PRACTICE EXAM 9: ASE L1 SIMULATION

50 Questions — Recommended Time: 150 Minutes

DOMAIN A — Q1–6

1. A vehicle has a P0171 and P0174. The technician finds LTFT B1 = +22%, LTFT B2 = +21% at idle only — both normalize at cruise. A smoke test reveals no leaks. The MOST likely cause is:

A. Weak injectors on both banks delivering below-spec volume at idle

B. A vacuum leak too small for the smoke test to detect — both-bank lean trim at idle normalizing at cruise is the definitive vacuum leak pattern

C. A MAF sensor undercounting at all airflow rates causing lean trim at all conditions

D. Low fuel pressure at idle recovering at higher RPM demand

2. A vehicle returns after a spark plug replacement with a new P0300 random misfire that was not present before the repair. The technician should FIRST:

A. Perform a compression test on all cylinders to rule out mechanical damage during plug replacement

B. Inspect all spark plugs for correct torque, correct heat range, and correct gap — an improperly installed plug is the most likely cause of a new misfire immediately after plug replacement

C. Replace all ignition coils as a precaution following the plug replacement

D. Perform a cylinder contribution test to identify which cylinder is misfiring before any inspection

3. A vehicle has a P0507 — Idle RPM High on a TAC system. PCM commands minimum throttle 2.1%. Idle = 1,390 RPM. LTFT = +1%. The MOST likely cause is:

A. A vacuum leak downstream of the throttle body introducing unmetered air above PCM control authority

B. The TAC motor is sticking mechanically at a partially open position

C. The PCM idle relearn has been lost requiring a throttle relearn procedure

D. The MAF sensor is undercounting at idle causing the PCM to hold minimum throttle

4. A vehicle has an intermittent stall only when making sharp left turns at low speed. No DTCs stored. The stall cannot be duplicated driving straight. The MOST likely cause is:

A. A TPS sensor losing signal during chassis flex from steering input

B. A MAF sensor with an intermittent fault triggered by chassis flex on left turns

C. Fuel starvation — fuel slosh during sharp left turns uncovers the fuel pickup in a low-fuel tank

D. A PCM connector with intermittent contact loss from chassis flex during turns

5. A vehicle has a surge at 60 mph steady cruise. No DTCs. Fuel trim = +1%. TCC slip PID shows 210 RPM at the exact moment of each surge event. The MOST likely cause is:

A. A slipping torque converter clutch causing RPM variation perceived as an engine surge

B. An EVAP purge solenoid opening at cruise delivering excess vapor disrupting the mixture

C. A thermally marginal ignition coil misfiring intermittently at highway cruise speed

D. An intermittent MAF sensor dropout causing a momentary lean condition at cruise

6. A vehicle has a P0016 correlation DTC. Timing marks confirm Bank 1 intake cam is retarded 13 degrees. Oil is correct. VVT solenoid screen is clean. Solenoid resistance = 7.9 ohms within spec. The MOST likely cause is:

A. PCM calibration fault not commanding VVT solenoid correctly

B. Timing chain stretch displacing cam position beyond VVT correction range

C. CMP sensor misalignment generating a false correlation fault

D. A worn or seized cam phaser not responding to correct oil pressure and solenoid command

DOMAIN B — Q7–22

7. A vehicle has STFT B1 = +23%, LTFT B1 = +20% at idle. Both drop to near zero at 2,500 RPM. No vacuum leaks found on smoke test. The MOST likely cause is:

A. Weak Bank 1 injectors at idle that improve at higher RPM demand

B. Low fuel pressure at idle recovering at higher RPM

C. A vacuum leak too small for the smoke test — lean trim at idle normalizing at RPM is the vacuum leak signature

D. A lazy Bank 1 upstream O2 sensor causing slow fuel trim correction at idle

8. A vehicle has STFT B1 = +2%, LTFT B1 = +3%, STFT B2 = +22%, LTFT B2 = +19% at idle. Both B2 values drop to near zero at 2,500 RPM. The MOST likely cause is:

A. A vacuum leak on the Bank 2 intake side — single-bank lean trim at idle normalizing at RPM is the definitive single-bank vacuum leak pattern

B. Weak Bank 2 injectors at all operating conditions

C. Low fuel pressure disproportionately affecting Bank 2 at idle

D. A MAF sensor fault affecting Bank 2 airflow calculation only

9. *[Composite Vehicle Question]* The Composite Vehicle has LTFT B1 = −24%, LTFT B2 = −22% at all conditions. EVAP purge disable shifts both to −10%. Re-enabling returns both to −23%. The MOST likely cause is:

A. The EVAP purge solenoid is the sole rich source — the −10% remaining trim is within normal LTFT variation

B. Leaking injectors are the sole rich source — EVAP disable should not affect injector leak-down

C. The MAF sensor is overcounting airflow causing PCM over-fueling at all conditions

D. The EVAP purge solenoid is confirmed stuck open and contributing — the −10% remaining trim after disable confirms an additional independent rich source is also present

10. A scan tool shows MAP = 14.5 psi at warm idle with the engine running. Atmospheric pressure is 14.6 psi. A running engine at idle should produce 17–21 in/Hg below atmospheric. The MOST likely cause is:

A. The engine has extremely low compression producing insufficient vacuum at idle

B. A large open vacuum port is causing the MAP sensor to read atmospheric correctly

C. The PCM is commanding a high MAP reading to extend warm-up enrichment

D. The MAP sensor has failed to barometric pressure — it is reading atmospheric rather than manifold vacuum

11. A vehicle has LTFT B1 = +22%, LTFT B2 = +21% at idle and at cruise — both banks remain elevated at 2,500 RPM. MAF g/s output compared to a known-good vehicle reads 20% lower at identical conditions. The MOST likely cause is:

A. A vacuum leak affecting both banks at all RPM conditions

B. Low fuel pressure causing lean operation at all operating conditions

C. Weak injectors on both banks causing lean trim at all conditions

D. A MAF sensor confirmed undercounting — 20% lower output than known-good at identical conditions confirms sensor fault as the cause of lean trim at all RPM

12. A vehicle has P0102 — MAF Low, P0122 — TPS Low, P0107 — MAP Low stored on the same trip. Battery voltage is normal. The MOST likely cause is:

A. Three independent sensor failures occurring simultaneously

B. A failed PCM 5V reference output — MAF, TPS, and MAP all share this supply and a failed VREF causes simultaneous low readings on all three sensors

C. A wiring harness short to ground affecting all three sensor signal wires simultaneously

D. A CAN bus fault preventing accurate sensor data from reaching the PCM

13. A vehicle has P0131 — O2 Sensor Low Voltage B1S1. The upstream B1 sensor reads fixed 0.06V at all conditions. STFT B1 = +24%, LTFT B1 = +21%. The MOST likely cause is:

A. A lean condition on Bank 1 producing legitimate low O2 sensor voltage and high positive fuel trim

B. The PCM is holding the O2 sensor signal low as a protection strategy

C. A failed upstream B1 O2 sensor stuck at low voltage — PCM interprets constant lean signal and adds maximum fuel producing high positive trim despite normal combustion

D. An exhaust leak at the upstream sensor diluting exhaust with fresh air and holding the sensor lean

14. A vehicle requires PCM reprogramming. Midway through the flash the battery voltage drops to 9.8V and the procedure stops at 62%. The MOST appropriate next step is:

A. Restart the flash immediately — the PCM can resume from the interruption point

B. Disconnect and reconnect the battery to reset the PCM before attempting to reflash

C. Contact the manufacturer technical support line or dealer for a PCM recovery procedure — a partially flashed PCM may require a specialized recovery tool

D. Replace the PCM immediately as a partially flashed module cannot be recovered

15. A vehicle has STFT = +1%, LTFT = +2% at idle and cruise. At WOT only STFT drops to −23%, LTFT begins shifting negative. EVAP purge disabled at simulated WOT — STFT immediately returns to +1%. The MOST likely cause is:

A. A MAF sensor overcounting at WOT airflow confirmed by the purge disable test

B. The EVAP purge solenoid opening at WOT delivering concentrated canister vapors — confirmed by immediate STFT response when purge is disabled

C. A fuel pressure regulator opening excessively at WOT causing excess fuel delivery

D. A fuel pump failing at WOT — the purge disable masked the actual fault

16. *[Composite Vehicle Question]* The Composite Vehicle has a confirmed permanent DTC P0420. Technician replaced the catalytic converter and cleared the code with a scan tool. The MIL extinguished. One week later at I/M testing P0420 is still reported. The MOST likely explanation is:

A. The replacement catalytic converter has already failed and P0420 has re-confirmed

B. The I/M equipment detected a pending P0420 the scan tool did not show

C. The MIL extinguishing confirmed the permanent DTC was successfully cleared

D. A scan tool clear command cannot erase a permanent DTC — only PCM monitor completion after a verified repair removes it

17. A vehicle has U0100 stored in the BCM, TCM, ABS module, and instrument cluster. PCM power = 12.6V, PCM ground = 0.03V. The MOST likely cause is:

A. All four modules have developed simultaneous communication faults

B. The battery is failing causing intermittent voltage drops simulating PCM loss

C. The scan tool protocol is incompatible generating false U0100 codes in all modules

D. The PCM has lost its CAN bus connection — power and ground confirmed normal, CAN bus wiring at the PCM is the most likely fault location

18. A vehicle has a P0141 — O2 Heater Circuit B1S2 Malfunction. Heater supply voltage = 12.4V at key on. Heater ground circuit tests 11.9V above chassis ground. Heater element resistance = infinite ohms. The MOST likely cause is:

A. The heater ground circuit has an open — 11.9V on the ground wire confirms no current path to chassis ground

B. The heater element has failed open — confirmed by infinite resistance — with 11.9V on the ground wire caused by back-feed through the open element confirming the heater element itself has failed

C. The PCM heater driver circuit has failed open preventing ground switching

D. The heater fuse has failed open — no current flow causes infinite resistance and voltage back-feeds to the ground wire

DOMAIN C — Q23–28

23. A P0304 misfire. Coil swap from cylinder 4 to cylinder 6 moves misfire to P0306. Cylinder 4 shows zero misfires with the replacement coil. The technician should:

A. Replace the coil originally on cylinder 4 — the misfire followed the coil confirming it is defective

B. Perform compression testing on cylinder 6 to confirm the transferred coil has not exposed a pre-existing mechanical fault

C. Also replace the cylinder 4 spark plug — it may have been damaged by the failed coil

D. Inspect both coil boots for carbon tracking before condemning the coil

24. A COP waveform shows normal dwell, normal collapse spike, spark line present but very short (0.2 ms) at very high spark line voltage. Post-spark oscillations are absent. The MOST likely cause is:

A. A wide spark plug gap requiring extended arc duration — long spark line is expected, not short

B. Carbon tracking in the coil boot providing an alternative high-voltage path that terminates the arc almost immediately after initiation

C. A closed gap spark plug — the very short arc at high voltage indicates the gap is too small, requiring minimal energy to fire but dissipating the arc energy almost instantly

D. A PCM driver cutting off dwell early causing insufficient energy and brief arc

25. A vehicle has P0351 — Coil A Primary Circuit Fault. Power supply = 12.6V. Ground drop = 0.1V within spec. PCM trigger confirmed with test light. Primary resistance = 0.5 ohms within spec. The MOST likely cause is:

A. PCM trigger signal voltage below threshold despite test light indication

B. An internal coil fault — all external inputs confirmed normal, pointing to internal primary winding failure under electrical load

C. An intermittent ground open not detected during static testing

D. A closed gap plug causing primary circuit overcurrent

26. A vehicle has a waste spark ignition with P0301 and P0304 simultaneously. Cylinders 1 and 4 are confirmed as a waste spark pair. Compression on both cylinders is normal. The MOST likely cause is:

A. Two independent injector faults on cylinders 1 and 4 simultaneously

B. Two independent coil failures on cylinders 1 and 4 simultaneously

C. Low compression on both cylinders from a shared mechanical fault

D. A single coil failure serving the 1/4 waste spark pair — simultaneous misfire on both cylinders of a confirmed waste spark pair is the definitive single coil failure indicator

27. A vehicle misfires only on cylinder 6 during cold start for the first 35 seconds. Warm operation is fully normal. Compression = 177 psi consistent with all cylinders. Warm injector contribution test is normal. The MOST likely cause is:

A. A cold-start rich condition flooding cylinder 6 during the enrichment period

B. Carbon deposits on the cylinder 6 plug that are only conductive when cold

C. A cylinder 6 COP coil producing insufficient secondary voltage during cold cranking when plug resistance is highest — recovering as it warms

D. A PCM not commanding sufficient cold-start enrichment to cylinder 6 only

28. A technician captures a six-cylinder COP primary waveform. One cylinder shows a collapse spike amplitude 48% lower than all others. Spark line is present. Post-spark oscillations are reduced but not absent. The technician should FIRST:

A. Replace the coil immediately — reduced collapse spike confirms primary winding fault

B. Perform a coil swap to confirm the fault follows the coil before condemning it

C. Measure primary resistance of the suspected coil and compare to specification as the first diagnostic step

D. Replace the spark plug on that cylinder — a wide gap increases secondary resistance reducing available collapse energy

DOMAIN D — Q29–36

29. A GDI vehicle has P0087. Low-pressure pump = 67 psi within spec. High-pressure rail at idle = 260 psi against a 1,500 psi minimum. HPFP cam lobe is confirmed normal. The MOST likely cause is:

A. A clogged high-pressure fuel filter between HPFP and rail

B. A high-pressure fuel pressure regulator stuck fully open bypassing all fuel

C. The low-pressure pump is actually failing — 67 psi is a false reading

D. A failed HPFP that cannot generate high-pressure output despite normal cam lobe and adequate low-pressure feed

30. A vehicle has STFT = −16%, LTFT = −14% at all conditions. EVAP purge disable causes no trim change. Fuel pressure = 66 psi — spec is 55–62 psi. No vacuum leaks. The MOST likely cause is:

A. Multiple leaking fuel injectors delivering excess fuel at all conditions

B. Fuel pressure at 4 psi above the upper spec limit is increasing injected volume per pulse across all injectors — elevated rail pressure is the confirmed rich source

C. A contaminated upstream O2 sensor reading rich causing aggressive PCM fuel reduction

D. A failed MAP sensor reading high load at idle causing PCM over-fueling

31. A fuel pressure hold test: static = 61 psi. After 20 minutes with the engine off pressure drops to 9 psi. The Schrader valve is blocked and test repeated — pressure holds at 61 psi for 20 minutes. This confirms:

A. The fuel pressure regulator is leaking

B. The fuel injectors are leaking — blocking the Schrader valve would not affect injector leak-down

C. The fuel pump check valve is leaking

D. The Schrader valve is leaking — blocking it stopped all pressure loss confirming it as the fault

32. A cylinder contribution test shows all cylinders producing 35–41 RPM drop when disabled except cylinder 2, which shows a 2 RPM drop. Cylinder 2 compression = 178 psi consistent with all others. Plug is dry and normal color. Injector DSO waveform on cylinder 2 is normal. The MOST likely cause is:

A. The cylinder 2 coil is weak — injector waveform is normal but the coil is failing

B. The cylinder 2 injector is clogged — a correct DSO waveform only confirms electrical operation, not mechanical fuel delivery

C. The PCM driver for cylinder 2 is not sending a trigger pulse

D. Cylinder 2 has a valve train fault causing poor volumetric efficiency

33. A vehicle has STFT B1 = +21%, LTFT B1 = +18% at idle. At 2,500 RPM both drop to +2%. A propane enrichment test near the Bank 1 rear intake runner immediately causes STFT B1 to drop to +1%. The MOST likely cause is:

A. A vacuum leak confirmed at the Bank 1 rear intake runner — propane enrichment isolated the leak location

B. A clogged Bank 1 rear injector causing lean operation — the propane test masked the injector fault

C. A MAF sensor fault — no propane response at the throttle body inlet confirmed the MAF is faulty

D. A PCV leak at the Bank 1 rear valve cover introducing unmetered air at idle

34. A vehicle with GDI has a rough idle and P0300 random misfire at 93,000 miles. No fuel DTCs. HPFP waveform is normal. Near-zero fuel trim. Borescope confirms heavy carbon deposits on all intake valves. The MOST appropriate repair is:

A. Replace all GDI injectors — the carbon deposits originate from injector spray pattern

B. Perform a walnut shell blast or chemical induction cleaning to remove the confirmed carbon deposits from the intake valves

C. Replace the intake manifold assembly to provide clean valve seats without disturbing the deposits

D. Replace the PCV valve — it is the sole cause of GDI intake valve carbon and the only required repair

35. A vehicle has P0087 at WOT only. Static = 59 psi. Idle dynamic = 57 psi. WOT dynamic = 24 psi. Volume test at WOT delivers 490 ml in 30 seconds — spec minimum 860 ml. The MOST likely cause is:

A. A fuel pressure regulator opening excessively at high demand

B. A partially clogged fuel filter — replace and retest before condemning the pump

C. A PCM reducing pump command at WOT to prevent overspeed

D. A fuel pump that cannot sustain adequate pressure or volume at WOT — confirmed by both the pressure drop and failed volume test

36. A scan tool command to disable EVAP purge at idle causes STFT B1 to shift from −17% to −2% and STFT B2 to shift from −16% to −2%. Re-enabling returns both to −16% to −17%. This confirms:

A. The EVAP vent solenoid is stuck open causing fresh air dilution of canister vapors

B. The charcoal canister is liquid-saturated delivering raw fuel vapor to the intake

C. The EVAP purge solenoid is stuck open — disabling it stops vapor delivery and both bank trims normalize immediately — confirming the solenoid is the active rich source

D. Normal purge operation — the canister is heavily loaded and purge is functioning correctly

DOMAIN E — Q37–44

37. A vehicle has P0401 — Insufficient EGR Flow. Bidirectional EGR test at idle produces 195 RPM drop. EGR monitor runs and fails P0401. The MOST likely cause is:

A. The EGR valve is not actually opening despite the RPM drop

B. EGR flow is adequate at idle but insufficient at the higher load conditions the monitor uses — partial carbon restriction in the passages is the most likely cause

C. The PCM is setting a false P0401 because the idle functional test confirmed correct operation

D. The EGR position sensor is misreporting causing the monitor to under-evaluate actual EGR flow

38. A vehicle has a P0420. Upstream B1 O2 switching is normal. Downstream B1 is fixed at 0.14V at all conditions. LTFT B1 = +1%. The MOST likely cause is:

A. A degraded Bank 1 catalyst — a failed converter would show the downstream sensor mirroring upstream switching, not fixed low

B. A rich condition overwhelming the catalyst — normal LTFT rules out a rich cause

C. The downstream B1 sensor has failed low or an exhaust leak upstream of the downstream sensor is holding it lean with fresh air — creating a false lean reading that mimics poor catalyst efficiency

D. The upstream B1 sensor is lazy causing incorrect catalyst efficiency evaluation

39. A five-gas test shows HC = 1,960 ppm, CO = 0.06%, O2 = 3.2%, CO2 = 14.5%, NOx = 18 ppm. STFT = +1%, LTFT = +2%. The MOST likely cause is:

A. A cylinder misfire — high HC with elevated O2 and very low CO with near-zero fuel trim is the definitive unburned mixture misfire pattern

B. A rich mixture — high HC and low O2 confirm excess fuel causing incomplete combustion

C. A catalytic converter failure — near-zero fuel trim and elevated HC indicate the converter is not oxidizing hydrocarbons

D. A lean condition — elevated O2 confirms lean combustion producing partial HC

40. A vehicle has P0446 — EVAP Vent Control Circuit Malfunction. Vent solenoid commanded closed via scan tool — smoke continues to flow freely from the vent port during a smoke test. The MOST likely cause is:

A. Smoke machine pressure is too high for the vent solenoid to seal against

B. The charcoal canister has an internal bypass allowing smoke to flow regardless of vent solenoid position

C. The PCM is overriding the close command to prevent canister pressure buildup

D. The vent solenoid is not closing when commanded — failed mechanically open or control circuit open preventing energization

41. A vehicle has an active P0300 from a failed ignition module and a stored P0420. The correct repair sequence is:

A. Replace both ignition module and catalytic converter simultaneously to address both DTCs efficiently

B. Replace the ignition module first — clear all codes — complete the catalyst monitor drive cycle — determine if P0420 returns independently before condemning the converter

C. Replace the catalytic converter first to prevent further thermal damage from the ongoing misfire

D. Clear all codes and perform a drive cycle with the misfire present to determine if P0420 is independently confirmed

42. A vehicle has P0455 large EVAP leak. Smoke test shows heavy smoke from the filler neck area with cap installed. Fuel cap passes a bench pressure test. The MOST likely cause is:

A. The EVAP vent solenoid is stuck open allowing smoke to escape near the filler neck

B. The canister vent tube is routed near the filler neck and is the actual smoke source

C. The filler neck has an internal crack allowing smoke to escape

D. The fuel cap is not sealing against the vehicle's filler neck — the cap seals correctly on a bench test adapter but leaks against the vehicle's worn or damaged filler neck sealing surface

43. A vehicle has elevated CO at a no-load I/M test. STFT = −18%, LTFT = −16% at both test RPMs. Upstream O2 sensor switches normally. Disabling EVAP purge causes STFT to shift from −18% to −3% immediately. The MOST likely cause is:

A. A stuck-open EVAP purge solenoid is the primary rich source — confirmed by the immediate fuel trim response when the solenoid is disabled

B. Leaking injectors are the primary rich source — the EVAP purge response is coincidental

C. High fuel pressure is causing excess delivery regardless of EVAP purge status

D. A failed upstream O2 sensor is causing the PCM to aggressively reduce fuel delivery

44. A vehicle has P0491 and P0492. Air pump runs when commanded. Five-gas during AIR operation shows 21% HC reduction Bank 1 — no change Bank 2. Both check valves seal correctly. The MOST likely cause is:

A. The air pump is delivering reduced volume to both banks simultaneously

B. The PCM is not commanding the Bank 2 AIR solenoid to open

C. Bank 2 exhaust ports are clogged preventing air injection

D. A disconnected or cracked Bank 2 air delivery hose — air is not reaching Bank 2 exhaust ports despite pump operation and confirmed check valve function on both banks

DOMAIN F — Q45–50

45. A vehicle fails OBD I/M. Report: MIL = ON, P0300 confirmed. Model year = 2013. The MOST likely test result explanation is:

A. P0300 is a misfire DTC — it illuminates the MIL only after two consecutive failure trips, not on the first detection

B. An illuminated MIL from any confirmed emissions-related DTC is an automatic OBD I/M failure regardless of DTC type

C. P0300 fails I/M only if the misfire monitor is also confirmed complete and the MIL has been on for more than one drive cycle

D. The vehicle passes because the misfire monitor is a continuous monitor and its status does not affect I/M testing

46. A vehicle fails no-load I/M: HC = 690 ppm (limit 220 ppm) at idle. CO within limits. O2 = 3.1%. No DTCs. Fuel trim near zero. The MOST likely cause is:

A. A rich condition — elevated HC with low O2 would confirm rich combustion, but O2 is elevated here

B. A catalytic converter not oxidizing HC — normal fuel trim and elevated O2 confirm normal combustion but the converter is not processing HC below the test limit

C. A lean condition producing partial combustion and elevated HC with excess O2

D. A cold engine — catalyst below light-off temperature allowing HC to pass through unreduced

47. A vehicle fails loaded I/M: NOx = 2,120 ppm (limit 1,000 ppm). HC and CO within limits. Road test confirms EGR commanded 0% at all load conditions above 22% throttle. EGR idle test produces 190 RPM drop. No EGR DTCs. The MOST likely cause is:

A. The PCM is intentionally disabling EGR above 22% throttle as a normal platform strategy

B. The EGR valve is mechanically binding above 22% throttle from thermal expansion under load

C. The catalytic converter is not reducing NOx despite adequate EGR operation

D. An EGR enable condition is not being satisfied above 22% throttle — a failed or out-of-range sensor input may be preventing PCM EGR command at load conditions needed for NOx control

48. A 2013 vehicle. OBD I/M report: MIL = OFF, No DTCs, Catalyst Monitor = Not Ready, EVAP Monitor = Not Ready. All other monitors complete. The technician should advise:

A. Two incomplete monitors are within the allowance for 1996–2000 vehicles but this 2013 model exceeds the one-monitor limit — the customer must complete a drive cycle before retesting

B. Two incomplete monitors are within the allowance for all OBD II vehicles regardless of model year

C. The EVAP monitor is excluded from the count so only one monitor is incomplete — the vehicle passes

D. The vehicle passes because the MIL is off and no DTCs are stored — monitor status is secondary

49. A vehicle fails no-load I/M: HC = 1,720 ppm at idle, HC = 810 ppm at 2,500 RPM. CO within limits at both speeds. O2 = 2.9% at idle, O2 = 0.7% at 2,500 RPM. Fuel trim near zero. No DTCs. The MOST likely cause is:

A. A rich condition at idle producing elevated HC that partially resolves at 2,500 RPM

B. An idle misfire — high HC with elevated O2 and near-zero fuel trim at idle improving at 2,500 RPM when combustion stabilizes is the definitive idle misfire I/M pattern

C. A catalytic converter that is cold at idle and becomes effective at 2,500 RPM

D. A cold engine — catalyst not yet at operating temperature allowing HC through at idle

50. A vehicle I/M report: MIL = OFF, No DTCs, all monitors complete. HC = 19 ppm, CO = 0.02%, NOx = 79 ppm. The vehicle:

A. Passes — all OBD I/M criteria are met and all emission gas readings confirm complete combustion and functioning emission controls

B. Fails — NOx must be below 50 ppm on all OBD II vehicles

C. Passes OBD only — a loaded five-gas test is required to confirm compliance

D. Fails — HC should read zero on a properly functioning catalyst-equipped vehicle

PRACTICE EXAM 9: ANSWER KEY AND EXPLANATIONS

1. B — Vacuum Leak Too Small for Smoke — Both-bank lean trim at idle normalizing at cruise is the definitive vacuum leak pattern. The smoke test not finding a leak does not eliminate this diagnosis — small cracks at gasket seating surfaces may not produce visible smoke. Propane enrichment testing is the appropriate follow-up.

2. D — Inspect New Plugs First — A new P0300 appearing immediately after a spark plug replacement is almost certainly related to the repair. Inspecting all newly installed plugs for correct torque, correct heat range, correct gap, and proper seating is the logical first step before any additional testing or component replacement.

3. A — Vacuum Leak Downstream of Throttle — Minimum PCM throttle command (2.1%) with idle at 1,390 RPM and near-zero LTFT confirms uncontrolled air is entering the intake downstream of the throttle body. Near-zero LTFT rules out a lean fuel condition — a vacuum leak introduces unmetered air the PCM cannot control or compensate for through throttle adjustment.

4. C — Fuel Slosh on Left Turns — An intermittent stall only during sharp left turns that cannot be duplicated driving straight points to momentary fuel starvation. At low fuel levels a sharp left turn can uncover the fuel pickup in the tank causing a brief fuel delivery interruption — the classic presentation of this fault is a stall that recovers when the vehicle straightens.

5. A — TCC Slipping — Near-zero fuel trim rules out mixture faults. TCC slip PID of 210 RPM at the exact moment of each surge event confirms the torque converter clutch is not locking consistently — RPM variation from TCC slip is directly perceived as an engine surge with no engine management fault present.

6. D — Cam Phaser Mechanical Fault — Confirmed cam retard of 13 degrees with correct oil, clean solenoid screen, and normal solenoid resistance confirms all electrical and hydraulic inputs are functioning. The phaser is receiving correct commands and oil pressure but is not responding — indicating mechanical wear or seizure within the phaser body itself.

7. C — Vacuum Leak Too Small for Smoke — Single-bank lean trim at idle normalizing at 2,500 RPM is the vacuum leak pattern. Smoke tests do not detect all leaks — small cracks at gasket seating surfaces or port areas may not produce visible smoke escape. Propane enrichment testing near the Bank 1 intake area is the appropriate follow-up diagnostic step.

8. A — Single-Bank Vacuum Leak — Bank 2 lean trim at idle normalizing at 2,500 RPM with Bank 1 near zero at all conditions is the definitive single-bank vacuum leak pattern. The leak is on the Bank 2 intake side downstream of the MAF sensor — unmetered air has proportionally greatest lean effect at idle when total airflow is lowest.

9. D — EVAP Purge Contributing Plus Additional Rich Source — Partial trim shift from −23% to −10% when purge is disabled confirms the stuck-open purge solenoid is contributing. The −10% LTFT remaining after purge disable confirms a second independent rich source — leaking injectors or elevated fuel pressure — is also present and must be separately identified and repaired.

10. D — MAP Sensor Failed to Barometric — A MAP sensor reading near-atmospheric (14.5 psi) on a running engine at idle is not responding to intake manifold vacuum. A functioning engine at idle creates 17–21 in/Hg of vacuum — the MAP sensor should read approximately 6–9 psi, not near-atmospheric. The sensor has failed to its barometric default output value.

11. D — MAF Sensor Undercounting Confirmed — Both-bank lean trim persisting at idle and cruise with MAF output confirmed 20% lower than a known-good vehicle at identical conditions directly identifies the MAF sensor as the cause. A 20% undercounting error is sufficient to produce the level of lean trim observed — the comparison test is the definitive MAF fault confirmation method.

12. B — Failed PCM 5V VREF — Three sensors from different circuits all reporting low values simultaneously on the same trip points to a single shared fault in their common input. MAF, TPS, and MAP all use the PCM 5V reference supply — a failed VREF output causes all three to simultaneously lose their reference and report low signals, producing all three DTCs from a single fault.

13. C — Failed Sensor Causing PCM Over-Fueling — A fixed 0.06V upstream B1 sensor stuck at minimum voltage is not responding to actual exhaust chemistry. The PCM interprets the constant low-voltage signal as persistent lean combustion and adds maximum fuel — producing high positive LTFT despite normal combustion quality. The sensor failure is causing the fuel control error, not an actual lean condition.

14. C — Recovery Procedure Required — A partially flashed PCM at 62% completion contains corrupted mixed firmware. Standard reflash tools may not be able to re-initiate a flash on a corrupted PCM. Manufacturer technical support or a dealer recovery tool capable of performing a forced recovery flash is required before a standard reflash can proceed.

15. B — EVAP Purge Confirmed as WOT Rich Source — Near-zero fuel trim at idle and cruise confirms normal fueling at those conditions. Negative fuel trim only at WOT with immediate STFT return to near-zero when the EVAP purge solenoid is disabled directly confirms the purge solenoid is opening at WOT and delivering concentrated canister vapors — the definitive confirmation of a stuck-open purge solenoid as the WOT-only rich source.

16. D — Permanent DTC Requires Monitor Completion — A scan tool clear command extinguishes the MIL by erasing the confirmed DTC from active memory but cannot remove a permanent DTC. The permanent P0420 remains in PCM memory until the PCM runs the catalyst monitor under required enable criteria and confirms catalyst efficiency is acceptable — only monitor completion removes a permanent DTC.

17. D — PCM CAN Bus Connection Fault — PCM power (12.6V) and ground (0.03V) are confirmed normal. All four modules logging U0100 simultaneously identifies the PCM as the module that has gone offline on the CAN bus. With confirmed power and ground, the CAN bus wiring at the PCM — CAN High or CAN Low wire open or shorted — is the most likely fault location.

18. B — Heater Element Failed Open — Infinite resistance of the heater element directly confirms the element has failed open. With the element open, supply voltage feeds toward the ground circuit but no current flows — causing the full supply voltage to back-feed and appear on the ground wire (11.9V). The element failure is confirmed by resistance measurement and consistent with the ground wire voltage reading.

23. A — Replace Original Cylinder 4 Coil — The misfire moving from P0304 to P0306 after the coil swap directly confirms the defective coil moved with the swap. Cylinder 4 shows zero misfires with the replacement coil installed — confirming the cylinder itself is not at fault. The original cylinder 4 coil is defective and requires replacement.

24. C — Closed Gap Spark Plug — A very short spark line (0.2 ms) at very high spark line voltage indicates extremely low secondary circuit resistance. A closed or near-closed spark plug gap requires very high voltage to initiate across the tiny gap but dissipates the arc energy almost instantly — producing a very brief, very high-voltage arc with no remaining energy for post-spark oscillations.

25. B — Internal Coil Fault — Power supply, ground voltage drop, PCM trigger signal, and primary resistance are all confirmed within specification. All external circuit inputs are normal. The fault is internal to the coil — an internal primary winding fault that does not appear on a cold static resistance test but fails under actual operating electrical load.

26. D — Single Coil Failure on Waste Spark Pair — P0301 and P0304 on cylinders confirmed as a waste spark pair is the definitive indicator of a single shared coil failure. Both cylinders misfiring simultaneously from one coil failure is the expected waste spark failure pattern — normal compression on both cylinders rules out mechanical causes.

27. C — COP Coil Cold Output Failure — Normal compression rules out mechanical fault. Normal warm injector contribution rules out fuel fault. A cold-start misfire on one cylinder that resolves after warm-up with no other identified faults points to a COP coil with reduced cold-ambient secondary output — the coil cannot deliver sufficient voltage during cold cranking when plug resistance is highest but recovers as it thermally stabilizes.

28. C — Measure Primary Resistance First — Before condemning a coil based on waveform analysis alone, primary resistance should be measured and compared to specification. A reduced collapse spike can result from primary winding resistance increase — confirmed by measurement. This is the correct first step before a coil swap or immediate replacement to avoid unnecessary component replacement.

29. D — Failed HPFP — Normal low-pressure supply (67 psi) and confirmed normal cam lobe confirm all HPFP inputs are correct. High-pressure rail at only 260 psi against a 1,500 psi minimum with all inputs confirmed normal confirms the HPFP itself is mechanically failing — unable to generate adequate high-pressure output despite receiving all required mechanical drive and fuel supply inputs.

30. B — High Fuel Pressure Rich Cause — EVAP purge disable causing no trim change rules out EVAP as the rich source. Fuel pressure at 66 psi is 4 psi above the 62 psi upper specification limit — excess rail pressure increases injected fuel volume per pulse across all injectors simultaneously. This produces consistent negative LTFT at all conditions — the most likely cause is a failed pressure regulator not limiting maximum rail pressure.

31. D — Schrader Valve Leaking — Blocking the Schrader valve and pressure holding at 61 psi for 20 minutes directly confirms the Schrader valve itself is the leak source. If injectors, the pressure regulator, or the pump check valve were leaking, blocking the Schrader valve would not affect those leak paths. The test directly isolates and confirms the Schrader valve as the pressure loss source.

32. B — Clogged Injector — Normal compression rules out mechanical fault. Dry normal-color plug rules out a rich injector leak. A correct DSO injector waveform confirms the PCM is commanding and the solenoid is electrically operating — but a waveform only confirms electrical function, not mechanical fuel delivery. A clogged injector delivers zero or near-zero fuel while producing a completely normal electrical waveform.

33. A — Vacuum Leak Isolated by Propane Test — Bank 1 lean trim at idle normalizing at RPM confirms a vacuum leak pattern. Immediate STFT drop when propane is introduced near the Bank 1 rear runner directly isolates the vacuum leak location. The propane displaces the unmetered air source — correcting the lean condition and identifying the leak at the Bank 1 rear intake runner gasket or port area.

34. B — Walnut Shell Blast or Chemical Induction Cleaning — GDI intake valve carbon deposits confirmed by borescope are a known maintenance issue — direct injection does not wash valve stems and backs with fuel as MFI does. Carbon deposits require mechanical removal via walnut shell media blasting or chemical Top Engine Clean induction procedures to restore normal airflow and cylinder filling.

35. D — Fuel Pump Volume and Pressure Failure — Near-zero fuel trim confirms adequate fueling at idle and cruise. WOT pressure dropping to 24 psi combined with a volume test delivering only

490 ml against an 860 ml minimum directly confirms the pump cannot sustain adequate delivery at maximum demand. Both test results independently confirm pump failure — the definitive dual-test confirmation methodology.

36. C — EVAP Purge Solenoid Stuck Open Confirmed — Both-bank fuel trims responding immediately to −2% when purge is disabled and returning to −16%/−17% when re-enabled confirms the solenoid is delivering concentrated canister vapors when commanded off. This is not normal canister loading behavior — the solenoid is stuck open and cannot be controlled by the PCM, making it the confirmed active rich source.

37. B — Partial Carbon Restriction Under Load — A 195 RPM drop at idle confirms the valve opens and gas flows adequately at idle conditions. The P0401 monitor failure confirms EGR flow is insufficient at the higher load and RPM conditions the monitor uses for evaluation. Carbon deposits partially restricting EGR passages allow adequate flow at idle but insufficient volume to satisfy the monitor's load-condition evaluation criteria.

38. C — Exhaust Leak or Failed Downstream Sensor — A downstream B1 sensor fixed at 0.14V with normal upstream switching and normal fuel trim is not consistent with a degraded catalyst — a failed catalyst would show the downstream sensor mirroring or slowly following upstream switching, not fixed at very low voltage. A very low fixed reading suggests fresh air from an exhaust leak upstream of the downstream sensor is holding it lean, or the sensor itself has failed low — both create a false lean reading mimicking high catalyst efficiency and generating a false P0420.

39. A — Cylinder Misfire Gas Pattern — HC = 1,960 ppm with O2 = 3.2%, CO = 0.06%, and near-zero fuel trim is the definitive misfire signature. Unburned air-fuel mixture exits intact during the misfire — HC elevated from unburned hydrocarbons, O2 elevated from the unburned air component, CO minimal because no combustion occurred. Rich combustion produces the opposite: low O2 and high CO.

40. D — Vent Solenoid Not Closing — Smoke flowing freely from the vent port when the solenoid is commanded closed confirms the solenoid is not sealing when energized. The solenoid has either failed mechanically in the open position or the control circuit has an open preventing energization — both produce the same result: the vent remains open regardless of PCM command.

41. B — Repair Misfire First Then Evaluate P0420 — The active misfire is the confirmed root cause of potential catalyst damage. Repairing the misfire, clearing all codes, and completing the catalyst monitor drive cycle determines whether the P0420 returns independently. If the converter recovers after the misfire is eliminated, replacement was unnecessary — the systematic repair sequence prevents unnecessary converter replacement.

42. D — Fuel Cap Not Sealing at Filler Neck — Smoke escaping from the filler neck area with the cap installed and the cap passing a bench pressure test confirms the cap seals correctly on a standardized test adapter but leaks against the vehicle's actual filler neck. The sealing surface is worn, corroded, or damaged — the cap-to-filler-neck interface is the confirmed large EVAP leak source.

43. A — EVAP Purge Solenoid Stuck Open Confirmed — High negative STFT and LTFT at both idle and 2,500 RPM confirms a rich condition. Disabling the EVAP purge solenoid causing STFT to shift immediately from −18% to −3% directly confirms the stuck-open purge solenoid is delivering excess canister vapors and is the primary rich source causing the elevated CO at the I/M test.

44. D — Bank 2 Delivery Hose Disconnected — Pump runs and both check valves seal correctly. Bank 1 shows a 21% HC reduction confirming the pump delivers adequate airflow to Bank 1. Zero HC change on Bank 2 despite all other components confirmed functioning indicates air is not reaching Bank 2 exhaust ports. A disconnected or cracked Bank 2 air delivery hose is the most specific cause of isolated Bank 2 AIR flow failure.

45. B — Illuminated MIL is Automatic Failure — Any confirmed emissions-related DTC that illuminates the MIL is an automatic OBD I/M failure on any OBD II equipped vehicle regardless of DTC type or monitor status. A confirmed P0300 with an illuminated MIL at I/M testing is an unconditional failure — the nature of the DTC does not affect this determination.

46. B — Catalyst Not Oxidizing HC — Near-zero fuel trim and elevated O2 (3.1%) at the idle test condition confirms the engine is not misfiring and combustion quality is normal upstream of the catalyst. Elevated HC with confirmed normal combustion and available oxygen indicates the catalytic converter is not oxidizing HC below the test limit — catalyst efficiency has degraded below the threshold needed to pass.

47. D — EGR Enable Condition Not Being Met — Normal idle RPM drop confirms the valve and control circuit function correctly. EGR commanded at 0% at all load conditions above 22% throttle with no EGR DTCs indicates the PCM has valid electrical control but is not receiving the input conditions required to enable EGR command at load. A failed or out-of-range ECT, MAP, or TPS input may be preventing EGR enable at the conditions where NOx control is most critical.

48. A — Two Monitors Exceed One Monitor Allowance — For 2001 and newer model year vehicles, only one incomplete non-continuous monitor is allowed for an OBD I/M pass with no MIL and no confirmed DTCs. A 2013 model with two incomplete monitors — catalyst and EVAP — exceeds the one-monitor maximum. The customer must complete the appropriate manufacturer drive cycle before retesting.

49. B — Idle Misfire Pattern — High HC at idle (1,720 ppm) with elevated O2 (2.9%), near-zero fuel trim, and no DTCs is the definitive idle misfire I/M gas pattern. Unburned air-fuel mixture exits during the idle misfire — HC from unburned hydrocarbons, O2 from the unburned air component. The misfire improves at 2,500 RPM as combustion stabilizes — confirming idle-specific misfire rather than catalyst failure or engine enrichment.

50. A — Vehicle Passes All Criteria — MIL off, no DTCs, all monitors complete, HC = 19 ppm, CO = 0.02%, NOx = 79 ppm confirm every OBD I/M passing criterion is met. All five emission gas values are well within acceptable limits — complete combustion with functioning emission control systems is confirmed. The vehicle passes both the OBD I/M criteria and the emission gas evaluation.