PRACTICE EXAM 12: ASE A8 ENGINE PERFORMANCE FULL-LENGTH SIMULATION

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50 Questions | 75 Minutes

DOMAIN A — GENERAL DIAGNOSIS (Questions 1–12)

1. A vacuum gauge at idle shows a steady reading of 17 in/Hg. When RPM is increased to 2,500 and held steady, the needle drops to 5 in/Hg and stays there. When RPM returns to idle, vacuum recovers to 17 in/Hg. What does this MOST likely indicate?

A. A large vacuum leak that has greater effect at higher RPM

B. Retarded ignition timing causing vacuum to collapse under sustained RPM

C. A restricted exhaust system that cannot handle the higher exhaust volume at sustained RPM

D. Worn piston rings that cannot maintain compression at elevated engine speeds

2. A compression test shows all cylinders between 155 and 165 psi except cylinders 4 and 5, which both read 80 psi. A wet test on both shows no improvement. What is the MOST likely cause?

A. A blown head gasket between cylinders 4 and 5

B. Worn piston rings on both cylinders 4 and 5 simultaneously

C. Carbon deposits reducing combustion volume on both cylinders equally

D. A single burned valve affecting both cylinders through a shared port

3. An engine produces a rhythmic knocking from the top of the engine that increases in speed directly with RPM and is loudest during cold starts. The noise diminishes significantly after the engine reaches full operating temperature. What is the MOST likely cause?

A. Worn main bearings producing a knock that is worse when cold oil has higher viscosity

B. A sticking hydraulic lifter that frees up as oil temperature and pressure normalize

C. Timing chain slack contacting the front cover under cold oil conditions

D. Collapsed or worn valve lifters producing increased valvetrain noise when cold

4. A cylinder leakage test shows 28% leakage with air escaping from the throttle body opening only. What does this indicate?

A. Worn piston rings allowing test air to enter the crankcase and escape through the PCV circuit

B. A leaking intake valve on that cylinder not seating correctly

C. A head gasket failure allowing test air to enter the cooling system

D. Both the intake and exhaust valves are leaking simultaneously on that cylinder

5. An engine has white smoke at startup on cold mornings that completely clears within 2 minutes of running. Coolant level is stable. What is the MOST likely cause?

A. Normal condensation in the exhaust system burning off as exhaust components reach operating temperature

B. A leaking intake manifold gasket allowing coolant to enter the combustion chamber only when cold

C. Worn valve stem seals allowing oil to accumulate overnight and burn off at startup

D. A small head gasket leak that seals with thermal expansion at operating temperature

6. A technician tests a cooling system by removing the radiator cap on a cold engine, starting the engine, and observing the coolant. Bubbles appear in the coolant immediately at idle. What does this MOST likely indicate?

A. Normal coolant circulation — bubbles from the water pump impeller are expected at idle

B. Air trapped in the cooling system from a recent coolant service that has not been purged

C. Combustion gases entering the cooling system through a head gasket breach

D. A failing water pump cavitating and introducing air into the coolant circuit

7. A relative compression test shows all cylinders cranking at similar amperage and speed. Cylinder 3 cranks at normal speed but the starter current draw spikes noticeably on every other compression stroke of cylinder 3. What does this MOST likely indicate?

A. A seized accessory component aligned with cylinder 3's firing interval on the drive belt

B. An injector fault on cylinder 3 activating during the test and affecting starter load

C. The CKP sensor producing a dropout near cylinder 3's position affecting speed measurement

D. A mechanical fault on cylinder 3 producing inconsistent compression between firing cycles

8. An engine has rough idle and a misfire that occurs immediately after an oil change. The misfire resolves after 10 minutes of operation. What should the technician check FIRST?

A. The ignition system for oil contamination from a leaking valve cover gasket during the service

B. The oil level and viscosity — overfilling or incorrect viscosity can affect hydraulic lifter operation

C. The spark plugs for oil fouling from oil entry during the oil change service

D. The PCV system for a disconnected hose that occurred during the oil change

9. An engine has a persistent misfire on cylinder 2 only under deceleration. All other operating conditions are normal. Compression and leakage on cylinder 2 are confirmed normal. What should the technician check NEXT?

A. The fuel injector on cylinder 2 for a lean delivery fault causing deceleration-specific misfires

B. The spark plug on cylinder 2 for a wide gap causing misfire under the high vacuum of deceleration

C. The valve stem seal on cylinder 2 for oil contamination of the plug under high deceleration vacuum

D. The coil on cylinder 2 for a fault causing misfire only under high-vacuum deceleration conditions

10. An engine has a ticking noise that appears only above 3,500 RPM and disappears immediately when RPM drops below that threshold. Oil pressure is within specification at all RPM. What is the MOST likely cause?

A. A valve float condition from worn or weak valve springs that cannot close the valve quickly enough at high RPM

B. A hydraulic lifter that loses its oil film above 3,500 RPM due to oil aeration at high pump speeds

C. Timing chain slap that only develops under the higher centrifugal loads at elevated RPM

D. A loose rocker arm that develops clearance only above the RPM threshold from vibration

11. A wet compression test is performed. Cylinder 6 shows 145 psi dry and 148 psi wet. All other cylinders are between 165 and 175 psi. What does the minimal wet test improvement on cylinder 6 MOST likely indicate?

A. Worn piston rings on cylinder 6 with near-complete ring seal loss

B. A partially clogged injector on cylinder 6 reducing the effective compression ratio

C. A compression leak past the rings with additional leakage from a valve or head gasket fault

D. A burned or leaking valve on cylinder 6 — minimal wet test response confirms the rings are not the primary fault

11. Cylinder 6 shows 145 psi dry and 148 psi wet against a 165–175 psi specification. What does the minimal wet test improvement MOST likely indicate?

A. Worn rings on cylinder 6 with near-complete ring seal loss

B. A partially clogged injector reducing the effective compression ratio

C. Compression leakage past both the rings and a valve or gasket fault simultaneously

D. A burned or leaking valve — the minimal wet response confirms the rings are not the primary fault

12. A no-start condition exists. Compression and spark are confirmed normal. A noid light confirms injector pulse on all cylinders during cranking. Fuel pressure is 0 psi. The fuel pump fuse tests good. What should the technician check NEXT?

A. The CKP sensor signal for a fault preventing the PCM from enabling the fuel pump

B. The fuel pump relay for an open output circuit preventing voltage from reaching the pump

C. The anti-theft system for a security lockout disabling fuel pump operation

D. The PCM fuel pump command output for a fault preventing relay activation

DOMAIN B — IGNITION SYSTEM DIAGNOSIS AND REPAIR (Questions 13–20)

13. A spark plug removed from a cylinder with a P0300 random misfire code shows a normal gray insulator and normal electrode wear. What does this indicate?

A. The spark plug is not the cause of the misfire — the fault lies elsewhere in the ignition, fuel, or mechanical systems

B. The plug has been recently replaced and the misfire has a different cylinder-specific cause

C. The plug is at the end of its service life despite appearing normal on visual inspection

D. Normal plug appearance confirms combustion is occurring correctly on that cylinder — the code is a false positive

14. A P0358 ignition coil H primary circuit fault code is stored. Supply voltage to coil H is 12.1 volts. The PCM command wire shows 11.9 volts at rest and 0.4 volts when the PCM fires the coil. Spark is produced normally on cylinder H. What is the correct interpretation?

A. The low firing voltage of 0.4 volts on the command wire indicates a weak PCM driver that should be replaced

B. The high resting voltage of 11.9 volts on the command wire confirms a short to power in the circuit

C. The coil circuit is functioning correctly — the voltage drop to 0.4 volts confirms the driver is completing the ground path normally

D. The code is valid — a 0.4-volt command signal is below the minimum required for full coil saturation

15. A secondary ignition scope waveform shows a normal firing line and a normal spark line but extremely short oscillations after the spark line ends — only 1–2 oscillations before the waveform goes flat. What does this indicate?

A. A shorted secondary winding in the coil dissipating stored energy too rapidly after spark completion

B. A high-resistance secondary circuit limiting current flow and reducing post-spark energy storage

C. Normal coil behavior — oscillation count varies with secondary circuit resistance and ignition design

D. A weak coil with insufficient stored energy remaining after the spark event to produce normal oscillations

15. A secondary waveform shows a normal firing line, normal spark line, but only 1–2 oscillations after spark completion before going flat. What does this MOST likely indicate?

A. A shorted secondary winding dissipating stored energy too rapidly

B. A high-resistance secondary circuit limiting post-spark energy

C. Normal behavior — oscillation count varies with circuit resistance and design

D. A weak coil with insufficient stored energy after the spark event

16. A Hall effect CKP sensor is tested with a lab scope. The waveform shows correct switching between 0 and 5 volts at all times except one position where the signal drops to only 2.5 volts instead of switching fully to 0 volts. What does this MOST likely indicate?

A. A PCM input circuit with a pull-up resistor fault causing incomplete signal switching at that position

B. A damaged Hall effect sensor with a degraded output transistor that cannot pull the signal fully to ground at that tooth position

C. A reluctor wheel tooth that is slightly out of position causing the sensor to partially trigger at that location

D. A wiring fault creating a voltage division on the signal line that is only apparent at one specific position

17. A waste spark COP system has a confirmed misfire on cylinder 4. Cylinder 4 and its waste spark paired cylinder are on the same coil. The coil is swapped to a different position. The misfire moves to the new position. What additional test should the technician perform to confirm whether the coil or the spark plug is the cause?

A. Replace both spark plugs on the affected cylinder pair and retest before condemning the coil

B. Perform a resistance test on the coil primary winding at the new position to confirm coil output

C. Swap the cylinder 4 spark plug with a known-good plug while the coil is at the new position to isolate the fault to the coil

D. Perform a secondary waveform comparison between the moved coil position and adjacent cylinders

18. A magnetic reluctance CKP sensor waveform shows a normal pattern except the signal is significantly weaker — lower amplitude — at all tooth positions compared to a known specification. The air gap is confirmed correct. What is the MOST likely cause?

A. A weakened permanent magnet inside the sensor losing its magnetic field strength

B. An open in the sensor ground circuit causing a reference shift that reduces apparent amplitude

C. A PCM input circuit with high resistance reducing the signal amplitude before processing

D. A reluctor wheel with uniform surface oxidation reducing the magnetic field change at all teeth

19. A distributor ignition system has a consistent miss on one cylinder only at idle. Swapping the plug wire to a known-good wire from another cylinder does not move the misfire. Replacing the spark plug does not resolve the misfire. What should the technician check NEXT?

A. A vacuum leak specifically near the affected cylinder's intake port causing a lean misfire at idle

B. A restricted fuel injector on the affected cylinder causing lean misfire at idle fuel demand levels

C. The distributor cap terminal for the affected cylinder for corrosion or carbon tracking

D. The compression and leakage on the affected cylinder for a mechanical fault causing the idle misfire

19. A distributor ignition miss on one cylinder at idle does not move with a plug wire swap and does not resolve with a new plug. What should the technician check NEXT?

A. A vacuum leak near the affected cylinder's intake port

B. A restricted fuel injector on the affected cylinder

C. The distributor cap terminal for the affected cylinder for corrosion or carbon tracking

D. Compression and leakage on the affected cylinder

20. A technician performs a spark output test on a COP system by removing a coil and observing spark across a gap tool. The spark is bright blue and consistent. What is the correct interpretation of this test result?

A. The coil and its primary circuit are confirmed functional — a bright blue consistent spark confirms adequate secondary voltage output

B. A bright blue spark confirms the coil is functioning but does not confirm adequate voltage at the spark plug under compression

C. The test confirms the coil, plug wire, and spark plug are all functioning correctly as a complete circuit

D. A bright blue spark at the gap tool specifically rules out a coil fault as the cause of any related misfire code

DOMAIN C — FUEL, AIR INDUCTION, AND EXHAUST SYSTEMS (Questions 21–30)

21. A fuel pressure test on a port injection engine shows 57 psi at key-on. After the engine starts, pressure rises to 62 psi at idle. The specification is 55–65 psi at idle without vacuum applied to the regulator. What is the correct interpretation?

A. The pressure rise from key-on to idle confirms a pressure regulator stuck closed causing pressure to build above specification

B. This is normal behavior on a return-style system — engine-on pressure is slightly higher than static key-on pressure due to fuel pump operation under load

C. The key-on pressure of 57 psi is above the minimum specification indicating a fuel pump delivering excess pressure at rest

D. The 5 psi pressure increase from key-on to idle confirms a leaking injector adding to rail pressure during engine operation

22. A scan tool shows LTFT at -19% on both banks. MAF reads 14.2 g/s at idle against a specification of 4.0–6.0 g/s. A smoke test reveals no air leaks downstream of the MAF. What is the MOST likely cause?

A. A stuck-open EVAP purge solenoid adding fuel vapor and causing the PCM to reduce fuel delivery

B. A vacuum leak upstream of the MAF that is adding air before it reaches the sensor, causing a high reading

C. A MAF sensor contaminated or damaged causing it to read significantly higher than actual airflow

D. Multiple leaking injectors on both banks causing the PCM to command negative fuel trim adjustments

23. A fuel-injected engine cranks normally and has correct spark and compression. Fuel pressure is 54 psi. A noid light confirms injector pulse on all cylinders. The engine does not start. Propane introduced at the throttle body causes the engine to fire briefly. What does this confirm?

A. The MAF sensor is faulty and preventing fuel delivery calculation despite confirmed fuel pressure

B. The fuel pressure regulator is stuck open allowing fuel to return before it can be injected

C. The fuel is present but not reaching the combustion chamber — possible injector failure, clogged injectors, or flooded condition

D. The ignition timing is so far off that combustion cannot be sustained without external fuel enrichment

24. A TPS is tested from closed throttle to WOT using a graphing multimeter. The voltage increases smoothly from 0.5 to 4.6 volts but shows a momentary dropout to 0 volts at approximately 50% throttle opening. What does this indicate?

A. An intermittent open circuit in the TPS — a worn resistive element or broken internal contact at mid-travel

B. The TPS reference voltage is marginal — a dropout at mid-travel confirms a supply voltage fault

C. Normal TPS behavior — a brief zero-volt dropout at mid-travel is an acceptable transition characteristic

D. A PCM input fault causing signal rejection at the 50% throttle position sampling point

25. A GDI engine has multiple P030X misfire codes and a rough idle after sitting unused for 6 weeks. Compression and ignition are confirmed normal. Fuel pressure at the low-pressure pump is confirmed correct. What should the technician check NEXT?

A. The high-pressure fuel pump cam follower for wear causing low high-pressure rail output

B. The fuel injectors for external leakage past O-rings flooding the cylinders during the storage period

C. The high-pressure fuel rail pressure under cranking for inadequate pressure from a stale fuel or pump priming issue

D. The EVAP canister for saturation from fuel evaporation during the storage period causing a rich condition

26. A naturally aspirated engine has a P0171 bank 1 lean code. Fuel pressure is normal. A propane enrichment test at the intake manifold improves bank 1 idle quality immediately. What is the correct next diagnostic step?

A. Perform a smoke test to locate and confirm the specific vacuum leak source on bank 1

B. Replace the bank 1 intake manifold gasket as propane response always indicates a gasket leak

C. Test the bank 1 fuel injectors for restriction before confirming a vacuum leak diagnosis

D. Replace the bank 1 upstream O2 sensor as propane response can indicate a contaminated sensor

27. A turbocharged engine has correct boost at idle and low RPM but develops a chuffing or fluttering sound under hard acceleration above 4,000 RPM. Boost pressure drops momentarily with each sound event. What is the MOST likely cause?

A. A wastegate that is opening prematurely under the high exhaust pressure of hard acceleration

B. A failing turbocharger compressor wheel losing balance at high shaft speeds

C. A boost leak at an intercooler connection that opens under maximum boost pressure

D. A compressor surge or blow-off valve malfunction allowing boost pressure spikes and drops under maximum demand

28. A fuel system volume test shows the pump delivers 1.6 liters per minute against a 1.5 liter minimum specification. Fuel pressure is 57 psi at idle. A P0087 fuel pressure low code sets only during extended WOT acceleration runs. What is the MOST likely cause?

A. A fuel supply line with a partial internal restriction that only causes pressure loss under sustained maximum flow

B. A failing fuel pump that passes volume testing at idle demand but cannot sustain output during extended maximum demand

C. A fuel pressure sensor fault causing a false low reading during high-load operation only

D. A fuel filter that is near the end of its service life and causes pressure drop only during sustained WOT

28. Volume test shows 1.6 L/min against a 1.5 L/min spec. Pressure is 57 psi at idle. P0087 sets only during extended WOT runs. What is the MOST likely cause?

A. A fuel supply line partial restriction causing pressure loss only under sustained maximum flow

B. A fuel pump passing idle volume testing but failing to sustain output during extended maximum demand

C. A fuel pressure sensor fault causing a false low reading at high load only

D. A fuel filter near end of life causing pressure drop only during sustained WOT

29. An engine has a consistent fuel smell in the engine compartment with no visible liquid leak. Fuel pressure is stable at all operating conditions. An EVAP smoke test is negative. What should the technician inspect NEXT?

A. The fuel tank vent lines for a crack allowing vapor to migrate into the engine compartment

B. The charcoal canister for saturation producing vapor that migrates to the engine compartment

C. The fuel injector O-rings and fuel rail connections for minor seepage not detectable as a liquid drip

D. The fuel pressure regulator vacuum line for a small fuel weep past the diaphragm

30. A vehicle has a P0128 coolant temperature below thermostat regulation code. The ECT sensor reads 162°F after 20 minutes of highway driving. Specification is 190–210°F. What is the MOST likely required repair?

A. Replace the ECT sensor — a reading this far below specification confirms sensor failure

B. Flush and refill the cooling system — contaminated coolant lowers the effective thermostat opening temperature

C. Replace the upper radiator hose — a collapsed hose allows excess coolant circulation preventing warm-up

D. Replace the thermostat — failure to reach operating temperature after extended driving confirms the thermostat is stuck open

DOMAIN D — EMISSIONS CONTROL SYSTEMS (Questions 31–37)

31. A PCV valve is tested by placing a thumb over its inlet port with the engine running. A strong vacuum pulls the thumb against the port. The valve does not rattle when shaken. What does this indicate?

A. The PCV valve is stuck in the open position — strong vacuum confirms flow but absence of rattle indicates a stuck-open plunger

B. Normal PCV function — strong vacuum confirms the circuit is drawing correctly and the valve may be a solid-type design

C. The PCV fresh air inlet is blocked causing excessive vacuum at the valve cover port

D. The intake manifold PCV port has a restriction causing vacuum to concentrate at the valve cover side

32. A vehicle has elevated HC and CO on a tailpipe emissions test. LTFT is -18% on both banks. No misfire codes are stored. What is the MOST likely cause?

A. An ignition system fault causing misfires that are below the PCM's misfire detection threshold

B. A vacuum leak causing a lean condition that produces incomplete combustion at idle

C. A persistent rich condition causing incomplete combustion and producing elevated HC and CO simultaneously

D. A degraded catalytic converter with reduced oxidation efficiency for both HC and CO

33. A P0443 EVAP purge control circuit code is stored. The purge solenoid supply wire shows 12 volts. The PCM command wire shows 0.1 volts when commanded. The solenoid does not activate. The solenoid resistance measures 26 ohms against a specification of 22–28 ohms. What is the MOST likely cause?

A. The solenoid resistance is outside specification and the solenoid requires replacement

B. An open circuit exists in the wiring between the PCM command wire and the solenoid connector

C. The solenoid resistance is within specification — the fault is in the PCM output driver circuit

D. The solenoid supply voltage is marginal at 12 volts causing activation failure despite correct resistance

34. A vehicle has a P0401 EGR insufficient flow code. A bi-directional EGR command opens the valve fully. Intake manifold vacuum drops 6 in/Hg when the valve opens. A P0401 continues to set after the test. What should the technician check NEXT?

A. The EGR passages for carbon restriction limiting flow despite confirmed valve operation

B. The EGR differential pressure sensor for a fault causing it to under-report actual flow to the PCM

C. The PCM for a calibration fault setting the P0401 threshold above the achievable flow range

D. The EGR valve position sensor for a fault causing the PCM to question actual valve opening

34. EGR is commanded fully open. Intake vacuum drops 6 in/Hg when the valve opens. P0401 continues to set. What should the technician check NEXT?

A. EGR passages for carbon restriction despite confirmed valve operation

B. The EGR differential pressure sensor for under-reporting actual flow to the PCM

C. The PCM for a calibration fault setting P0401 above the achievable flow range

D. The EGR valve position sensor for a fault causing PCM to question actual opening

35. A vehicle has a P0136 downstream O2 sensor circuit code on bank 1. The sensor reads a fixed 0.45 volts at all operating conditions. The sensor heater is confirmed functional. What is the MOST likely cause?

A. A catalyst that has failed completely, delivering raw exhaust to the downstream sensor at all times

B. A downstream O2 sensor with a failed sensing element reading the mid-range default voltage

C. A lean air-fuel mixture causing the downstream sensor to read at the lean-rich transition voltage

D. A PCM input circuit fault holding the downstream sensor signal at the 0.45-volt reference midpoint

36. An AIR system is confirmed delivering air to the exhaust ports on cold start. The upstream O2 sensor shows a lean response. However, the lean response lasts only 4 seconds before the sensor returns to normal switching. The AIR pump runs for the full 30-second commanded period. What should the technician check?

A. The AIR check valves for leakage allowing exhaust to back-flow and contaminate the delivered air

B. The upstream O2 sensor heater for a fault causing premature sensor activation and early closed-loop entry

C. The AIR distribution tubes for a partial blockage reducing air volume after the initial delivery

D. The PCM AIR monitor threshold settings for a calibration fault requiring a longer lean response period

37. A vehicle has a P0453 fuel tank pressure sensor high input code. The fuel tank pressure sensor signal reads 4.9 volts at all times with the key on. The specification at atmospheric pressure is approximately 2.5 volts. What is the MOST likely cause?

A. A short to the 5-volt reference in the fuel tank pressure sensor signal circuit holding the voltage high

B. A stuck-closed EVAP vent solenoid trapping positive pressure in the fuel tank and raising the sensor reading

C. A saturated charcoal canister causing positive tank pressure that is above the sensor's normal range

D. A fuel tank pressure sensor with an open internal circuit causing the signal to float at reference voltage

DOMAIN E — COMPUTERIZED ENGINE CONTROLS INCLUDING OBD II (Questions 38–50)

38. A scan tool shows STFT at +2% and LTFT at +4% on bank 1, and STFT at +18% and LTFT at +20% on bank 2 at idle. These values are present at all RPM. No vacuum leaks are found. Fuel pressure is normal. What should the technician check NEXT?

A. The bank 1 upstream O2 sensor for contamination causing incorrect bank 1 corrections

B. The MAF sensor for contamination causing under-reading that affects bank 2 more than bank 1

C. A bank 2 exhaust manifold leak upstream of the bank 2 O2 sensor introducing oxygen and causing a false lean signal

D. The EVAP purge solenoid for a fault delivering excess vapors to one bank only

39. A vehicle has a P0172 rich code on bank 1 and P0171 lean code on bank 2 simultaneously. LTFT bank 1 is -16% and LTFT bank 2 is +18%. Fuel pressure is normal. What is the MOST likely cause?

A. Two simultaneous injector faults — one leaking on bank 1 and one restricted on bank 2

B. A bank 1 upstream O2 sensor contaminated or biased toward a rich reading causing false rich correction on bank 1

C. A shared fuel delivery fault affecting both banks differently based on their relative positions in the fuel system

D. The EVAP purge solenoid delivering excess vapor to bank 1 while bank 2 has a simultaneous vacuum leak

39. P0172 rich on bank 1 with LTFT at -16% and P0171 lean on bank 2 with LTFT at +18% are stored simultaneously. Fuel pressure is normal. What is the MOST likely cause?

A. Two simultaneous injector faults — one leaking on bank 1 and one restricted on bank 2

B. A bank 1 upstream O2 sensor contaminated or biased toward rich causing false rich correction

C. A shared fuel delivery fault affecting both banks differently

D. A stuck-open EVAP purge solenoid on bank 1 and a simultaneous vacuum leak on bank 2

40. A scan tool during a road test shows the upstream O2 sensor on bank 1 switching rapidly between 0.1 and 0.9 volts. STFT is cycling between +8% and -8%. LTFT is +1%. What is the correct interpretation?

A. This is normal closed-loop fuel control — the O2 sensor is switching correctly and LTFT near zero confirms no persistent bias

B. The O2 sensor is switching too rapidly indicating a degraded element with erratic response

C. The STFT cycling range of +8% to -8% is too wide and indicates a vacuum leak causing rapid lean-rich cycling

D. The upstream O2 sensor is contaminated — rapid switching with near-zero LTFT indicates a compensated fault

41. A vehicle has a P0507 high idle code. Actual idle is 1,050 RPM against a 700 RPM target. The IAC valve is confirmed functional. No vacuum leaks are found. The throttle body is clean. A bi-directional test commands the IAC to minimum airflow. Idle drops to 900 RPM but does not reach the 700 RPM target. What should the technician check NEXT?

A. The PCM for a calibration fault preventing correct idle target calculation on this vehicle

B. A secondary air source — a partially open throttle plate, a sticking EGR valve, or an unseated throttle body gasket

C. The MAF sensor for a fault causing the PCM to miscalculate required idle airflow

D. The TPS for a fault reporting incorrect throttle position at idle causing the PCM to add additional airflow

41. P0507 high idle at 1,050 RPM against a 700 RPM target. IAC confirmed functional. No vacuum leaks. Throttle body clean. Commanding IAC to minimum drops idle to only 900 RPM. What should the technician check NEXT?

A. The PCM for a calibration fault

B. A secondary air source — partially open throttle plate, sticking EGR valve, or unseated throttle body gasket

C. The MAF sensor for a fault causing incorrect idle airflow calculation

D. The TPS for an incorrect throttle position reading at idle

42. A scan tool captures a stall event. Live data shows STFT spiking to +25% for 3 seconds before the stall while all other sensor data appears normal. RPM drops to zero over those 3 seconds. What does this MOST likely indicate?

A. A MAP sensor dropout causing the PCM to default to a rich strategy before the stall

B. A lean fuel delivery event causing the PCM to add maximum fuel correction before combustion fails

C. A PCM power supply dropout that causes incorrect STFT display before the processor resets

D. The IAC valve closing fully and starving the engine of idle air while the PCM adds fuel in response

43. A vehicle has a P0016 crankshaft-camshaft correlation code on bank 1. Ignition timing confirmed correct at the crankshaft. The variable valve timing system is commanded to neutral position on the scan tool and actual cam timing matches commanded. What should the technician check NEXT?

A. The PCM for a calibration fault generating a false correlation code despite confirmed correct cam-crank relationship

B. The CKP sensor installation for a fault causing an offset in the crankshaft position reference signal

C. The VVT oil control solenoid for an intermittent fault causing cam timing drift under operating conditions

D. The camshaft position sensor for a fault causing incorrect cam timing feedback to the PCM

44. A vehicle with all OBD II monitors complete has a Mode 6 oxygen sensor test value showing the upstream bank 1 sensor response time at 380 milliseconds. The minimum threshold is 400 milliseconds. What is the correct interpretation?

A. The sensor response time is within the passing threshold — the sensor is currently functional and no action is required

B. The sensor has failed — 380 milliseconds is above the typical normal response time of under 100 milliseconds

C. The sensor is approaching its failure threshold and should be replaced proactively before the next drive cycle

D. Mode 6 response time data is informational only and does not require action until a P0133 code sets

45. A vehicle has a U0100 lost communication with PCM code stored in the instrument cluster only. The scan tool communicates normally with the PCM and all other modules. What should the technician check FIRST?

A. The PCM for a fault preventing it from broadcasting specific data to the instrument cluster network segment

B. The instrument cluster power and ground circuits for a fault affecting its ability to receive network data

C. The CAN bus termination resistors for an open circuit affecting the entire network communication path

D. The specific CAN bus wiring segment between the PCM and instrument cluster for an open or high resistance

45. A U0100 lost communication with PCM code is stored in the instrument cluster only. The scan tool and all other modules communicate normally with the PCM. What should the technician check FIRST?

A. The PCM for a fault preventing it from broadcasting to the cluster

B. The instrument cluster power and ground circuits

C. The CAN bus termination resistors for an open circuit affecting the full network

D. The CAN bus wiring segment between the PCM and instrument cluster for an open or high resistance

46. A vehicle has an intermittent no-start that occurs randomly and resolves on its own. No codes are stored during the no-start. A scan tool connected during one event shows the PCM communicating and all sensor inputs reading correctly — but RPM reads zero during cranking. What should the technician check?

A. The starter motor for an intermittent fault preventing engine rotation during the no-start events

B. The CKP sensor for an intermittent signal loss causing the PCM to receive no engine speed data during cranking

C. The PCM for a fault causing it to disable spark and injection despite confirmed sensor inputs

D. The battery for a voltage dropout under cranking load that prevents PCM function despite normal communication

47. A vehicle has STFT at +1% and LTFT at +2% on bank 1 and STFT at +1% and LTFT at +3% on bank 2 at all engine speeds. Mode 1 data shows all sensor values within specification. No codes are stored. What is the correct interpretation?

A. The slightly asymmetric LTFT values between banks indicate a developing bank-specific fault requiring investigation

B. A small vacuum leak is causing the positive fuel trims on both banks at all engine speeds

C. All fuel trims are well within the normal operating range — no fault is present and no action is required

D. The positive LTFT on both banks confirms a MAF sensor reading slightly below actual airflow requiring cleaning

48. A vehicle has a P0304 cylinder 4 misfire. The coil, plug, and injector are all confirmed good by swap testing. Compression and leakage on cylinder 4 are confirmed normal. A scope test confirms the PCM driver signal is correct and consistent on cylinder 4. What should the technician check NEXT?

A. The cylinder 4 intake port for a restriction or collapsed valve seat causing reduced airflow to that cylinder

B. A vacuum leak specifically at the cylinder 4 intake runner or port causing a lean misfire on that cylinder only

C. The cylinder 4 fuel injector spray pattern and volume under operating pressure for a subtle delivery fault

D. The cylinder 4 coil boot and spark plug well for oil contamination causing secondary voltage leakage

49. A vehicle fails an emissions inspection because the catalytic converter monitor shows incomplete. All other monitors are complete. No codes are stored. The vehicle has been driven 800 miles since a battery replacement. What is the MOST likely reason the catalyst monitor has not completed?

A. A small EVAP leak below the detection threshold is blocking the catalyst monitor from running

B. The upstream O2 sensors have degraded response time preventing the catalyst monitor from evaluating converter efficiency

C. The catalyst monitor requires the oxygen sensor monitor to complete first — a pending O2 sensor fault is blocking completion

D. The specific drive cycle conditions required to enable the catalyst monitor have not been met despite the accumulated mileage

50. A vehicle has a P0300 random misfire that sets under cold operating conditions only and clears when the engine reaches full operating temperature. LTFT is +19% on both banks when cold. What is the MOST likely cause?

A. A cold-sensitive ignition component — a coil or plug wire with degraded insulation that arcs internally when cold

B. A failing fuel pump that loses volume output when cold fuel has higher viscosity

C. A vacuum leak that is larger when cold — rubber components shrink at low temperatures creating a lean misfire condition

D. A MAF sensor contaminated with ice or moisture causing incorrect cold-weather airflow readings

PRACTICE EXAM 12: ANSWER KEY AND EXPLANATIONS

DOMAIN A — GENERAL DIAGNOSIS

1. **C. A restricted exhaust system that cannot handle the higher exhaust volume at sustained RPM** — Normal idle vacuum of 17 in/Hg confirms the engine is healthy at low load. The collapse to 5 in/Hg specifically at sustained 2,500 RPM — with recovery when RPM returns to idle — is the definitive pattern of exhaust restriction. At sustained elevated RPM, exhaust volume increases significantly. A restricted catalyst, collapsed muffler, or kinked pipe cannot pass the increased exhaust flow, causing backpressure to build and collapse manifold vacuum. The recovery at idle confirms the restriction is flow-rate dependent — it only manifests when exhaust volume exceeds the restriction's capacity.
2. **A. A blown head gasket between cylinders 4 and 5** — Two adjacent cylinders with equally low compression that shows no wet test improvement is the textbook presentation of a head gasket failure between those two cylinders. The shared combustion pressure between adjacent cylinders through the gasket breach bleeds equally from both, producing matching low readings on both. Oil addition during the wet test cannot seal a path between two adjacent combustion chambers, explaining the complete absence of wet test improvement. Worn rings on two cylinders simultaneously would typically show at least partial wet test improvement on each.
3. **D. Collapsed or worn valve lifters producing increased valvetrain noise when cold** — A rhythmic knock from the top of the engine that increases directly with RPM, is loudest during cold starts, and diminishes significantly once the engine reaches operating temperature points to valvetrain noise from collapsed or worn hydraulic lifters. Cold oil has higher viscosity and takes longer to fully charge collapsed lifters, producing maximum noise at cold start. As the engine warms and oil thins, lifters recover more fully, reducing the lash and the associated noise. The direct RPM relationship confirms the noise source is rotating or reciprocating at engine speed — consistent with valvetrain components.
4. **B. A leaking intake valve on that cylinder not seating correctly** — Test air escaping exclusively from the throttle body opening during a cylinder leakage test confirms the pressurized air is passing through the intake valve into the intake manifold and traveling upstream toward the throttle body. The intake valve is the only path between the combustion chamber and the intake manifold. Air escaping only at the throttle body with no air at the tailpipe, oil filler, or coolant confirms the intake valve is the sole leak path. No other seal failure produces air exclusively at the throttle body opening.

5. **A. Normal condensation burning off as exhaust components reach operating temperature** — White smoke that appears only at cold start on cold mornings and completely clears within 2 minutes with a stable coolant level is the normal presentation of condensation. Cool overnight temperatures cause water vapor in the exhaust system to condense into liquid. When the engine starts, exhaust heat converts this condensate back to steam, producing visible white vapor at the tailpipe. Once the exhaust components reach operating temperature, condensation can no longer form and the white vapor disappears completely. Stable coolant level confirms no coolant is being consumed.

6. **C. Combustion gases entering the cooling system through a head gasket breach** — Bubbles appearing in the coolant immediately at idle on a cold, static engine confirm a pressurized gas source is entering the cooling system. At idle, the only source of pressure in the engine is combustion. A head gasket breach allows combustion chamber pressure to communicate directly with the cooling system passages, pushing combustion gases into the coolant as bubbles. Normal coolant circulation from the water pump produces flow but not discrete bubbles. Air from a recent coolant service would typically produce a single surge of air rather than a continuous stream of bubbles at idle.

7. **D. A mechanical fault on cylinder 3 producing inconsistent compression between firing cycles** — A cylinder that cranks at normal average speed but produces a noticeably higher starter current spike on every other compression stroke indicates the compression is inconsistent between firing events on that cylinder. A mechanical fault — such as a sticking valve that seals on some strokes but not others, or a ring that seals inconsistently — produces variable compression. On strokes where sealing occurs normally, the starter encounters full resistance and draws higher current. On strokes where sealing fails, resistance is lower. This alternating pattern produces the intermittent current spike described.

8. **B. The oil level and viscosity — overfilling or incorrect viscosity can affect hydraulic lifter operation** — A rough idle and misfire that appear immediately after an oil change and resolve after 10 minutes of operation points directly to the oil service as the cause. Overfilling the crankcase causes oil aeration as the crankshaft whips through excess oil, introducing air bubbles into the lubrication system. Aerated oil cannot maintain hydraulic lifter pressure, causing lifters to collapse and produce misfires from inconsistent valve opening. Incorrect viscosity — particularly oil that is too thick — similarly prevents rapid hydraulic lifter pressurization at startup. Both conditions resolve as oil circulates and temperature stabilizes.

9. **C. The valve stem seal on cylinder 2 for oil contamination under high deceleration vacuum** — A misfire on one cylinder specifically under deceleration with confirmed normal compression and leakage points to an oil contamination fault rather than a compression or ignition fault. During deceleration, the throttle closes while engine RPM remains elevated, creating very high intake manifold vacuum. A worn valve stem seal on cylinder 2 allows oil to be drawn past the seal under this high vacuum, contaminating the spark plug with oil on each deceleration event. The oil-fouled

plug misfires under the specific high-vacuum deceleration condition and may recover when the plug partially cleans under other operating conditions.

10. **A. A valve float condition from worn or weak valve springs** — A ticking noise that appears specifically above 3,500 RPM and disappears immediately when RPM drops below that threshold is the classic presentation of valve float. At high RPM, the valve train must open and close valves with increasing speed and force. Worn or weakened valve springs cannot provide sufficient closing force to keep up with the camshaft at high RPM, allowing the valve to momentarily remain open past its designed closing point — or to bounce on closing — producing a distinct ticking. The immediate disappearance below the RPM threshold confirms the fault is purely speed-dependent, consistent with a spring force limitation.

11. **D. A burned or leaking valve — the minimal wet test response confirms the rings are not the primary fault** — Cylinder 6 showing only a 3 psi improvement on the wet test — from 145 to 148 psi — against a 20–30 psi improvement expected if rings were the primary fault confirms the leak path is not primarily past the rings. Oil sealing the ring gap would produce a substantial improvement if rings were responsible. The minimal response confirms oil is not significantly changing the sealing condition, pointing to a valve or head gasket fault where the seal cannot be improved by oil addition. The leakage test is the appropriate next step to identify the specific valve or seal path.

12. **B. The fuel pump relay for an open output circuit** — Compression and spark are confirmed, injector pulse is confirmed on all cylinders, and the fuse is confirmed good. Zero fuel pressure despite a good fuse and confirmed injector pulse narrows the fault to the fuel pump circuit specifically. The relay is the next component between the fuse and the fuel pump. A relay with a functioning coil — which activates on the PCM command — but an open or failed output contact prevents voltage from reaching the pump despite everything else in the circuit testing correctly. Testing the relay output contact directly with a test light or voltmeter confirms whether the relay is passing voltage to the pump circuit.

DOMAIN B — IGNITION SYSTEM DIAGNOSIS AND REPAIR

13. **A. The spark plug is not the cause of the misfire** — A spark plug showing a normal gray insulator and normal electrode wear is a healthy plug with no signs of fouling, overheating, mechanical damage, or service wear. A plug in good condition is not the cause of a misfire on that cylinder. The misfire diagnosis must continue beyond the spark plug to other ignition components — the coil, coil boot, or PCM driver — as well as fuel delivery components and mechanical factors on that cylinder. Dismissing a healthy plug without further diagnosis would leave the actual fault unidentified.

14. **C. The coil circuit is functioning correctly — the voltage drop confirms normal ground path completion** — A PCM command wire that rests at near-battery voltage — 11.9 volts — when not commanded and drops to 0.4 volts when the PCM fires confirms the PCM output driver is

switching the circuit to ground correctly. This is the expected behavior of a PCM-controlled coil driver — the wire rests high when the driver is open and drops low when the driver grounds the circuit. Spark is confirmed produced normally on cylinder H. The P0358 code was likely set during a previous intermittent fault event. The current circuit operation is correct and no fault is present at this time.

15. **D. A weak coil with insufficient stored energy after the spark event** — The firing line and spark line are normal, confirming the coil produced adequate voltage to initiate and sustain the arc. After the spark event ends, the coil's remaining stored magnetic energy produces oscillations as the residual energy dissipates in the secondary circuit. A very small number of oscillations — only 1–2 — before the waveform goes flat indicates the coil had very little energy remaining after the spark event. A weak coil that is approaching the end of its service life may produce adequate firing voltage while having minimal reserve energy, resulting in a reduced oscillation count that indicates diminished overall energy output capacity.

16. **B. A damaged Hall effect sensor with a degraded output transistor** — A Hall effect sensor produces a clean digital square wave by switching its output transistor fully on — pulling the signal to near ground — and fully off — allowing the signal to rise to reference voltage. The signal dropping to only 2.5 volts instead of fully to 0 volts at one specific tooth position indicates the output transistor cannot fully saturate at that triggering event. A degraded transistor that is losing its switching ability may still partially conduct but cannot pull the signal fully to ground. This produces a reduced-amplitude switch at the affected position while all other positions where triggering is stronger show correct full switching.

17. **C. Swap the cylinder 4 spark plug with a known-good plug while the coil is at the new position** — The coil swap confirmed the fault travels with the coil — the coil is responsible for the misfire on whichever cylinder pair it serves. However, the coil serves both cylinder 4 and its waste spark pair. The cylinder 4 spark plug moved with cylinder 4's coil position because it is a COP system — the plug is under the coil. With the coil confirmed as the circuit fault origin, swapping the cylinder 4 spark plug with a known-good plug while keeping the suspect coil at its new position determines whether the plug under the suspect coil contributes to the fault or whether the coil alone is responsible.

18. **A. A weakened permanent magnet inside the sensor losing its magnetic field strength** — A magnetic reluctance sensor generates its AC voltage signal through electromagnetic induction — the amplitude is directly proportional to the strength of the sensor's permanent magnet and the rate of magnetic field change. When all teeth produce uniformly reduced amplitude with a confirmed correct air gap, the magnetic field source — the permanent magnet inside the sensor — has weakened uniformly. A wiring fault would cause signal loss or distortion rather than uniform amplitude reduction. Reluctor wheel oxidation would affect individual teeth inconsistently. A PCM input circuit issue would affect all sensors on that input uniformly, not specifically one sensor.

19. **D. Compression and leakage on the affected cylinder for a mechanical fault** — The plug wire swap not moving the misfire rules out the plug wire as the cause. The new spark plug not resolving the misfire rules out the spark plug. Both ignition delivery components for that cylinder have been eliminated. With the secondary circuit confirmed functional by component substitution, the remaining causes are mechanical — a compression seal fault, a burned valve, or excessive wear — or fuel delivery related. Compression and leakage testing on the affected cylinder is the logical next step to identify whether a mechanical fault is preventing combustion on that specific cylinder at idle.

20. **B. A bright blue spark confirms the coil is functional but does not confirm adequate voltage under compression** — A spark output test performed in open air across a gap tool confirms the coil can produce enough secondary voltage to jump the test gap in atmospheric conditions. However, the voltage required to fire a spark plug inside a combustion chamber under compression pressure is significantly higher than the voltage needed to jump the same gap in open air. A coil that produces a strong spark in the open air test may still fail to fire adequately under the higher resistance conditions of a pressurized combustion chamber. The test confirms coil output capability but does not simulate actual operating conditions.

DOMAIN C — FUEL, AIR INDUCTION, AND EXHAUST SYSTEMS

21. **B. Normal behavior on a return-style system** — On a return-style fuel system, key-on pressure reflects the fuel pump building pressure against the closed regulator spring with no engine vacuum applied. Once the engine starts, the pump continues running and the regulator's vacuum reference slightly modulates pressure, but pump output under active flow demand can produce a slightly higher sustained pressure than the initial key-on static build. A rise from 57 psi at key-on to 62 psi at idle — both within the 55–65 psi specification — confirms the system is operating correctly at both test points. No fault is indicated by this normal pressure behavior.

22. **C. A MAF sensor contaminated or damaged causing it to read significantly higher than actual airflow** — A MAF reading more than double the specified idle value combined with strongly negative LTFT on both banks is the definitive pattern of a MAF sensor reporting far more airflow than is actually occurring. The PCM delivers fuel proportional to the measured airflow — an inflated MAF reading commands excess fuel delivery. The -19% LTFT confirms the PCM is aggressively removing fuel to compensate for the resulting rich condition. A smoke test ruling out downstream air leaks eliminates unmetered air entry as the cause, directly implicating the MAF sensor's calibration accuracy.

23. **D. Fuel is present but not reaching the combustion chamber** — All primary systems are confirmed — spark, compression, fuel pressure at specification, and injector pulse on all cylinders. The engine has everything required for combustion yet will not start. Propane introduced at the throttle body causes momentary firing, confirming the ignition and compression systems can support combustion when fuel is physically present in the cylinder. The fact that injector pulse is confirmed but the engine does not respond to fuel delivery suggests the injectors may be pulsing

but not actually delivering fuel — clogged injectors, a flooded condition with liquid fuel preventing ignition, or an internal injector fault preventing spray despite confirmed electrical pulse.

24. **A. An intermittent open circuit in the TPS at mid-travel** — A TPS voltage sweep that is smooth throughout its range except for a momentary dropout to absolute zero at a specific throttle position indicates the internal resistive element or wiper contact has a break at that point. A zero-volt dropout — not a dip or hesitation, but a complete drop to zero — confirms the signal path is momentarily broken, not merely resistive. This is the classic presentation of a worn or cracked resistive element inside the TPS that loses continuity at the specific mechanical position where the damage exists. The PCM interprets this dropout as a closed throttle event at mid-travel, causing a momentary fuel cut or hesitation.

25. **C. The high-pressure fuel rail pressure under cranking for inadequate pressure** — Compression and ignition are confirmed normal, and the low-pressure pump is delivering correct pressure to the high-pressure pump inlet. On a GDI engine that has sat unused for six weeks, the high-pressure fuel rail may have lost its residual pressure through normal seepage, and the high-pressure pump requires several cranking cycles to prime the rail to operating pressure. Additionally, fuel that has degraded during storage may have altered volatility characteristics. Measuring actual high-pressure rail pressure during cranking confirms whether the GDI injection system has adequate pressure to deliver atomized fuel to the combustion chambers before pursuing component-level diagnosis.

26. **A. Perform a smoke test to locate and confirm the specific vacuum leak source on bank 1** — A propane enrichment test that improves bank 1 idle quality immediately confirms unmetered air is entering the intake tract on bank 1 — a vacuum leak is present. The propane test identifies the leak's existence and approximate location by the area where propane enrichment produces a response. The next logical diagnostic step is a smoke test to precisely identify the specific leak point — whether it is an intake manifold gasket, a vacuum hose, a throttle body gasket, or another component. Replacing the manifold gasket without smoke test confirmation risks misdiagnosing the specific leak source.

27. **D. A compressor surge or blow-off valve malfunction under maximum demand** — A chuffing or fluttering sound specifically under hard acceleration above 4,000 RPM with accompanying momentary boost pressure drops is the characteristic presentation of compressor surge or a malfunctioning blow-off valve. Compressor surge occurs when the pressure ratio across the compressor exceeds its stable operating range — the airflow momentarily reverses direction through the compressor, producing the characteristic chuffing sound and pressure drop before the compressor re-stabilizes. A blow-off valve that is stuck closed or opening prematurely under high boost produces a similar audible event with associated pressure fluctuation.

28. **B. A failing fuel pump passing idle volume testing but failing under extended maximum demand** — Volume testing at idle demand confirms the pump meets specification under low-flow

conditions. The P0087 code setting only during extended WOT acceleration — the highest sustained fuel demand condition — reveals a pump that can meet short-term idle requirements but cannot sustain adequate output volume during the maximum continuous demand of extended wide-open throttle operation. A pump with degraded internal components may pass a brief idle volume test while being unable to maintain the sustained high flow rate required during maximum power demand, causing pressure to drop progressively during the extended acceleration run.

29. **C. The fuel injector O-rings and fuel rail connections for minor seepage** — Stable fuel pressure at all conditions eliminates active fuel system leaks. A negative EVAP smoke test eliminates the EVAP system as a vapor source. The fuel pressure regulator vacuum line being dry eliminates the regulator diaphragm as a source. With all external systems confirmed, minor seepage at fuel injector O-rings or fuel rail fittings — too small to produce a visible drip or a detectable EVAP leak — is the most likely remaining source. Fuel seeping slowly past aged O-rings evaporates in the engine compartment heat, producing a persistent fuel smell without a visible drip or EVAP system involvement.

30. **D. Replace the thermostat — it is stuck open** — A P0128 code with an ECT reading of 162°F after 20 minutes of highway driving — well below the 190–210°F specification — confirms the engine is not reaching its designed operating temperature under conditions that should easily achieve full warm-up. A stuck-open thermostat allows continuous coolant circulation between the engine and radiator, preventing the coolant from reaching the thermostat's designed opening temperature and holding the engine below specification indefinitely. Highway driving provides more than sufficient heat input to reach operating temperature on a correctly functioning cooling system — failure to warm up after 20 minutes of highway operation is the definitive indicator of a thermostat stuck open.

DOMAIN D — EMISSIONS CONTROL SYSTEMS

31. **A. The PCV valve is stuck in the open position** — Strong vacuum at the valve cover port confirms the intake manifold vacuum circuit is drawing correctly through the PCV system. However, a PCV valve that does not rattle when shaken indicates the internal plunger is not free to move — it is either stuck open or stuck closed. Given that strong vacuum is present at the cover port, the valve is passing flow, which means the plunger is stuck in the open position rather than closed. A stuck-open PCV valve bypasses its designed flow restriction, allowing unrestricted crankcase vacuum that draws oil vapor and mist at a rate exceeding the engine's tolerance, causing abnormal oil consumption through the intake manifold.

32. **C. A persistent rich condition causing elevated HC and CO simultaneously** — Elevated HC and CO appearing together at the tailpipe with strongly negative LTFT on both banks confirms a severe, persistent rich air-fuel mixture as the common cause of both emissions failures. A rich mixture produces elevated HC from incomplete combustion of excess fuel and elevated CO from insufficient oxygen to fully oxidize all carbon in the fuel to CO_2. The negative LTFT confirms the PCM is actively reducing fuel delivery to compensate for the rich condition but cannot fully correct

it. The absence of misfire codes eliminates ignition-sourced HC, which would not also produce elevated CO.

33. **B. An open circuit exists in the wiring between the PCM command wire and the solenoid connector** — Supply voltage is confirmed at 12 volts and the PCM command wire shows 0.1 volts when commanded — confirming the PCM driver is pulling the circuit to ground. Both the supply and driver circuits are confirmed functional. The solenoid resistance of 26 ohms is within the 22–28 ohm specification, confirming the solenoid winding is intact. Despite confirmed supply voltage, confirmed PCM ground switching, and a confirmed intact solenoid, the solenoid does not activate — indicating an open between the PCM command wire test point and the solenoid connector itself. The ground signal is not reaching the solenoid despite the PCM providing it.

34. **D. The EGR valve position sensor for a fault causing the PCM to question actual valve opening** — A 6 in/Hg vacuum drop when the EGR valve is commanded open confirms exhaust gas is physically entering the intake manifold and reducing intake vacuum — the system is flowing. Despite confirmed physical flow, the P0401 continues to set. When the EGR valve opens and flow is confirmed by vacuum response but the monitor continues to fail, the PCM may be receiving incorrect feedback from the EGR valve position sensor suggesting the valve has not opened to the commanded position. A position sensor fault causing the PCM to believe the valve remained partially or fully closed despite its confirmed physical opening would generate a continuing P0401 based on position feedback rather than actual flow.

35. **B. A downstream O2 sensor with a failed sensing element reading mid-range default** — A downstream O2 sensor reading a fixed 0.45 volts at all operating conditions is not actively monitoring exhaust oxygen content — it is outputting a constant voltage near the mid-range of its operating scale. A failed zirconia sensing element that has lost its electrochemical activity defaults to a steady mid-range output rather than switching between rich and lean voltages in response to exhaust composition changes. The confirmed functional heater eliminates heater circuit faults. A fixed mid-range reading with no response to changing operating conditions is the specific electrical presentation of a chemically depleted or physically failed O2 sensor element.

36. **C. The AIR distribution tubes for a partial blockage reducing air volume after initial delivery** — Air delivery is confirmed — the pump runs, check valves are open, and the upstream O2 sensor shows an initial lean response. However, the lean response lasts only 4 seconds despite the pump running for 30 seconds. The air delivery path is confirmed open at the check valves, but a partial blockage in the distribution tubes downstream of the check valves would allow initial air delivery that becomes restricted as backpressure builds in the partially blocked tube. This produces the brief initial lean response that disappears as air volume reaching the exhaust ports decreases below the threshold needed to maintain a detectable lean signal.

37. **A. A short to the 5-volt reference in the fuel tank pressure sensor signal circuit** — A fuel tank pressure sensor reading 4.9 volts — near the maximum 5-volt reference value — at all times indicates the signal wire is being held at near-reference voltage by an external source rather than

varying with actual tank pressure. A short between the signal wire and the 5-volt reference supply wire clamps the signal at near-reference voltage regardless of sensor output, producing the fixed high reading. This is distinct from a sensor with an open internal circuit — an open would cause the signal to float at reference voltage, but a short to the reference wire specifically clamps it at that level regardless of circuit conditions.

DOMAIN E — COMPUTERIZED ENGINE CONTROLS INCLUDING OBD II

38. **C. A bank 2 exhaust manifold leak upstream of the bank 2 O2 sensor** — Bank 1 fuel trims are near zero, confirming normal fuel control and eliminating shared system faults — the MAF, fuel pressure, and EVAP system are functioning correctly. Bank 2 shows substantially elevated positive LTFT at all RPM with no vacuum leaks found and normal fuel pressure. An exhaust manifold leak upstream of the bank 2 upstream O2 sensor introduces atmospheric oxygen into the exhaust stream before it reaches the sensor. The sensor detects this additional oxygen as a lean exhaust condition and signals the PCM to add fuel, generating the elevated positive LTFT on bank 2 only — exactly the bank-specific lean trim pattern observed.

39. **B. A bank 1 upstream O2 sensor contaminated or biased toward a rich reading** — Simultaneous opposite fuel trim codes on the two banks — rich on bank 1 and lean on bank 2 — with normal fuel pressure eliminates shared fuel system faults. A bank 1 O2 sensor contaminated with silicone, phosphorus, or other substances that bias its output toward the rich voltage range causes the PCM to incorrectly perceive bank 1 as running rich and remove fuel accordingly, generating negative LTFT. The bank 2 lean code with positive LTFT reflects normal bank 2 operation or a mild separate condition. The asymmetric opposite-direction trim pattern with a sensor fault on one bank is the most common cause of simultaneous opposite-code lean-rich presentations.

40. **A. Normal closed-loop fuel control** — An upstream O2 sensor switching rapidly between 0.1 and 0.9 volts with STFT cycling between +8% and -8% and LTFT at +1% represents correct, active closed-loop fuel control operation. The O2 sensor is performing its designed function — switching between lean and rich voltage states as the PCM alternately adds and removes fuel around stoichiometry. The STFT cycling confirms the PCM is responding correctly to the sensor signal. The near-zero LTFT is the definitive confirmation of correct operation — LTFT at +1% means the PCM has no persistent fuel bias to correct, indicating the average mixture is centered at stoichiometry exactly as designed.

41. **B. A secondary air source — partially open throttle plate, sticking EGR valve, or unseated throttle body gasket** — The IAC is confirmed functional and is commanded to minimum airflow, yet idle speed only drops to 900 RPM rather than reaching the 700 RPM target. This confirms the IAC has removed all the airflow it controls, yet additional uncontrolled air is still entering the engine and maintaining the elevated idle. An air source that exists independent of the IAC — a throttle plate that cannot fully close, a sticking EGR valve delivering exhaust flow that acts as an

idle air source, or an unseated throttle body gasket allowing unmetered air entry — would continue supplying air to the engine regardless of IAC position.

42. **B. A lean fuel delivery event causing the PCM to add maximum fuel correction** — STFT spiking to +25% for 3 seconds before the stall with all other sensor data appearing normal confirms the PCM is detecting a lean condition and responding by adding maximum short-term fuel correction. The fact that the stall occurs despite maximum STFT addition confirms the fuel delivery deficit was severe enough that even maximum PCM enrichment could not maintain combustion. This pattern — progressive STFT increase to maximum followed by stall — is the characteristic presentation of a sudden fuel delivery failure such as a fuel pump losing output, a fuel pressure regulator failing open, or a vapor lock event in the fuel rail.

43. **C. The VVT oil control solenoid for an intermittent fault causing cam timing drift** — Ignition timing is confirmed correct at the crankshaft, and commanding the VVT system to neutral with confirmed actual cam timing match eliminates a cam phaser mechanical fault at the neutral position. A P0016 correlation code that sets under operating conditions but not during a static scan tool test points to an intermittent fault that only manifests during dynamic operation. A VVT oil control solenoid with an intermittent electrical fault or a sticky plunger may function correctly during low-demand static testing but allow unwanted cam timing drift during the higher oil pressure demands and thermal cycling of actual engine operation.

44. **A. The sensor response time is within the passing threshold — no action is required** — Mode 6 oxygen sensor response time data represents the measured time in milliseconds for the sensor to transition between rich and lean states. A lower number indicates faster response — better sensor performance. A reading of 380 milliseconds against a minimum passing threshold of 400 milliseconds confirms the sensor's response time is faster than the minimum required — it is within the passing range. The sensor has passed its monitor evaluation. While the value is closer to the threshold than ideal, it is currently passing and no immediate action is required. The customer can be informed as a monitoring point for future inspections.

45. **D. The specific CAN bus wiring segment between the PCM and instrument cluster** — The scan tool communicates normally with the PCM and all other modules, confirming the PCM is broadcasting on the network and the main CAN bus is intact. Only the instrument cluster is reporting lost communication with the PCM. When all other modules communicate correctly with the PCM and only one module reports a lost communication code, the fault is localized to the wiring segment or connection specific to that module's network connection rather than the main bus or the PCM itself. An open or high-resistance connection in the specific wiring harness segment between the PCM network connection and the instrument cluster connector isolates that module from the PCM broadcast.

46. **B. The CKP sensor for an intermittent signal loss** — The PCM is confirmed communicating and all sensor inputs read correctly during the no-start event — but RPM reads zero during cranking. RPM data is derived exclusively from the CKP sensor signal. A scan tool showing zero

RPM while the engine is confirmed cranking means the PCM is receiving no engine speed data — not that the engine is not rotating. An intermittent CKP signal loss during cranking provides the PCM with no crankshaft position information, preventing it from triggering ignition or injection events. No codes are stored because the event is intermittent and may not meet the PCM's fault confirmation criteria for code storage.

47. **C. All fuel trims are well within the normal operating range — no fault is present** — LTFT at +2% on bank 1 and +3% on bank 2, with STFT at +1% on both banks at all engine speeds, represents minimal fuel corrections well within the accepted normal operating range of ±10%. The slight asymmetry between banks — +2% versus +3% — is within the expected variation between two independent fuel control loops operating on separate banks. Near-zero fuel trims across all operating conditions with no codes and all sensor values within specification confirm a correctly functioning engine management system with no fault requiring diagnosis or repair.

48. **A. The cylinder 4 intake port for a restriction or collapsed valve seat** — All swappable cylinder-specific components — coil, plug, and injector — are confirmed good, and compression and leakage tests are normal, which rules out most common single-cylinder misfire causes. The PCM driver signal is confirmed correct, eliminating the electrical command path. A cylinder that misfires despite confirmed ignition, confirmed fuel delivery, and confirmed compression sealing has a physical impediment to normal combustion. A restricted intake port or a collapsed valve seat that allows the valve to open and close — producing normal leakage test results — but restricts airflow volume to the cylinder would cause a lean misfire without affecting compression or leakage test results.

49. **D. The specific drive cycle conditions required to enable the catalyst monitor have not been met** — All other monitors completing confirms the PCM and monitoring systems are functional. No stored codes eliminates active faults preventing monitor completion. Eight hundred miles of driving after a battery replacement is substantial mileage, but the catalyst monitor has among the most specific enable criteria of all OBD II monitors — requiring defined coolant temperature ranges, sustained vehicle speed windows, specific load conditions, and particular fuel trim stability simultaneously in a defined sequence. Urban driving patterns, frequent cold starts, or driving profiles that do not include sustained highway segments commonly prevent catalyst monitor completion despite hundreds of miles of accumulated driving.

50. **C. A vacuum leak that is larger when cold — rubber components shrink at low temperatures** — A random misfire with positive LTFT on both banks specifically under cold operating conditions that resolves completely when the engine reaches operating temperature is the definitive pattern of a cold-sensitive vacuum leak. Rubber intake manifold gaskets, vacuum hoses, and throttle body gaskets contract at cold temperatures, creating gaps that allow unmetered air entry. The resulting lean condition at cold idle — where the fixed leak volume is proportionally significant relative to closed-throttle airflow — causes random lean misfires confirmed by the

elevated positive LTFT. As the engine warms and rubber components expand back to their normal dimensions, the gap seals and both the lean condition and the misfires disappear.