit, AND ABS status is broadcast on the data bus to other modules including the cluster for display and logging. Both communication paths exist on current heavy-duty trucks.
46. B — Shorted fuel sender stuck at the full position. A continuously-full fuel gauge reading regardless of actual level indicates the sender is sending the full-position signal continuously, typically from a stuck or shorted sender mechanism. Open circuits typically produce empty readings or no reading; cluster and module failures produce different patterns.
47. A — Programming the new cluster with truck-specific configuration data. Modern heavy-duty instrument clusters require programming with truck-specific configuration data (VIN, mileage, options, calibration values) after replacement. Plug-and-play installation does not work on multiplexed trucks because the cluster must know vehicle configuration to display correct information.
48. C — Connect a scan tool and retrieve the active fault codes. The first diagnostic step for any check engine lamp on a heavy-duty truck is to retrieve fault codes with a scan tool, which identifies the specific system or sensor reporting the fault. ECU replacement, battery disconnect, and harness inspection are all premature actions that bypass the diagnostic information already available.
49. D — Both Tech A and Tech B. Heavy-duty telematics systems receive data from the J1939 bus through a gateway module that translates messages, and they transmit fault codes and operational data to fleet management software remotely via cellular or other wireless connection. Both functions are standard for modern fleet telematics.
50. B — Voltage transients during disconnect or reconnect of the battery. Multiple modules reporting fault codes after battery service most commonly trace to voltage transients during disconnect or reconnect, which produce momentary out-of-range readings that modules log as faults. These codes typically clear normally and do not indicate permanent damage.