

PRACTICE EXAM 8: ASE L1 SIMULATION

50 Questions — Recommended Time: 150 Minutes

DOMAIN A — Q1–6

1. A vehicle has a rough idle only after sitting overnight. After 3 minutes of running the idle smooths completely. No DTCs stored. The MOST likely cause is:

- A. Low compression worsening during cold thermal contraction
- B. A stuck-open EGR valve causing cold dilution at idle only
- C. A component marginal when cold — such as a sticking injector pintle or coil with reduced cold output — that recovers with heat
- D. The PCM not commanding sufficient cold-start enrichment causing lean cold-start misfire

2. A customer reports a surge at 55 mph steady cruise. No DTCs. Fuel trim = +1% at cruise. TCC slip PID shows 240 RPM at the exact moment of the surge. The MOST likely cause is:

- A. A slipping torque converter clutch causing RPM variation perceived as an engine surge
- B. An intermittent MAF dropout causing a lean condition at cruise speed
- C. An EVAP purge solenoid opening at cruise delivering excess vapor
- D. A thermally marginal ignition coil misfiring at cruise speed

3. A vehicle has three P0302 repairs — coil, plug, injector — all returning within weeks. The MOST appropriate next step is:

- A. Replace all cylinder 2 components with OEM parts simultaneously
- B. Order a PCM — repeated misfire confirms an internal driver fault
- C. Perform a five-gas test to identify if the misfire is ignition or fuel related
- D. Perform compression and leakdown testing on cylinder 2 — a mechanical cause has been overlooked

4. A P0507 — Idle RPM High on a TAC system. PCM commands minimum throttle 1.9%. Idle = 1,410 RPM. LTFT = +2%. The MOST likely cause is:

- A. PCM idle relearn loss requiring a throttle relearn procedure
- B. A vacuum leak downstream of the throttle introducing unmetered air above PCM control authority
- C. The TAC motor sticking mechanically at a partially open position
- D. MAF sensor undercounting at idle causing the PCM to hold minimum throttle

5. A P0128. Infrared thermometer confirms upper hose = 161°F after 15 minutes. Thermostat spec = 195°F. ECT sensor resistance is within spec at measured temperature. The MOST likely cause is:

- A. The ECT sensor is reading colder than actual engine temperature
- B. The cooling system is functioning normally for the ambient temperature conditions
- C. Normal thermostat operation — 161°F is within acceptable warm-up variation
- D. A stuck-open thermostat confirmed by independent temperature measurement showing the engine cannot reach operating temperature

6. A vehicle has a P0016 correlation DTC. Timing marks confirm Bank 1 intake cam is retarded 14 degrees. Oil level and viscosity are correct. VVT solenoid screen is clean. Solenoid resistance = 7.6 ohms within spec. The MOST likely cause is:

- A. A worn or seized cam phaser not responding to correct oil pressure and solenoid command
- B. A PCM calibration fault not commanding the VVT solenoid correctly
- C. Timing chain stretch displacing cam position beyond VVT correction range
- D. CMP sensor misalignment generating a false correlation fault

DOMAIN B — Q7–22

7. A vehicle has STFT B1 = +22%, LTFT B1 = +19% 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 only
- B. Low fuel pressure at idle recovering at higher RPM demand

C. A lazy Bank 1 upstream O2 sensor causing slow idle trim correction

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

8. A vehicle has P0171 and P0174 simultaneously. MAF output increases correctly with RPM. Fuel pressure = 59 psi within spec. Smoke test finds no leaks. The MOST appropriate next step is:

A. Replace both upstream O2 sensors — dual lean codes indicate sensor failure

B. Compare MAF g/s output to a known-good identical vehicle at identical conditions to identify undercounting

C. Perform an injector balance test to identify weak injectors on both banks

D. Replace the fuel pump — dynamic pressure confirms pump weakness

9. *[Composite Vehicle Question]* The Composite Vehicle has LTFT B1 = -21%, LTFT B2 = -20% at all conditions. EVAP purge disable shifts both to -7%. Re-enabling returns both to -20%. The MOST likely cause is:

A. The EVAP purge solenoid is the sole rich source — the -7% remaining trim is within normal variation

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

C. The EVAP purge solenoid is confirmed stuck open and contributing — the -7% remaining trim after disable confirms an additional rich source is also present

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

10. A scan tool shows MAP = 14.6 psi at warm idle with the engine running. Atmospheric pressure = 14.7 psi. The MOST likely cause is:

A. The MAP sensor has failed to barometric pressure — a running engine at idle should read approximately 6–9 psi (significant vacuum below atmospheric), not near-atmospheric pressure

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

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

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

11. A vehicle has STFT B1 = +1%, LTFT B1 = +2%, STFT B2 = +21%, LTFT B2 = +18% at idle and at 2,500 RPM with minimal change at both speeds. The MOST likely cause is:

- A. A vacuum leak on Bank 2 — a leak would normalize at 2,500 RPM, not persist
- B. A MAF sensor fault affecting Bank 2 only — MAF faults affect both banks simultaneously
- C. Weak Bank 2 injectors delivering below-specification volume at all conditions — lean trim persisting at idle and cruise confirms an injector delivery fault
- D. Low fuel pressure disproportionately affecting Bank 2 at all RPM

12. A vehicle has P0102 — MAF Low, P0113 — IAT High, P0118 — ECT High stored on the same trip. Battery voltage is normal. The MOST likely cause is:

- A. Three independent sensor failures occurring simultaneously
- B. A wiring harness short to ground affecting all three signal wires simultaneously
- C. A failed PCM 5V reference output — all three sensors share this supply and a failed VREF causes simultaneous abnormal readings
- D. A CAN bus fault preventing accurate sensor data from reaching the PCM

13. A vehicle has P0132 — O2 Sensor High Voltage B1S1. Upstream B1 sensor reads fixed 0.93V at all conditions. STFT B1 = -22%, LTFT B1 = -19%. The MOST likely cause is:

- A. A rich condition on Bank 1 causing legitimate high O2 voltage and negative fuel trim
- B. A failed upstream B1 O2 sensor stuck high — PCM interprets constant rich signal and aggressively reduces fuel producing high negative trim despite normal combustion
- C. A leaking Bank 1 injector causing a rich condition that overwhelms PCM correction
- D. A catalytic converter failure allowing rich exhaust to reach the upstream sensor

14. A vehicle has a confirmed permanent DTC P0300. The technician repaired a failed coil pack and cleared codes with a scan tool. MIL extinguished. One week later at I/M testing P0300 is still reported. The MOST likely explanation is:

- A. The replacement coil pack has already failed causing the P0300 to re-confirm
- B. The I/M equipment detected a pending P0300 the scan tool did not show

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

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

15. A vehicle has STFT = +1%, LTFT = +2% at idle and cruise. At WOT only STFT drops to -22%, LTFT begins shifting negative. Disabling EVAP purge at simulated WOT causes STFT to immediately return to +1%. The MOST likely cause is:

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

B. A fuel pressure regulator opening excessively at WOT

C. The EVAP purge solenoid opening at WOT delivering concentrated canister vapors — confirmed by the immediate fuel trim response when purge is disabled

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

16. [*Composite Vehicle Question*] The Composite Vehicle has P0087. Rail pressure = 43 psi (spec 55–62 psi). Commanded pump speed = 92%. Pump speed increased to 100% — rail pressure rises to only 39 psi. The MOST likely cause is:

A. A clogged fuel filter that even maximum pump speed cannot overcome

B. A fuel pressure regulator stuck open bypassing all fuel before reaching rail pressure

C. A fuel supply line restriction between tank and rail

D. A failing fuel pump — pressure decreasing when command increases to maximum confirms mechanical pump failure

17. A technician performs a successful J2534 PCM reflash. The vehicle starts and runs normally. Three days later the original DTC returns. The MOST likely cause is:

A. The new calibration file was incompatible and reverted to the old software

B. The PCM lost calibration during a battery voltage drop after the customer left

C. Reprogramming requires a second drive cycle to fully activate new calibration

D. Reprogramming was successful but did not address the underlying hardware fault causing the original DTC — the root cause remains present

18. A DSO of a fuel injector shows normal opening spike and delivery phase but no pintle closing spike at pulse end. The MOST likely cause is:

- A. The PCM driver is using a soft-close strategy eliminating the closing spike by design
- B. The injector solenoid winding is open — no magnetic field collapse occurs at pulse end
- C. The injector pintle is mechanically stuck open
- D. A shorted winding is dissipating energy during the delivery phase eliminating the closing spike

DOMAIN C — Q23–28

23. A P0303 misfire. Coil swap from cylinder 3 to cylinder 5 moves misfire to P0305. Cylinder 3 shows zero misfires with the replacement coil. The technician should:

- A. Also replace the cylinder 3 spark plug — it may have been damaged by the failed coil
- B. Replace the coil originally on cylinder 3 — the misfire followed the coil confirming it is defective
- C. Perform compression testing on cylinder 5 to confirm the transferred coil has not exposed a mechanical fault
- D. Inspect both boots for carbon tracking before condemning the coil

24. A COP waveform shows normal dwell, normal collapse spike, very long spark line (4.6 ms vs normal 1.5 ms), and reduced post-spark oscillations. The MOST likely cause is:

- A. A shorted coil secondary causing rapid energy dissipation at elevated voltage
- B. A coil boot with carbon tracking providing an alternative discharge path extending arc duration
- C. A PCM driver cutting off dwell before full coil saturation producing a brief high-voltage arc
- D. A wide spark plug gap requiring extended arc duration to consume available coil energy — long spark line confirms energy is consumed sustaining the wide-gap arc

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

- B. PCM trigger signal voltage is below threshold despite test light indication
- C. An intermittent ground open not captured during static testing
- D. A closed-gap plug causing primary circuit overcurrent

26. A vehicle misfires only on cylinder 4 during cold start for the first 40 seconds. Warm operation is normal. Compression = 174 psi consistent with all cylinders. Warm injector contribution test is normal. The MOST likely cause is:

- A. A cold-start rich condition flooding cylinder 4 during enrichment
- B. Carbon deposits on the cylinder 4 plug that are only conductive when cold
- C. A cylinder 4 COP coil producing insufficient secondary voltage during cold cranking when plug resistance is highest
- D. A clogged cylinder 4 injector sticking only during cold operation

27. A six-cylinder waste spark system has P0302 and P0305. Cylinders 2 and 5 are confirmed as a waste spark pair. Compression on both cylinders is normal. The MOST likely cause is:

- A. Two independent coil failures on cylinders 2 and 5 simultaneously
- B. A single coil failure serving the 2/5 waste spark pair — simultaneous misfire on both cylinders of a confirmed pair is the definitive coil failure pattern
- C. Independent injector faults on cylinders 2 and 5 occurring simultaneously
- D. Low compression on both cylinders from a shared mechanical fault

28. A six-cylinder COP waveform shows one cylinder's collapse spike amplitude at 45% lower than all others. Spark line is present. Post-spark oscillations are reduced. The technician should NEXT:

- A. Replace the coil immediately — reduced collapse spike confirms primary winding resistance increase
- B. Perform a coil swap to another cylinder and monitor misfire counts and waveform to confirm the fault follows the coil before condemning it
- C. Replace the spark plug on that cylinder — a wide gap may increase secondary resistance reducing available collapse energy

D. Measure primary resistance of the coil with an ohmmeter and compare to specification as a first step

DOMAIN D — Q29–36

29. A GDI vehicle has P0087. Low-pressure pump = 64 psi within spec. High-pressure rail at idle = 280 psi against a 1,500 psi minimum. HPFP cam lobe is confirmed normal. The MOST likely cause is:

- A. A failed HPFP that cannot generate high-pressure output despite normal cam lobe and adequate low-pressure feed
- B. A clogged high-pressure fuel filter between HPFP and fuel rail
- C. A high-pressure fuel pressure regulator stuck fully open bypassing all fuel before reaching rail pressure
- D. The low-pressure pump is actually failing — the 64 psi reading is a false positive

30. A vehicle has STFT = -17%, LTFT = -15% at all conditions. EVAP purge disable causes no change. Fuel pressure = 67 psi — spec is 55–62 psi. No vacuum leaks. The MOST likely cause is:

- A. Multiple leaking injectors delivering excess fuel at all conditions
- B. A contaminated upstream O₂ sensor reading rich causing aggressive PCM fuel reduction
- C. Fuel pressure at 5 psi above the upper spec limit is increasing injected volume per pulse across all injectors — elevated rail pressure is the confirmed rich source
- D. A failed MAP sensor reading high load at idle causing PCM over-fueling

31. A fuel pressure hold test: static = 62 psi — drops to 10 psi in 20 minutes. Schrader valve blocked — pressure holds at 62 psi for 20 minutes. This confirms:

- A. The fuel pressure regulator is leaking — isolating it confirmed it as the source
- B. Injectors are leaking — blocking the Schrader valve would not affect injector leak-down
- C. The fuel pump check valve is leaking — isolating the rail from the pump confirmed check valve as the source
- D. The Schrader valve is leaking — blocking it stopped pressure loss confirming it as the fault

32. A cylinder contribution test shows all cylinders producing 33–39 RPM drop when disabled except cylinder 4, which shows a 3 RPM drop. Cylinder 4 compression = 177 psi consistent with all others. Plug is dry and normal color. Injector DSO waveform on cylinder 4 is normal. The MOST likely cause is:

- A. The cylinder 4 coil is weak — injector waveform is normal but ignition is failing
- B. The cylinder 4 injector is clogged — a correct DSO waveform only confirms electrical operation, not mechanical fuel delivery
- C. The PCM driver for cylinder 4 is not sending a trigger pulse despite the waveform appearing normal
- D. Cylinder 4 has a valve train fault causing poor volumetric efficiency despite normal compression

33. A vehicle has STFT B1 = +22%, LTFT B1 = +19% at idle. At 2,500 RPM both drop to +3%. A propane enrichment test near the Bank 1 front runner causes STFT B1 to immediately drop to +2%. The MOST likely cause is:

- A. A vacuum leak confirmed at the Bank 1 front intake runner gasket or port — propane enrichment isolated the leak to that location
- B. A clogged Bank 1 front injector causing lean operation — the propane test masked the injector fault
- C. A MAF sensor fault — propane at the throttle body inlet showed no response confirming MAF as the cause
- D. A PCV leak at the Bank 1 front valve cover introducing unmetered air at idle only

34. A vehicle with GDI has a rough idle and cold-start misfire. Borescope confirms heavy carbon deposits on intake valves at 91,000 miles. No fuel DTCs. HPFP waveform is normal. The MOST appropriate repair is:

- A. Replace all GDI fuel injectors — they are the source of intake valve carbon deposits
- B. Perform a walnut shell blast or chemical induction cleaning to remove carbon deposits from the intake valves
- C. Replace the intake manifold assembly to provide clean valve seats
- D. Replace the PCV valve and perform an oil change — PCV failure is the sole cause of GDI carbon buildup

35. A vehicle has P0087 at WOT only. Static = 60 psi. Idle dynamic = 57 psi. WOT dynamic = 26 psi. Volume test at WOT delivers 510 ml in 30 seconds — spec minimum 870 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 and volume at WOT — confirmed by both the pressure drop and volume test failure

36. A vehicle has STFT = +2%, LTFT = +1%. Five-gas test: HC = 1,840 ppm, CO = 0.07%, O₂ = 3.1%. The MOST likely cause is:

- A. A rich condition — high HC and low O₂ confirm excess fuel in the exhaust
- B. A catalytic converter failing to oxidize HC — normal trim and elevated O₂ suggest converter fault
- C. A lean condition — elevated O₂ confirms lean combustion producing HC from partial oxidation
- D. A cylinder misfire — high HC, elevated O₂, and very low CO with near-zero fuel trim is the definitive unburned mixture misfire pattern

DOMAIN E — Q37–44

37. A vehicle has P0401 — Insufficient EGR Flow. Bidirectional EGR test at idle produces 185 RPM drop. EGR monitor runs and fails with P0401. The MOST likely cause is:

- A. The EGR valve is not actually opening despite the RPM drop
- B. The PCM is setting a false P0401 because the functional test confirmed correct operation
- C. EGR flow is adequate at idle but insufficient at the higher load conditions the monitor uses — partial carbon restriction is the most likely cause
- D. The EGR position sensor is misreporting causing the monitor to under-evaluate actual flow

38. A five-gas test: HC = 1,920 ppm, CO = 0.07%, CO₂ = 14.7%, O₂ = 3.0%, NO_x = 19 ppm. STFT = +1%, LTFT = +2%. The MOST likely cause is:

- A. A rich mixture — high HC and low O₂ confirm excess fuel causing incomplete combustion
- B. A cylinder misfire — high HC with elevated O₂ and very low CO with near-zero fuel trim is the definitive unburned mixture gas pattern
- C. A catalytic converter failure — near-zero fuel trim and elevated HC indicate the converter is not processing hydrocarbons
- D. A lean condition — elevated O₂ confirms lean combustion producing partial HC

39. A vehicle has P0420 with upstream B1 O₂ switching normally. Downstream B1 sensor mirrors upstream switching frequency and amplitude. LTFT B1 = +2%. The MOST likely cause is:

- A. An exhaust leak upstream of the downstream sensor introducing fresh air mimicking catalyst inefficiency
- B. The downstream sensor is lazy causing a false P0420 by responding too quickly to upstream activity
- C. A rich condition overwhelming the catalyst — normal LTFT rules out rich cause
- D. A degraded Bank 1 catalyst that has lost oxygen storage capacity — downstream sensor mirrors upstream because the catalyst is no longer buffering exhaust chemistry changes

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

- A. The smoke machine pressure is too high for the vent solenoid to seal
- B. The charcoal canister has an internal bypass allowing smoke to flow regardless of vent solenoid position
- C. The vent solenoid is not closing when commanded — failed mechanically open or control circuit open preventing energization
- D. The PCM is overriding the close command to prevent canister pressure buildup

41. A vehicle has P0300 random misfire from a failed ignition module and P0420 stored on the same visit. The correct repair sequence is:

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

- B. Replace ignition module first — clear all codes — complete 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 before repairs

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 through the vent path 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 = -19%, LTFT = -17% at both test RPMs. Upstream O₂ sensor switches normally. Disabling EVAP purge causes STFT to shift from -19% to -4% immediately. The MOST likely cause is:

- A. Leaking injectors are the primary rich source — the EVAP response is coincidental
- B. High fuel pressure is causing excess delivery regardless of EVAP purge status
- C. A failed upstream O₂ sensor is causing the PCM to aggressively reduce fuel delivery
- D. A stuck-open EVAP purge solenoid is the primary rich source — confirmed by the immediate fuel trim response when disabled

44. A vehicle has P0491 and P0492. Air pump runs when commanded. Five-gas during AIR operation shows 24% 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
- B. A disconnected or cracked Bank 2 air delivery hose — air is not reaching Bank 2 exhaust ports despite pump operation, correct check valve sealing, and Bank 1 confirmed functioning
- C. The PCM is not commanding the Bank 2 AIR solenoid to open

D. Bank 2 exhaust ports are clogged with carbon deposits preventing air injection

DOMAIN F — Q45–50

45. A vehicle fails OBD I/M. Report: MIL = ON, P0442 confirmed. Model year = 2014. The test result is:

A. Fail — a pending DTC alongside a confirmed DTC causes automatic failure

B. Fail — the illuminated MIL from a confirmed emissions-related DTC is an automatic OBD I/M failure regardless of DTC type or leak size

C. Pass — P0442 is a small EVAP leak and does not meet the threshold for automatic OBD I/M failure

D. Pass — both catalyst and EVAP monitors are complete confirming the system has been evaluated

46. A vehicle fails no-load I/M: HC = 720 ppm (limit 220 ppm) at idle. CO within limits. O₂ = 3.4%. No DTCs. Fuel trim = +1%. 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 the engine is not misfiring but the converter is not processing HC below the test limit

C. An idle misfire — high HC with elevated O₂ and near-zero fuel trim is the misfire gas pattern

D. A lean condition producing HC from partial combustion with excess O₂

47. A vehicle fails loaded I/M: NO_x = 2,060 ppm (limit 1,000 ppm). HC and CO within limits. Road test shows EGR commanded 0% at all throttle positions above 18%. EGR idle test produces 200 RPM drop. No EGR DTCs. The MOST likely cause is:

A. The PCM is intentionally disabling EGR above 18% throttle as a normal platform strategy

B. The EGR valve is mechanically binding above 18% throttle from thermal expansion

C. An EGR enable condition is not being satisfied above 18% throttle — a failed or out-of-range sensor input may be preventing PCM EGR command at load conditions needed for NO_x control

D. The catalytic converter is not reducing NO_x despite adequate EGR at idle

48. A 2011 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 2011 exceeds the one-monitor limit — confirmed fail
- B. One incomplete monitor is the maximum allowed for 2001+ vehicles — two incomplete monitors is an I/M failure, the customer must complete a drive cycle before retesting
- C. Two incomplete monitors are acceptable for all OBD II model years
- D. The EVAP monitor is excluded from the count so only one monitor is incomplete — the vehicle passes

49. A vehicle fails no-load I/M: HC = 1,680 ppm at idle, HC = 790 ppm at 2,500 RPM. CO within limits at both speeds. O₂ = 2.7% at idle, O₂ = 0.8% 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. A cold catalytic converter — below light-off temperature at idle but effective at 2,500 RPM
- C. 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
- D. A catalytic converter that is cold at idle and effective at 2,500 RPM

50. A vehicle OBD I/M report: MIL = OFF, No DTCs, all monitors complete, HC = 21 ppm, CO = 0.02%, NO_x = 82 ppm. The vehicle:

- A. Passes the OBD portion only — a five-gas test is required to confirm emission gas compliance
- B. Fails — NO_x must be below 50 ppm on all OBD II vehicles regardless of limit
- C. Passes — all OBD I/M criteria are met and all emission gas readings are within acceptable limits confirming complete combustion and functioning emission controls
- D. Fails — the HC reading should be zero on a properly functioning vehicle with a catalyst

PRACTICE EXAM 8: ANSWER KEY AND EXPLANATIONS

- 1. C** — Marginal Component Recovering with Heat — A fault present only after overnight cold soak that resolves within minutes of running indicates a component that is marginal when cold. A sticking injector pintle or coil with reduced cold output are the most common causes of cold-only rough idle with no stored DTCs.
- 2. A** — TCC Slipping — Near-zero fuel trim rules out mixture faults. TCC slip PID of 240 RPM at the exact moment of the surge 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.
- 3. D** — Mechanical Cause Overlooked — Three consecutive component replacements that each temporarily appear to resolve the misfire confirm the root cause has not been identified. Compression and leakdown testing should have been performed before the first repair — a mechanical fault on cylinder 2 has been overlooked on all three prior visits.
- 4. B** — Vacuum Leak Downstream of Throttle — Minimum PCM throttle command (1.9%) with idle at 1,410 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.
- 5. D** — Stuck-Open Thermostat Confirmed — Independent infrared measurement showing only 161°F after 15 minutes confirms the engine cannot reach the 195°F thermostat specification. Normal ECT sensor resistance rules out a sensor fault. The independent temperature measurement directly confirms a stuck-open thermostat as the cause of P0128.
- 6. A** — Cam Phaser Mechanical Fault — Confirmed cam retard of 14 degrees with correct oil, clean solenoid screen, and normal solenoid resistance confirms all electrical and hydraulic inputs are functioning correctly. The cam phaser is receiving correct commands and oil pressure but is not responding — indicating mechanical wear or seizure within the phaser itself.
- 7. D** — 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 suspected locations is the appropriate follow-up diagnostic step.
- 8. B** — MAF Comparison Test — Both banks lean simultaneously with normal fuel pressure and no vacuum leaks found does not eliminate a MAF that is undercounting across all conditions. Comparing MAF g/s output to a known-good identical vehicle at the same operating conditions

directly identifies a calibration error that a snap throttle test or voltage check alone would not reveal.

9. C — EVAP Purge Contributing Plus Additional Rich Source — Partial trim shift from -20% to -7% when purge is disabled confirms the stuck-open purge solenoid is contributing to the rich condition. The -7% LTFT remaining after purge disable confirms a second independent rich source is present and must be separately identified and repaired.

10. A — MAP Sensor Failed to Barometric — A MAP sensor reading near-atmospheric pressure (14.6 psi) on a running engine at idle is not responding to intake manifold vacuum. A functioning engine at idle should produce 17–21 in/Hg of vacuum below atmospheric — the MAP sensor should read approximately 6–9 psi. The sensor has failed to its barometric default output.

11. C — Weak Bank 2 Injectors — Bank 2 lean trim persisting at both idle and 2,500 RPM is the critical differentiator from a vacuum leak, which would normalize at RPM. Lean trim remaining elevated at cruise confirms the fault is not RPM-dependent or proportional to airflow volume — pointing to a fuel delivery deficit from weak Bank 2 injectors at all operating conditions.

12. C — Failed PCM 5V VREF — Three sensors from different circuits all reporting abnormal values simultaneously on the same trip points to a single shared fault in their common input. MAF, IAT, and ECT all use the PCM 5V reference supply — a failed VREF output causes all three to report simultaneous abnormal values from the loss of their shared reference voltage.

13. B — Failed Sensor Causing PCM Over-Correction — A fixed 0.93V upstream B1 sensor that never switches is not responding to actual exhaust chemistry. The PCM interprets the constant high-voltage signal as persistent rich combustion and aggressively reduces fuel — producing high negative LTFT. Normal combustion is occurring — the sensor failure is causing the fuel control error.

14. C — 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 P0300 remains until the PCM runs the misfire monitor under required enable criteria and confirms no misfire is present — only monitor completion removes a permanent DTC.

15. C — 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 rich source.

16. D — Failing Fuel Pump — Rail pressure at 43 psi at 92% command dropping to 39 psi at 100% maximum command confirms the pump cannot achieve specification pressure at any command level. A decrease in rail pressure when pump command increases to maximum confirms

the pump is mechanically failing — not a regulator or filter issue, which would respond more significantly to maximum pump command.

17. D — Root Cause Not Addressed — Successful reprogramming with confirmed completion and immediate normal operation confirms the procedure was correctly performed and the new calibration loaded. The original DTC returning after three days confirms the software update did not address the underlying hardware fault — the root cause of the original DTC remains present and unrepaired.

18. B — Open Injector Solenoid Winding — The closing spike occurs when the PCM driver opens the circuit and the collapsing magnetic field induces a reverse voltage. No closing spike means no magnetic field collapse — confirming the solenoid winding is open. No current was flowing through the winding during the commanded pulse despite the electrical opening event being triggered by the PCM.

23. B — Replace Original Cylinder 3 Coil — The misfire moving from P0303 to P0305 after the coil swap directly confirms the defective coil moved with the swap. Cylinder 3 now shows zero misfires with the replacement coil installed — confirming the cylinder itself is not at fault. The original cylinder 3 coil is defective and requires replacement.

24. D — Wide Spark Plug Gap — A very long spark line (4.6 ms vs 1.5 ms normal) with reduced post-spark oscillations indicates coil energy is being consumed sustaining an extended arc across a wide gap. A spark plug with a significantly wide gap requires the available coil energy to sustain the arc for a longer duration — confirming plug inspection and replacement is the appropriate next step before coil replacement.

25. A — 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 conditions.

26. 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 warms.

27. B — Single Coil Failure on Waste Spark Pair — P0302 and P0305 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 on either cylinder.

28. D — 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 with present spark line and reduced oscillations can result from primary winding resistance increase — confirmed by measurement. This is the correct first step before performing a coil swap or immediate replacement.

29. A — Failed HPFP — Normal low-pressure supply (64 psi) and confirmed normal cam lobe confirm all HPFP inputs are correct. High-pressure rail at only 280 psi against a 1,500 psi minimum with confirmed normal cam lobe and adequate low-pressure feed confirms the HPFP itself is mechanically failing — unable to generate high-pressure output despite all required inputs being present.

30. C — High Fuel Pressure Rich Cause — EVAP purge disable causing no trim change rules out EVAP as the rich source. Fuel pressure at 67 psi is 5 psi above the 62 psi upper specification limit — excess rail pressure increases the injected fuel volume per pulse across all injectors simultaneously. This produces consistent negative LTFT at all operating conditions confirming elevated fuel pressure as the rich source.

31. D — Schrader Valve Leaking — Blocking the Schrader valve and pressure holding at 62 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. Propane enrichment causing an immediate STFT drop when introduced near the Bank 1 front runner directly isolates the vacuum leak location. The propane displaces the unmetered air source — correcting the lean condition and identifying the leak area at the Bank 1 front intake runner gasket or port.

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

35. D — Fuel Pump Volume and Pressure Failure — Near-zero fuel trim confirms adequate fueling at idle and cruise. WOT pressure dropping to 26 psi combined with a volume test delivering only 510 ml against an 870 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.

36. D — Cylinder Misfire Gas Pattern — High HC (1,840 ppm) with elevated O₂ (3.1%) and very low CO (0.07%) with near-zero fuel trim is the definitive cylinder misfire exhaust signature. Unburned air-fuel mixture exits intact — HC from unburned hydrocarbons, O₂ from the unburned air component, and minimal CO because no combustion occurred. Rich combustion produces low O₂ and high CO — the opposite of this pattern.

37. C — Partial Carbon Restriction Under Load — A 185 RPM drop at idle confirms the valve opens and gas flows adequately at idle. 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 not enough volume to satisfy the monitor's higher load-condition criteria.

38. B — Cylinder Misfire Gas Pattern — HC = 1,920 ppm with O₂ = 3.0%, CO = 0.07%, 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. A rich condition would produce the opposite: low O₂ and high CO.

39. D — Degraded Catalyst Confirmed — Normal fuel trim rules out a rich cause. Normal upstream switching confirms combustion quality is correct. A downstream sensor mirroring upstream switching frequency and amplitude confirms the catalyst has lost its oxygen storage capacity — it is no longer chemically buffering post-combustion exhaust gas changes and the downstream sensor directly follows upstream activity.

40. C — Vent Solenoid Not Closing — Smoke flowing freely with solenoid both commanded open and 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 solenoid 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 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 filler neck sealing surface is worn, corroded, or damaged — the cap-to-filler-neck interface is the confirmed large EVAP leak source.

43. D — EVAP Purge Solenoid Stuck Open Confirmed — High negative STFT and LTFT at both idle and 2,500 RPM confirm a rich condition. Disabling the EVAP purge solenoid causing STFT to shift immediately from -19% to -4% directly confirms the stuck-open purge solenoid is delivering excess canister vapors and is the primary rich source causing the CO I/M failure.

44. B — Bank 2 Delivery Hose Disconnected — Pump runs, both check valves seal correctly, and Bank 1 shows a 24% HC reduction confirming the pump delivers adequate airflow. Zero HC change on Bank 2 despite all other components functioning confirms 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, leak size, or monitor completion status. An illuminated MIL at the time of I/M testing is an unconditional failure.

46. C — Idle Misfire Pattern — HC elevated to 720 ppm with O₂ at 3.4%, CO within limits, near-zero fuel trim, and no DTCs is the definitive idle misfire exhaust pattern. Unburned air-fuel mixture exits the exhaust during the misfire — HC from unburned hydrocarbons and O₂ from the unburned air component. Near-zero fuel trim confirms the engine is not running rich — misfire is the cause of the elevated HC at the idle test condition.

47. C — EGR Enable Condition Not Being Met — Normal idle RPM drop confirms the valve and control circuit function correctly. EGR commanded at 0% at all throttle positions above 18% 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 NO_x control is most needed.

48. B — 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 2011 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. C — Idle Misfire Pattern — High HC at idle (1,680 ppm) with elevated O₂ (2.7%) at idle, near-zero fuel trim, and no DTCs is the definitive idle misfire gas pattern. Unburned mixture exits during the idle misfire event — 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 a catalyst efficiency fault.

50. C — Vehicle Passes All Criteria — MIL off, no DTCs, all monitors complete, HC = 21 ppm, CO = 0.02%, NO_x = 82 ppm all confirm every OBD I/M passing criterion is met and 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 test and the emission gas evaluation.