PRACTICE EXAM 10: ASE L1 SIMULATION

50 Questions — Recommended Time: 150 Minutes

DOMAIN A — Q1–6

1. A vehicle has a rough idle only after an overnight cold soak that resolves within 4 minutes of running. No DTCs stored. The MOST likely cause is:

A. Low compression worsening during cold thermal contraction at overnight temperatures

B. A stuck-open EGR valve causing exhaust dilution only during cold idle

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 vehicle has LTFT B1 = +21%, LTFT B2 = +20% at idle only — both normalize at cruise. Smoke test reveals no leaks. The MOST likely cause is:

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

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

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

D. A MAF sensor undercounting at all airflow rates producing lean trim at all conditions

3. A vehicle has three consecutive P0304 repairs — coil, plug, injector — each returning within weeks. The MOST appropriate next step is:

A. Replace all cylinder 4 components simultaneously with OEM parts

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 4 — a mechanical cause has been overlooked on all three prior visits

4. A vehicle has P0128. Infrared thermometer confirms upper hose = 163°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 generating a false P0128

B. The cooling system is functioning normally for cold ambient temperature conditions

C. Normal thermostat operation — 163°F is within acceptable warm-up variation

D. A stuck-open thermostat confirmed by independent temperature measurement showing the engine cannot reach operating temperature

5. A vehicle has a surge at 65 mph steady cruise. No DTCs. Fuel trim = +1%. TCC slip PID shows 230 RPM at the exact moment of each surge. The MOST likely cause is:

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

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

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

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

6. A vehicle has a P0016 correlation DTC. Timing marks confirm Bank 1 intake cam is retarded 11 degrees. Oil is correct. VVT solenoid screen is clean. Solenoid resistance = 7.7 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 without actual cam timing error

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 delivering below-spec volume at idle only

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

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

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

8. A vehicle has P0171 and P0174 simultaneously. MAF output increases correctly with RPM snap throttle. Fuel pressure = 58 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 = −22%, LTFT B2 = −21% at all conditions. EVAP purge disable shifts both to −8%. Re-enabling returns both to −21%. The MOST likely cause is:

A. The EVAP purge solenoid is the sole rich source — the −8% remaining trim is within normal variation

B. The EVAP purge solenoid is confirmed stuck open and contributing — the −8% remaining trim after disable confirms an additional independent rich source is also present

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

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

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10. A scan tool shows MAP = 14.4 psi at warm idle with the engine running. Atmospheric pressure is 14.6 psi. The MOST likely cause is:

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

B. A large open vacuum port 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 — a running engine at idle should read approximately 6–9 psi, not near-atmospheric pressure

11. A vehicle has STFT B1 = +1%, LTFT B1 = +2%, STFT B2 = +20%, 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 at cruise

B. A MAF sensor fault affecting Bank 2 only — MAF faults affect both banks simultaneously

C. Weak Bank 2 injectors delivering below-spec volume at all conditions — lean trim persisting at idle and cruise confirms a fuel delivery fault not a vacuum leak

D. Low fuel pressure disproportionately affecting Bank 2 injectors 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 wiring harness short to ground affecting all three sensor signal wires simultaneously

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

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 reads fixed 0.92V at all conditions. STFT B1 = −21%, LTFT B1 = −18%. The MOST likely cause is:

A. A rich condition on Bank 1 producing legitimate high O2 voltage and negative fuel trim correction

B. A failed upstream B1 O2 sensor stuck at high voltage — 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 P0171. The technician repaired a vacuum leak, cleared codes with a scan tool, MIL extinguished. One week later at I/M testing P0171 is still reported. The MOST likely explanation is:

A. The vacuum leak repair failed and P0171 has re-confirmed

B. The I/M equipment detected a pending P0171 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 verified repair removes it

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 airflow confirmed by the purge disable test

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

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 actual fault

16. *[Composite Vehicle Question]* The Composite Vehicle has STFT B1 = +2%, LTFT B1 = +3%, STFT B2 = +21%, LTFT B2 = +18% at idle and at 2,500 RPM with minimal change. 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

C. Low fuel pressure disproportionately affecting Bank 2 at all conditions

D. Weak Bank 2 injectors delivering below-spec volume at all conditions — positive LTFT persisting at both idle and cruise confirms a fuel delivery deficit not a vacuum leak

17. A vehicle has U0100 stored in the BCM, TCM, ABS module, and instrument cluster. PCM power = 12.6V, PCM ground = 0.04V. 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

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 LTFT = +23% on both banks at all conditions. Fuel pressure = 59 psi within spec. No vacuum leaks on smoke test. MAF g/s output compared to a known-good vehicle reads 21% lower at identical operating conditions. The MOST likely cause is:

A. Weak injectors on both banks delivering below-spec fuel volume at all conditions

B. Low fuel pressure causing lean operation despite the 59 psi reading being within specification

C. A vacuum leak too small for the smoke test affecting both banks at all RPM

D. The MAF sensor is confirmed undercounting — 21% lower output than known-good at identical conditions confirms sensor fault as the cause of lean trim at all conditions

DOMAIN C — Q23–28

23. A P0302 misfire. Coil swap from cylinder 2 to cylinder 6 moves misfire to P0306. Cylinder 2 shows zero misfires with the replacement coil. The technician should:

A. Also replace the cylinder 2 spark plug — it may have been damaged by the failed coil

B. Replace the coil originally on cylinder 2 — the misfire followed the coil confirming it is defective

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

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

24. A COP waveform shows normal dwell, normal collapse spike, very long spark line (4.7 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 spark voltage

B. Carbon tracking in the coil boot providing an alternative discharge path extending arc duration

C. A PCM driver cutting off dwell early causing insufficient energy and a brief high-voltage arc

D. A wide spark plug gap requiring extended arc duration to consume available coil energy — the long spark line confirms energy is consumed sustaining the 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 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 has a waste spark ignition with P0303 and P0306 simultaneously. Cylinders 3 and 6 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 3 and 6 simultaneously

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

C. A single coil failure serving the 3/6 waste spark pair — simultaneous misfire on both cylinders of a confirmed waste spark pair is the definitive single coil failure indicator

D. Two independent coil failures on cylinders 3 and 6 occurring simultaneously

27. A vehicle misfires only on cylinder 3 during cold start for the first 30 seconds. Warm operation is normal. Compression = 176 psi consistent with all cylinders. Warm injector contribution test is normal. The MOST likely cause is:

A. A cold-start rich condition flooding cylinder 3 during the enrichment period

B. Carbon deposits on the cylinder 3 plug that are only conductive when cold

C. A PCM not commanding sufficient cold-start enrichment to cylinder 3 only

D. A cylinder 3 COP coil producing insufficient secondary voltage during cold cranking when plug resistance is highest — recovering as the coil warms

28. A six-cylinder COP primary waveform shows one cylinder with a collapse spike amplitude 46% 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 another cylinder and monitor misfire counts and waveform to confirm the fault follows the coil

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

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

DOMAIN D — Q29–36

29. A GDI vehicle has P0087. Low-pressure pump = 65 psi within spec. High-pressure rail at idle = 295 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 actually failing — 65 psi is a false positive reading

30. A vehicle has STFT = −18%, LTFT = −16% at all conditions. EVAP purge disable causes no change. Fuel pressure = 66 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 4 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 = 60 psi — drops to 12 psi in 20 minutes with engine off. Schrader valve blocked — pressure holds at 60 psi for 20 minutes. This confirms:

A. The fuel pressure regulator is leaking — blocking the Schrader valve isolated and confirmed it as the source

B. Injectors are leaking — blocking the Schrader valve would not affect injector leak-down paths

C. The fuel pump check valve is leaking — isolating the rail confirmed the check valve as the source

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 36–42 RPM drop when disabled except cylinder 5, which shows a 2 RPM drop. Cylinder 5 compression = 179 psi consistent with all others. Plug is dry and normal color. Injector DSO waveform on cylinder 5 is normal. The MOST likely cause is:

A. The cylinder 5 coil is weak — injector waveform is normal but ignition is failing

B. The cylinder 5 injector is clogged — a correct DSO waveform only confirms electrical operation not mechanical fuel delivery

C. The PCM driver for cylinder 5 is not sending a trigger pulse despite the waveform appearing normal

D. Cylinder 5 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 intake runner causes STFT B1 to immediately drop to +2%. The MOST likely cause is:

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

B. A vacuum leak confirmed at the Bank 1 front intake runner — propane enrichment isolated the leak to that location

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 front valve cover introducing unmetered air at idle only

34. A vehicle has STFT = +2%, LTFT = +1%. Five-gas test: HC = 1,880 ppm, CO = 0.07%, O2 = 3.0%. Near-zero fuel trim with high HC and elevated O2 and very low CO. The MOST likely cause is:

A. A rich condition — high HC and low O2 confirm excess fuel in the exhaust

B. A catalytic converter not oxidizing HC — normal trim and elevated O2 suggest converter fault

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

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

35. A vehicle has P0087 at WOT only. Static = 61 psi. Idle dynamic = 58 psi. WOT dynamic = 27 psi. Volume test at WOT delivers 520 ml in 30 seconds — spec minimum 880 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 pump 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 −18% to −3% and STFT B2 to shift from −17% to −2%. Re-enabling returns both to −17%/−18%. 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. Normal purge operation — the canister is heavily loaded and purge is functioning correctly

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

DOMAIN E — Q37–44

37. A vehicle has P0401 — Insufficient EGR Flow. Bidirectional EGR test at idle produces 188 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 indicating flow

B. The PCM is setting a false P0401 because the idle 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 in the passages is the most likely cause

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

38. A five-gas test: HC = 1,940 ppm, CO = 0.06%, O2 = 3.1%, CO2 = 14.6%, NOx = 17 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 gas 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 processing HC

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

39. A vehicle has P0420. Upstream B1 O2 switching is normal. 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 B1 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 a rich cause

D. A degraded Bank 1 catalyst that has lost oxygen storage capacity — downstream sensor mirrors upstream because the catalyst no longer buffers 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 the vent port. 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 P0300 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 the 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 any 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 from the neck body

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 purge 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 the solenoid is disabled

44. A vehicle has P0491 and P0492. Air pump runs when commanded. Five-gas during AIR operation shows 23% 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 and confirmed check valve function on both banks

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

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

DOMAIN F — Q45–50

45. A vehicle fails OBD I/M. Report: MIL = ON, P0455 confirmed. Model year = 2016. The MOST likely test result explanation is:

A. P0455 is a large EVAP leak — it fails I/M only if the EVAP monitor is also confirmed complete

B. A pending EVAP DTC alongside the confirmed code causes the automatic failure

C. A small EVAP leak would not illuminate the MIL — the test equipment has an error

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

46. A vehicle fails no-load I/M: HC = 710 ppm (limit 220 ppm) at idle. CO within limits. O2 = 3.3%. No DTCs. Fuel trim near zero. The MOST likely cause is:

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

B. An idle misfire — high HC with elevated O2 and near-zero fuel trim is the definitive misfire gas pattern — unburned mixture exits the exhaust with both unburned HC and unburned O2 elevated

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

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

47. A vehicle fails loaded I/M: NOx = 2,080 ppm (limit 1,000 ppm). HC and CO within limits. Road test shows EGR commanded 0% at all load conditions above 20% throttle. EGR idle test produces 205 RPM drop. No EGR DTCs. The MOST likely cause is:

A. The PCM is intentionally disabling EGR above 20% throttle as a normal platform strategy

B. The EGR valve is mechanically binding above 20% throttle from thermal expansion

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

D. An EGR enable condition is not being satisfied above 20% throttle — a failed or out-of-range sensor input is preventing PCM EGR command at the load conditions needed for NOx control

48. A 2015 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 2015 model exceeds the one-monitor limit — the customer must complete a drive cycle before retesting

B. Two incomplete monitors are acceptable for all OBD II model years regardless of 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 = 1,760 ppm at idle, HC = 800 ppm at 2,500 RPM. CO within limits at both speeds. O2 = 2.8% 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 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 from heat buildup

50. A vehicle OBD I/M report: MIL = OFF, No DTCs, all monitors complete, HC = 22 ppm, CO = 0.02%, NOx = 85 ppm. The vehicle:

A. Passes the OBD portion only — a loaded five-gas test is required to confirm emission gas compliance

B. Fails — NOx above 50 ppm is an automatic failure on all OBD II vehicles

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

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

PRACTICE EXAM 10: ANSWER KEY AND EXPLANATIONS

1. C — Marginal Component Recovering with Heat — A fault present only after overnight cold soak resolving within minutes of running indicates a component marginal when cold. A sticking injector pintle or coil with reduced cold output are the most common causes — both recover as temperature rises, producing the described pattern with no stored DTCs.

2. A — Vacuum Leak Too Small for Smoke — Both-bank lean trim at idle normalizing at cruise is the definitive vacuum leak pattern. Smoke tests do not detect all leaks — small cracks at gasket seating surfaces may not produce visible smoke. Propane enrichment testing near suspected locations is the appropriate follow-up diagnostic step.

3. D — Mechanical Cause Overlooked — Three consecutive component replacements that each appear to temporarily 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 4 has been overlooked on all three prior visits.

4. D — Stuck-Open Thermostat Confirmed — Independent infrared measurement confirming only 163°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 — thermostat replacement is the correct repair.

5. C — TCC Slipping — Near-zero fuel trim rules out mixture faults. TCC slip PID of 230 RPM at the exact moment of each 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.

6. A — Cam Phaser Mechanical Fault — Confirmed cam retard of 11 degrees with correct oil, clean solenoid screen, and normal solenoid resistance confirms all electrical and hydraulic inputs are functioning correctly. The phaser is receiving correct commands and oil pressure but not responding — indicating mechanical wear or seizure within the phaser body 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. The smoke test not finding a leak does not eliminate the diagnosis — small cracks at gasket seating surfaces or port areas may not produce visible smoke escape during standard testing. Propane enrichment is the appropriate follow-up.

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 identical conditions directly identifies a calibration error that snap throttle testing or voltage checking alone cannot confirm.

9. B — EVAP Purge Contributing Plus Additional Rich Source — Partial trim shift from −21% to −8% when purge is disabled confirms the stuck-open purge solenoid is contributing to the rich condition. The −8% LTFT remaining after purge disable confirms a second independent rich source is present and must be separately identified and repaired before returning the vehicle.

10. D — MAP Sensor Failed to Barometric — A MAP sensor reading near-atmospheric (14.4 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, not near-atmospheric. 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 key differentiator from a vacuum leak, which would normalize at RPM. Lean trim remaining elevated at cruise confirms the fault is fuel delivery dependent — pointing to weak Bank 2 injectors delivering below-specification volume at all operating conditions rather than unmetered air from a vacuum leak.

12. C — 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 three DTCs from a single fault source.

13. B — Failed Sensor Causing PCM Over-Correction — A fixed 0.92V 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 despite normal combustion. The sensor failure is causing the fuel control error, not an actual rich condition.

14. 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 P0171 remains in PCM memory until the PCM runs the appropriate monitor under required enable criteria and confirms no lean condition 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-only rich source.

16. D — Weak Bank 2 Injectors — Bank 2 positive LTFT persisting at both idle and 2,500 RPM is the key differentiator from a vacuum leak. A vacuum leak would normalize at RPM — lean trim remaining elevated at cruise confirms the fault is fuel-delivery dependent. Weak Bank 2 injectors delivering below-specification volume at all operating conditions is the most consistent explanation for persistent single-bank lean trim.

17. D — PCM CAN Bus Connection Fault — PCM power (12.6V) and ground (0.04V) 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. D — MAF Sensor Undercounting Confirmed — Both-bank lean trim persisting at all conditions with MAF output confirmed 21% lower than a known-good vehicle at identical operating conditions directly identifies the MAF sensor as the lean cause. A 21% undercounting error is sufficient to produce the observed LTFT level — the comparison test is the definitive MAF fault confirmation method.

23. B — Replace Original Cylinder 2 Coil — The misfire moving from P0302 to P0306 after the coil swap directly confirms the defective coil moved with the swap. Cylinder 2 now shows zero misfires with the replacement coil installed — confirming the cylinder itself is not at fault. The original cylinder 2 coil is defective and requires replacement.

24. D — Wide Spark Plug Gap — A very long spark line (4.7 ms vs 1.5 ms normal) with reduced post-spark oscillations indicates coil energy is 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 than normal — confirming spark plug inspection and replacement is the appropriate next step.

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 and verified. 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 — Single Coil Failure on Waste Spark Pair — P0303 and P0306 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.

27. D — 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 during warm-up.

28. D — Measure Primary Resistance First — Before condemning a coil based on waveform analysis alone, primary resistance should be measured and compared to specification as the first diagnostic step. A reduced collapse spike with present spark line and reduced oscillations can result from primary winding resistance increase — confirmed by measurement before performing a coil swap or immediate replacement to avoid unnecessary component replacement.

29. A — Failed HPFP — Normal low-pressure supply (65 psi) and confirmed normal cam lobe confirm all HPFP inputs are correct. High-pressure rail at only 295 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. C — 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 — a failed pressure regulator not limiting maximum rail pressure is the most likely cause.

31. D — Schrader Valve Leaking — Blocking the Schrader valve and pressure holding at 60 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 — fuel would continue draining through those components. The test directly isolates the Schrader valve as the confirmed fault.

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. B — 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 front runner directly isolates the vacuum leak location — the propane displaces the unmetered air source, correcting the lean condition and identifying the Bank 1 front intake runner gasket or port area as the leak location.

34. D — Cylinder Misfire Gas Pattern — High HC (1,880 ppm) with elevated O2 (3.0%) 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, CO minimal because no combustion occurred. Rich combustion produces the opposite: low O2 and high CO.

35. D — Fuel Pump Volume and Pressure Failure — Near-zero fuel trim confirms adequate fueling at idle and cruise. WOT pressure dropping to 27 psi combined with a volume test delivering only 520 ml against an 880 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 — EVAP Purge Solenoid Stuck Open Confirmed — Both-bank fuel trims responding immediately to near-zero when purge is disabled and returning to −17%/−18% 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 PCM command, making it the confirmed active rich source.

37. C — Partial Carbon Restriction Under Load — A 188 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. A — Cylinder Misfire Gas Pattern — HC = 1,940 ppm with O2 = 3.1%, 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 pattern: 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 chemistry changes and the downstream sensor directly follows upstream activity.

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. D — 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 −19% to −4% 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. B — Bank 2 Delivery Hose Disconnected — Pump runs and both check valves seal correctly. Bank 1 shows a 23% HC reduction confirming adequate pump airflow delivery. 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. D — 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 — the nature or severity of the emissions fault does not affect this determination.

46. B — Idle Misfire Pattern — HC elevated to 710 ppm with O2 at 3.3%, CO within limits, near-zero fuel trim, and no DTCs is the definitive idle misfire exhaust pattern. Unburned air-fuel mixture exits during the idle misfire — HC from unburned hydrocarbons and O2 from the unburned air component. Near-zero fuel trim confirms the engine is not running rich — a cylinder misfire is the cause of the elevated HC at the idle test condition.

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 20% 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 needed.

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 2015 model with two incomplete monitors — catalyst and EVAP — exceeds the one-monitor maximum. The customer must complete the appropriate manufacturer drive cycle to allow both monitors to run before retesting.

49. C — Idle Misfire Pattern — High HC at idle (1,760 ppm) with elevated O2 (2.8%), near-zero fuel trim, and no DTCs is the definitive idle misfire I/M gas pattern. Unburned 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 a catalyst efficiency fault or enrichment issue.

50. C — Vehicle Passes All Criteria — MIL off, no DTCs, all monitors complete, HC = 22 ppm, CO = 0.02%, NOx = 85 ppm 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 criteria and the emission gas evaluation.