PRACTICE EXAM 9: ASE A8 ENGINE PERFORMANCE FULL-LENGTH SIMULATION

50 Questions | 75 Minutes

DOMAIN A — GENERAL DIAGNOSIS (Questions 1–12)

1. A vacuum gauge at idle shows a steady 14 in/Hg with no fluctuation. The reading increases normally with RPM. What does this MOST likely indicate?

A. A sticking exhaust valve reducing vacuum at idle

B. A single cylinder misfire causing periodic vacuum drops

C. Retarded ignition timing reducing overall manifold vacuum

D. A partially restricted exhaust system lowering idle vacuum

2. A compression test shows cylinders 1, 2, 4, and 5 between 165 and 175 psi. Cylinder 3 reads 110 psi dry and 155 psi wet. What does this indicate?

A. Worn or damaged piston rings on cylinder 3

B. A burned valve on cylinder 3 with no wet test improvement expected

C. A head gasket leak between cylinder 3 and the adjacent coolant passage

D. Normal variation — cylinder 3 is within acceptable range of the others

3. An engine has a knock that is loudest at idle, decreases as RPM increases, and is not affected by engine temperature. What is the MOST likely cause?

A. Worn connecting rod bearings producing a load-sensitive knock

B. A hydraulic lifter that has bled down and produces noise at low oil pressure

C. Timing chain slap at the front cover under low oil pressure at idle

D. Piston slap from excessive bore clearance that is RPM-dependent at low speed

4. A cylinder leakage test on cylinder 4 shows 55% leakage with air escaping from both the throttle body opening and the tailpipe simultaneously. What does this indicate?

A. A blown head gasket between cylinder 4 and the cooling system

B. Both the intake and exhaust valves on cylinder 4 are not seating correctly

C. Worn piston rings allowing pressure to escape into the crankcase and exhaust

D. A cracked piston on cylinder 4 allowing pressure to escape in multiple directions

5. An engine with a turbocharger has blue smoke under acceleration that clears at idle. What is the MOST likely cause?

A. A worn or failed turbocharger shaft seal allowing oil into the intake under boost

B. Worn piston rings allowing oil past under high cylinder pressure during acceleration

C. Worn valve stem seals allowing oil to be drawn in under high intake vacuum

D. A leaking intercooler allowing oil from the charge air to enter the combustion chamber

6. A technician performs a cylinder contribution test. Cylinder 5 shows a 200 RPM drop when disabled. All other cylinders show a 225–235 RPM drop. What does this indicate?

A. Cylinder 5 has completely failed and is not contributing to engine power

B. Cylinder 5 has a major fuel delivery fault reducing its contribution significantly

C. Cylinder 5 is contributing slightly less than the other cylinders and warrants further investigation

D. The 25 RPM difference is within normal variation and no fault is indicated

7. An engine has white smoke from the exhaust that persists at all temperatures and worsens under load. Coolant level drops steadily. What is the MOST likely cause?

A. Normal condensation in the exhaust system burning off during warm-up

B. Worn valve stem seals allowing oil to enter and burn in the combustion chamber

C. A PCV system fault routing excessive oil vapor into the intake manifold

D. A head gasket failure or cracked head allowing coolant into the combustion chamber

8. An oil pressure test shows 45 psi at hot idle and 65 psi at 2,500 RPM on an engine with a 25–65 psi specification. What is the correct interpretation?

A. Oil pressure at 2,500 RPM is at the maximum limit — the relief valve should be inspected

B. Oil pressure is within specification at both test points — no fault is indicated

C. Hot idle pressure is too low — worn bearings are causing pressure loss at idle

D. The pressure difference between idle and 2,500 RPM is too large — the pump is failing

9. A relative compression test shows one cylinder drawing significantly less cranking amperage than all others. What does this confirm?

A. That cylinder has reduced compression and is offering less resistance to the starter

B. That cylinder has a seized ring causing the piston to drag and draw more current

C. The fuel injector on that cylinder is disabled during the test affecting the reading

D. The CKP sensor is producing a signal dropout near that cylinder's firing position

10. A technician suspects valve timing is retarded from a stretched timing chain. Which test would MOST directly confirm this?

A. A cylinder leakage test identifying exhaust valve leakage consistent with retarded timing

B. A relative compression test showing reduced cranking resistance on all cylinders

C. A compression test showing uniformly low readings across all cylinders

D. A vacuum test showing uniformly low vacuum that does not improve with RPM increase

11. An engine has a ticking from the top of the engine that increases in speed with RPM but does not change with engine temperature. Oil pressure is within specification. What is the MOST likely cause?

A. A collapsed hydraulic lifter that has not recovered after multiple warm-up cycles

B. Excessive valve clearance from a worn rocker arm or camshaft lobe

C. Timing chain slack contacting the timing cover at low RPM

D. A worn camshaft bearing producing a speed-dependent noise from above

12. A no-start condition exists. Compression is normal. Spark is confirmed at all plugs. Fuel pressure is 56 psi. No injector pulse is present during cranking. The PCM has confirmed power and ground. What should the technician check NEXT?

A. The crankshaft position sensor signal during cranking

B. The fuel pump relay for a fault affecting injector power supply

C. The throttle position sensor for a fault preventing PCM injector command

D. The CMP sensor signal for a fault preventing sequential injector activation

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

13. A spark plug removed from a high-mileage engine shows a worn, rounded center electrode with a slightly widened gap and a light gray insulator. What does this indicate?

A. Coolant contamination causing insulator erosion and electrode rounding

B. Normal wear consistent with a plug that has reached or exceeded its service interval

C. Rich combustion causing accelerated electrode erosion from excess fuel

D. Pre-ignition damage causing the electrode to erode from abnormal heat cycles

14. A P0356 ignition coil F primary circuit code is stored. The coil supply wire shows 12 volts. The PCM command wire shows 0.2 volts when commanded. No spark is produced. What should the technician check NEXT?

A. Replace the PCM — a confirmed functional driver with no spark output indicates an internal PCM fault

B. Test the coil primary winding resistance for an open or short circuit

C. Replace the spark plug on cylinder F as plug failure can prevent coil discharge despite correct command

D. Test the coil secondary winding for an open preventing high-voltage output

14. A P0356 code is stored. The coil supply shows 12 volts and the command wire shows 0.2 volts when fired. No spark is produced. What should the technician check NEXT?

A. Replace the PCM

B. Test the coil primary winding resistance

C. Replace the spark plug

D. Test the coil secondary winding for an open

15. A distributor ignition system has a no-start. Spark is absent at all plug wires and at the coil wire. Battery voltage is confirmed at the ignition coil positive terminal with the key on. What should the technician check NEXT?

A. The ignition module for a fault preventing coil primary switching

B. The distributor cap and rotor for carbon tracking preventing high-voltage distribution

C. The coil secondary winding for an open preventing high-voltage output from the coil

D. The plug wires for simultaneous high resistance preventing spark delivery

16. A secondary ignition waveform on one cylinder shows a firing line significantly lower than all other cylinders. The spark line duration is normal. What does this MOST likely indicate?

A. A wide spark plug gap requiring more voltage to initiate the arc on that cylinder

B. A high-resistance plug wire on that cylinder requiring more voltage to overcome

C. A carbon-tracked coil tower or distributor cap terminal providing an alternate low-resistance ground path

D. A weak coil on that cylinder producing insufficient secondary voltage

16. A secondary waveform shows a firing line significantly lower than all other cylinders. Spark line duration is normal. What does a low firing line MOST likely indicate?

A. A wide spark plug gap on that cylinder

B. A high-resistance plug wire on that cylinder

C. A carbon track or low-resistance alternate path shorting voltage before the plug gap

D. A weak coil producing insufficient secondary voltage

17. A waste spark system misfires on cylinders 3 and 6. The coil serving those cylinders is swapped with the coil serving cylinders 2 and 5. The misfire moves to cylinders 2 and 5. What does this confirm?

A. The spark plugs on cylinders 3 and 6 have simultaneously failed

B. The coil originally serving cylinders 3 and 6 has failed

C. The PCM driver circuit for the cylinder 3 and 6 coil position has a fault

D. The plug wires on cylinders 3 and 6 both have high resistance

18. A magnetic reluctance CKP sensor is tested during cranking. The waveform shows normal teeth amplitude but one position shows a voltage spike significantly above all surrounding teeth amplitude. What does this MOST likely indicate?

A. A damaged or raised tooth on the reluctor wheel producing a stronger-than-normal magnetic field change at that position

B. A designed reference tooth that is taller than the others for PCM timing identification

C. PCM signal processing creating a reference spike at the TDC position for timing calculations

D. A wiring fault creating a voltage injection at one specific crankshaft position

19. A Hall effect CMP sensor is tested with the engine running. The signal wire shows a consistent square wave switching between 0 volts and 5 volts. The PCM reports a P0341 CMP sensor range performance code. What should the technician check NEXT?

A. Replace the PCM as a confirmed normal sensor signal with a performance code indicates an internal PCM input fault

B. Test the CMP sensor supply voltage and ground for marginal values that pass basic testing but affect signal quality

C. Verify the CMP sensor signal pattern matches the expected tooth count and pattern for that specific engine

D. Replace the CMP sensor as a performance code always indicates sensor degradation despite a normal-appearing signal

20. A COP system has confirmed misfires on cylinders 1, 3, and 5 simultaneously. All three are on the same bank. Coil swaps confirm the coils are not the cause. What should the technician check NEXT?

A. The fuel injectors on cylinders 1, 3, and 5 for simultaneous restriction

B. The PCM driver circuits for cylinders 1, 3, and 5 for a shared wiring fault

C. A bank 1 compression fault affecting odd-numbered cylinders specifically

D. A shared power or ground supply circuit for the bank 1 coils

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

21. A port injection engine cranks normally and has correct spark and compression. Fuel pressure is 0 psi during cranking. The fuel pump relay clicks when the key is turned on. What should the technician check NEXT?

A. The fuel pump fuse and the fuel pump itself for an open circuit

B. The fuel pressure regulator for a stuck-open fault bleeding all pressure during cranking

C. The anti-theft system for a lockout disabling the fuel pump relay output

D. The inertia switch for a trip condition preventing fuel pump operation

22. A MAF-equipped engine has LTFT at -2% on both banks at idle and +19% on both banks at 2,500 RPM. What does this fuel trim pattern MOST likely indicate?

A. A vacuum leak causing a lean condition that worsens at higher RPM

B. A stuck-open EVAP purge solenoid adding excess vapors predominantly at idle

C. A MAF sensor reading high at idle but dropping its reading at higher RPM

D. A fuel pressure drop under high-flow demand causing lean conditions at speed

22. LTFT is -2% at idle and +19% at 2,500 RPM on both banks. What does this fuel trim pattern MOST likely indicate?

A. A vacuum leak worsening at higher RPM

B. A stuck-open EVAP purge solenoid adding excess vapors at idle

C. A MAF sensor reading correctly at idle but underreporting airflow at higher RPM

D. Fuel pressure dropping under high-flow demand causing lean conditions at speed

23. A fuel-injected engine has a P0087 fuel rail pressure low code. Fuel pressure at idle is 42 psi on a 60 psi system. When the fuel return line is briefly pinched, pressure rises to 60 psi immediately. What does this confirm?

A. The fuel filter is partially restricted causing pressure loss before the rail

B. The fuel pump is delivering adequate flow but the pressure regulator is bleeding excess pressure

C. The pump is weak and cannot maintain pressure without the return line restriction

D. A leaking injector is bleeding rail pressure down through an open injector circuit

24. A GDI engine misfires on multiple cylinders after extended highway driving. The misfires clear after the engine cools. No codes are stored when the engine is cold. What is the MOST likely cause?

A. A MAF sensor that becomes inaccurate at high operating temperatures

B. A high-pressure fuel pump that loses output capacity when hot

C. A PCM calibration fault triggered by elevated underhood temperatures

D. Fuel vaporization in the high-pressure fuel rail under sustained high-temperature operation

25. An engine has a P0171 lean code on bank 1 only. A propane enrichment test near the intake manifold on the bank 1 side does not improve idle quality. What does this MOST likely indicate?

A. The fault is not a vacuum leak — a lean condition from a fuel delivery or sensor fault is more likely

B. The propane test confirms a vacuum leak that is too large to be corrected by propane enrichment

C. The bank 1 upstream O2 sensor is contaminated and not responding to the propane enrichment

D. The propane test is being performed incorrectly — it must be performed with the engine under load

26. A throttle body with electronic throttle control has a P0068 MAP-throttle position correlation code. At idle, MAP reads 35 kPa and TPS reads 12% throttle opening. What does this indicate?

A. The MAP sensor vacuum supply is partially restricted causing a low reading at idle

B. A TPS fault reporting a higher-than-actual throttle opening at idle conditions

C. The MAP and TPS signals do not agree with each other for the current operating conditions

D. A MAP sensor reading low combined with a TPS reading high creates a code on all ETC systems

27. A naturally aspirated engine has correct fuel pressure at idle but a P0087 code sets only during hard acceleration. A fuel volume test shows the pump delivering 0.7 liters per minute against a 1.4 liter specification. What is the MOST likely cause?

A. A partially restricted fuel filter limiting flow under high-demand acceleration

B. A fuel pressure regulator stuck open bleeding pressure only under high flow demand

C. A fuel supply line with a partial kink reducing flow rate under high demand

D. A failing fuel pump with insufficient volume output to sustain pressure under high demand

28. A turbo engine returns from a long highway drive with an oil consumption complaint and blue smoke under boost. The air filter and intercooler are dry. What is the MOST likely cause?

A. Worn piston rings allowing oil into the combustion chamber under boost pressure

B. A worn turbocharger shaft seal allowing oil to enter the intake side of the turbocharger

C. Worn valve stem seals allowing oil into the combustion chamber under high intake vacuum

D. A clogged PCV system forcing oil vapor into the intake manifold under boost conditions

29. A scan tool shows the fuel pump commanded on during cranking but no fuel pressure builds. The pump fuse and relay are confirmed good. A direct battery voltage test at the pump connector produces no pump operation. What does this confirm?

A. The fuel pump has failed and requires replacement

B. The fuel pump inertia switch has tripped and is preventing pump operation

C. The PCM is not commanding the fuel pump relay despite the scan tool showing command active

D. A wiring fault exists between the relay and the pump connector preventing voltage delivery

30. An exhaust backpressure test at 2,500 RPM shows 2.2 psi. The specification limit is 3.0 psi. A P0420 catalyst efficiency code is stored. What is the correct interpretation?

A. The backpressure reading confirms the catalyst substrate has partially collapsed

B. The backpressure is elevated but below the restriction limit — substrate collapse is not confirmed by this test

C. The backpressure reading is within the acceptable range — the P0420 is not from physical restriction

D. The 2.2 psi reading at 2,500 RPM is inconclusive and requires a WOT retest to confirm

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

31. A vehicle has crankcase pressure with oil leaking from multiple seals. The PCV valve is replaced and confirmed functional. Oil leaks persist. The PCV fresh air inlet hose is confirmed unobstructed. What should the technician check NEXT?

A. The intake manifold PCV port for carbon blockage preventing vacuum from reaching the new valve

B. The valve cover baffles for collapse restricting oil vapor separation

C. The PCV hose routing for a kink that appeared after the valve replacement

D. The engine for excessive blowby from worn rings overpowering the PCV system capacity

32. A P0402 EGR excessive flow code is stored. No mechanical EGR faults are found. What is the MOST likely cause?

A. An EGR valve stuck open delivering maximum flow regardless of PCM command

B. A carbon-restricted EGR passage causing turbulent flow that the DPFE sensor misreads as excessive

C. A faulty DPFE sensor reporting higher flow than actually occurring

D. A PCM calibration fault over-commanding EGR flow beyond the monitor threshold

33. A P0441 EVAP incorrect purge flow code is stored. The purge solenoid activates on command. No vacuum is felt at the purge solenoid outlet when commanded open with the engine running. What is the MOST likely cause?

A. A stuck-open canister vent solenoid preventing purge vacuum from reaching the system

B. A clogged charcoal canister restricting flow through the purge solenoid outlet

C. A blocked or disconnected vacuum supply line between the purge solenoid and the intake manifold

D. A faulty fuel tank pressure sensor providing incorrect flow feedback to the PCM

34. A vehicle has a P0138 downstream O2 sensor high voltage code on bank 1. The downstream sensor reads a fixed 0.85 volts at all operating conditions. What is the MOST likely cause?

A. A catalytic converter that has failed and is passing rich exhaust directly to the downstream sensor

B. A downstream sensor contaminated by fuel or silicone producing a falsely high voltage output

C. Normal downstream sensor behavior on a vehicle with a highly efficient catalytic converter

D. A rich air-fuel mixture causing the downstream sensor to read consistently high on bank 1

35. An emissions test shows HC and CO both within limits but the vehicle fails for NOx. EGR is confirmed operational. The technician suspects insufficient EGR flow at the test conditions. Which additional finding would MOST support this diagnosis?

A. Positive LTFT on both banks indicating a lean condition that increases combustion temperature

B. A P0401 EGR insufficient flow code stored in PCM memory

C. A downstream O2 sensor switching at the same rate as the upstream sensor

D. Elevated coolant temperature above the normal operating range increasing combustion temperatures

36. A P0455 large EVAP leak code is stored. A smoke test with the vent solenoid commanded closed immediately shows smoke exiting from a cracked rubber section of the main EVAP vapor line between the fuel tank and the charcoal canister. What is the correct repair?

A. Replace the cracked vapor line section and retest with the smoke machine to confirm the repair

B. Replace the charcoal canister as the cracked line indicates stress damage to the entire EVAP system

C. Replace the fuel tank pressure sensor as it shares the same vapor line routing

D. Replace the purge solenoid as the vapor line crack is adjacent to the purge solenoid mounting

37. A vehicle has slightly elevated HC at idle that increases significantly at 2,500 RPM. No misfire codes are stored. LTFT is +3% on both banks. What is the MOST likely cause?

A. A lean air-fuel mixture causing incomplete combustion at higher RPM

B. A partially degraded catalytic converter with reduced HC oxidation efficiency under higher exhaust flow

C. A partially clogged fuel injector delivering inconsistent spray patterns under high-flow demand

D. A stuck-open EGR valve diluting the mixture and causing incomplete combustion at higher RPM

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

38. A scan tool shows STFT at +1% and LTFT at +2% on both banks at idle. At 2,500 RPM, STFT is +2% and LTFT is +3%. What is the correct interpretation?

A. A small vacuum leak is present — positive trims at all speeds confirm unmetered air entry

B. The MAF sensor is slightly contaminated and under-reading across the RPM range

C. The upstream O2 sensors have slight contamination causing minor positive corrections

D. Fuel control is operating normally — these trims are well within the acceptable range

39. A P0300 random misfire is stored with LTFT at +22% on both banks at idle recovering to +4% at cruise. A vacuum leak is suspected. Which additional finding would MOST confirm a vacuum leak as the cause of both the lean condition and the misfire?

A. A propane enrichment test near the intake manifold that improves idle quality and reduces misfire activity

B. An intake manifold smoke test that reveals no smoke exiting any component

C. A fuel pressure test showing normal pressure at all operating conditions

D. A compression test showing normal pressure on all cylinders

40. A technician uses a scan tool to monitor live data during a road test. At highway cruise, the upstream O2 sensor on bank 1 suddenly reads a fixed 0.1 volts for 8 seconds before resuming normal switching. STFT spikes to +22% during the event. What does this indicate?

A. An intermittent lean exhaust event on bank 1 causing the sensor to read lean and the PCM to add fuel

B. A fuel injector on bank 1 that is sticking closed intermittently under high-speed demand

C. A vacuum leak that opens intermittently at highway speed causing a sudden lean excursion

D. An intermittent O2 sensor signal dropout causing a false lean reading and STFT overcorrection

41. A P0172 rich code is stored on bank 1. LTFT bank 1 is -19%. Bank 2 LTFT is +1%. A fuel injector balance test shows all bank 1 injectors within 2% of each other. What should the technician check NEXT?

A. A vacuum leak on the bank 1 intake manifold causing lean overcorrection

B. The bank 1 upstream O2 sensor for contamination or a false rich signal

C. The bank 1 fuel pressure regulator for a fault causing high pressure on that bank

D. The EVAP purge solenoid for a stuck-open fault delivering vapors to bank 1

41. A P0172 rich code on bank 1 has LTFT at -19%. Bank 2 LTFT is +1%. All bank 1 injectors are within 2% of each other on a balance test. What should the technician check NEXT?

A. A vacuum leak on bank 1 causing lean overcorrection

B. The bank 1 upstream O2 sensor for contamination or a false rich signal

C. The bank 1 fuel pressure regulator for a high-pressure fault

D. The EVAP purge solenoid for a stuck-open fault

42. A scan tool reads coolant temperature at 232°F on a vehicle that should operate between 190 and 215°F. The cooling fan is running at high speed. No overheating warning light is on. What should the technician check FIRST?

A. The cooling fan relay for a fault preventing high-speed fan operation

B. The radiator for blockage reducing cooling capacity at operating temperature

C. The water pump for reduced output causing inadequate coolant circulation

D. The ECT sensor for a fault producing an elevated reading before condemning cooling system components

42. Scan tool shows ECT at 232°F on a 190–215°F system. The cooling fan runs at high speed and no warning light is on. What should the technician check FIRST?

A. The cooling fan relay for a fault

B. The radiator for blockage

C. The water pump for reduced output

D. The ECT sensor for a fault producing an elevated reading

43. A vehicle has a P0606 PCM processor fault code stored. All other systems test normally. What is the MOST likely required repair?

A. PCM replacement — a P0606 internal processor fault cannot be resolved by any other repair

B. A PCM software update or reflash — many P0606 codes result from software corruption rather than hardware failure

C. Battery replacement — a weak battery causing voltage fluctuations can trigger a P0606 processor fault

D. Inspection of the PCM connector and grounds before condemning the PCM

43. A P0606 PCM processor fault code is stored. All other systems test normally. What is the MOST likely required repair?

A. PCM replacement

B. A PCM software update or reflash — many P0606 codes result from software corruption

C. Battery replacement

D. PCM connector and ground inspection before condemning the PCM

44. A scan tool shows MAP sensor reading 98 kPa at idle on a sea-level engine where idle should read approximately 30–40 kPa. No codes are stored. What is the MOST likely cause?

A. A vacuum leak causing manifold pressure to approach atmospheric pressure at idle

B. A failing throttle body causing insufficient vacuum at idle

C. A MAP sensor vacuum supply line that is disconnected or blocked

D. A MAP sensor with an internal short to the 5-volt reference producing a maximum reading

45. A vehicle has a P0128 code. The ECT reads 172°F after 25 minutes of highway driving. The specification is 190–210°F. The technician replaces the thermostat. After the repair, the ECT reads 198°F after the same drive cycle. What does this confirm?

A. The ECT sensor has also failed and must be replaced to prevent the code from returning

B. The thermostat was the cause of the P0128 and the repair is confirmed successful

C. The new thermostat is slightly below its opening temperature specification and may set the code again

D. The cooling system has an air pocket causing the ECT to read slightly low despite the new thermostat

46. A scan tool captures a stall event. Live data shows IAC steps dropping to zero and throttle position at 0% for 2 seconds before the stall. RPM drops gradually to zero over those 2 seconds. What does this MOST likely indicate?

A. A PCM output driver fault cutting idle air control and causing the gradual stall

B. A vacuum leak suddenly sealing and starving the engine of the unmetered air it had been using to idle

C. A throttle blade closing completely from a carbon deposit breaking free and wedging the throttle

D. A fuel pump failing gradually and reducing fuel pressure over those 2 seconds before the stall

47. A vehicle has an intermittent P0171 lean code on bank 1 that sets only on cold mornings. LTFT bank 1 is +24% when the code sets and returns to +3% when the engine warms. What is the MOST likely cause?

A. A cold-sensitive vacuum leak at an intake manifold gasket or vacuum hose that seals as the engine reaches operating temperature

B. A bank 1 fuel injector that becomes restricted when cold fuel increases viscosity

C. A MAF sensor that reads low when intake air is cold and dense

D. A bank 1 upstream O2 sensor that responds slowly when cold causing delayed closed-loop entry

48. A scan tool shows all OBD II monitors complete with no stored codes. Mode 6 data for the oxygen sensor monitor shows a test value very close to the minimum response time threshold. What is the MOST appropriate action?

A. No action required — the monitor passed and no code exists

B. Replace both upstream O2 sensors proactively as near-threshold values always indicate imminent failure

C. Inform the customer the upstream O2 sensor response is degrading and recommend monitoring or replacement before a code sets

D. Perform a fuel trim analysis to confirm the near-threshold reading is not caused by a fuel system fault affecting sensor response

49. A P0335 CKP sensor circuit no signal code is stored. The engine cranks but will not start. A scope test confirms no CKP signal during cranking. The sensor wiring, connector, and resistance test normal. What should the technician check NEXT?

A. Replace the PCM as a confirmed normal circuit with no signal indicates an internal PCM input failure

B. Test the CKP sensor air gap and inspect the reluctor wheel for damage or incorrect sensor installation

C. Replace the CKP sensor as confirmed normal wiring with no signal always indicates internal sensor failure

D. Test the reluctor wheel reference gap position for incorrect orientation preventing signal generation

49. A P0335 no CKP signal code is stored. The engine will not start. The scope shows no signal during cranking. Wiring, connector, and resistance all test normal. What should the technician check NEXT?

A. Replace the PCM

B. Inspect the CKP sensor air gap and reluctor wheel for damage or incorrect installation

C. Replace the CKP sensor

D. Test the reluctor wheel reference gap orientation

50. A vehicle has LTFT at +3% on bank 1 and -2% on bank 2 at all engine speeds. No codes are stored. What is the correct interpretation?

A. A small bank-specific lean fault on bank 1 requires further investigation

B. Both banks are within the normal acceptable fuel trim range — no fault is indicated

C. The bank 2 negative trim indicates a minor rich condition requiring O2 sensor inspection

D. The asymmetric trims between banks confirm a shared MAF sensor fault affecting each bank differently

PRACTICE EXAM 9: ANSWER KEY AND EXPLANATIONS

DOMAIN A — GENERAL DIAGNOSIS

1. **C. Retarded ignition timing** — A steady, uniformly low vacuum reading at idle with no fluctuation that increases normally with RPM is the classic presentation of retarded ignition timing. Retarded timing delays the combustion event past TDC, reducing the pressure differential that creates manifold vacuum. The reading is stable because the fault is consistent — not intermittent like a sticking valve or periodic like a misfire. The normal RPM response distinguishes it from exhaust restriction, which collapses vacuum under RPM increase.
2. **A. Worn or damaged piston rings on cylinder 3** — A single cylinder with low compression that improves significantly on the wet test — from 110 psi to 155 psi — confirms the compression leak is past the piston rings. Oil added to the cylinder temporarily seals the ring gap, allowing pressure to build toward normal. A burned valve would show no wet test improvement because oil cannot seal a gap between a valve face and its seat. A head gasket leak between the cylinder and coolant would also show no improvement from oil addition.
3. **D. Piston slap from excessive bore clearance** — A knock that is loudest at idle, decreases as RPM increases, and is unaffected by temperature is characteristic of piston slap from excessive piston-to-bore clearance. At idle, piston speed is lowest and lateral piston movement against the cylinder wall is most pronounced. As RPM increases, piston velocity increases and the direction changes more rapidly, reducing the duration and severity of each wall contact. The absence of temperature effect distinguishes this from a hydraulic fault that clears with oil pressure.
4. **B. Both the intake and exhaust valves on cylinder 4 are not seating** — Air escaping simultaneously from both the throttle body opening and the tailpipe during a cylinder leakage test confirms neither the intake nor the exhaust valve on cylinder 4 is seating correctly. Pressurized test air escaping toward the intake manifold confirms an intake valve leak. Air simultaneously escaping toward the exhaust confirms an exhaust valve leak. Both seals have failed on the same cylinder — a condition commonly caused by a bent valve, severe seat recession, or a dropped valve seat.
5. **A. A worn or failed turbocharger shaft seal** — Blue smoke specifically during acceleration on a turbocharged engine that clears at idle points directly to the turbocharger shaft seal as the source. Under boost, the compressor wheel pressurizes the intake side of the turbo. A worn shaft seal allows oil from the center bearing housing to be forced into the intake stream under this positive pressure, delivering oil to the combustion chambers during acceleration. At idle with no boost, the pressure differential is insufficient to push oil past the seal and smoke disappears.

6. **C. Cylinder 5 is contributing slightly less than the other cylinders** — A cylinder contribution test that shows a 200 RPM drop on cylinder 5 versus 225–235 RPM on all others indicates cylinder 5 is producing slightly less power than its peers but is still contributing. A completely failed cylinder would show no RPM drop at all. A 25–35 RPM difference warrants further investigation with compression, leakage, and injector balance testing to identify whether the reduced contribution is from a mechanical, ignition, or fuel delivery fault.

7. **D. A head gasket failure or cracked head** — White smoke that persists at all temperatures, worsens under load, and is accompanied by steady coolant loss is the definitive presentation of coolant entering the combustion chamber from a head gasket failure or cracked head. Cold-start condensation clears within minutes and does not consume coolant. The worsening under load occurs because increased combustion chamber pressure forces more coolant past the compromised gasket into the cylinder, increasing the volume of coolant burned and the visibility of the white exhaust smoke.

8. **B. Oil pressure is within specification at both test points** — Hot idle pressure of 45 psi and 2,500 RPM pressure of 65 psi are both within the specified 25–65 psi range. The idle reading exceeds the 25 psi minimum, and the 2,500 RPM reading is exactly at the 65 psi maximum — technically within specification. No fault is indicated by these readings. Normal oil pressure rises with RPM as pump output increases. Both data points falling within the specification range confirms the lubrication system is operating correctly.

9. **A. That cylinder has reduced compression** — A cylinder drawing significantly less cranking amperage than all others during a relative compression test is offering less resistance to the starter motor on its compression stroke. Less resistance means lower compression pressure — the piston encounters less air resistance as it compresses the charge. This confirms a mechanical sealing fault on that cylinder and directs the technician to perform a standard compression and leakage test to identify the specific cause and leak path.

10. **D. A vacuum test showing uniformly low vacuum that does not improve with RPM** — Retarded valve timing from a stretched timing chain reduces the engine's volumetric efficiency at all engine speeds by delaying intake valve opening and closing events. This produces a uniformly low manifold vacuum reading that does not respond to RPM increase — the same pattern at all speeds because the valve timing fault affects every cylinder equally at all operating conditions. A compression test may show normal or slightly low readings and does not specifically identify a timing fault the way a vacuum test does.

11. **B. Excessive valve clearance from a worn rocker arm or camshaft lobe** — A consistent ticking that increases in speed with RPM but does not change with temperature and occurs with normal oil pressure indicates a fixed mechanical clearance rather than a hydraulic fault. Hydraulic lifter noise clears with oil pressure and temperature. A persistent RPM-proportional tick with no temperature relationship points to a worn rocker arm, worn camshaft lobe, or excessive valve clearance that exists as a fixed gap unaffected by oil pressure or thermal expansion.

12. **D. The CMP sensor signal for a fault preventing sequential injection** — Compression, spark, and fuel pressure are all confirmed normal. The absence of injector pulse on any cylinder with a functional PCM and confirmed CKP signal points to a sequential injection command fault. The CMP sensor provides cylinder identification — telling the PCM which cylinder is approaching TDC on its compression stroke. Without a CMP signal, the PCM cannot sequence injector firing and defaults to disabling injection entirely on most systems, producing a no-start despite all other systems being operational.

DOMAIN B — IGNITION SYSTEM DIAGNOSIS AND REPAIR

13. **B. Normal wear at or beyond the service interval** — A worn, rounded center electrode with a slightly widened gap and a clean light gray insulator is the textbook description of a spark plug that has simply reached the end of its service life through normal combustion wear. The electrode erodes gradually from each spark event over thousands of miles. No unusual deposits, no discoloration, and no physical damage indicate the plug has been operating in correct combustion conditions throughout its service life — it simply needs replacement on schedule.

14. **C. Replace the spark plug** — Supply voltage and PCM command signal are both confirmed functional — the coil has everything it needs externally to fire. With the primary circuit confirmed intact, the fault is in the coil's ability to produce or deliver secondary voltage. Testing the coil secondary winding resistance with an ohmmeter identifies an open or shorted secondary winding that would prevent high-voltage output despite correct primary circuit operation. This is the next logical step before condemning the coil assembly or pursuing other secondary circuit components.

15. **A. The ignition module for a fault preventing coil primary switching** — Spark is absent at both the plug wires and the coil wire, which confirms the coil is not producing any high-voltage output. Battery voltage is confirmed at the coil positive terminal, which means the coil has power. The coil cannot fire without the ignition module completing and interrupting the primary circuit. No primary switching means no magnetic field collapse and no secondary voltage induction. The ignition module is the component responsible for primary circuit switching and is the correct next test.

16. **C. A carbon track or low-resistance alternate path shorting voltage before the plug gap** — A firing line that is significantly lower than other cylinders indicates the secondary circuit on that cylinder requires less voltage to initiate the arc — not more. Lower firing voltage means the path to ground has less resistance than normal, not more. A carbon track on the distributor cap terminal, a cracked coil tower, or a damaged coil boot provides an alternate low-resistance path that bleeds off secondary voltage before it reaches the plug gap, reducing the firing line height while the spark line may remain normal.

17. **B. The coil originally serving cylinders 3 and 6 has failed** — The misfire moved from cylinders 3 and 6 to cylinders 2 and 5 after the coil swap, confirming the fault traveled with the coil from its original position to its new location. When a fault follows a swapped component to its new cylinder

pair, that component is definitively confirmed as the cause. The spark plugs, plug wires, and PCM driver circuits for cylinders 3 and 6 all remained in place while the misfire moved — only the coil moved, and the misfire followed it.

18. **A. A damaged or raised tooth on the reluctor wheel** — A magnetic reluctance sensor generates voltage amplitude proportional to the rate of magnetic field change as each tooth passes. A tooth that is physically raised, damaged, or closer to the sensor tip than the surrounding teeth creates a stronger and more rapid magnetic field change, producing a voltage spike significantly higher than normal teeth. This is distinct from the designed reference gap — which produces a lower amplitude dropout — and indicates a physical anomaly on the reluctor wheel that can cause PCM timing calculation errors.

19. **C. Verify the CMP sensor signal pattern matches the expected tooth count** — The sensor is producing a clean square wave switching between 0 and 5 volts, confirming the electrical circuit and sensor switching function are correct. A P0341 range and performance code with a seemingly normal signal indicates the signal pattern — the number of pulses per camshaft revolution, their spacing, or their relationship to the CKP signal — does not match what the PCM expects for that specific engine. Verifying the tooth count and pulse pattern against the engine specification identifies a pattern fault not visible on basic electrical testing.

20. **B. The PCM driver circuits for cylinders 1, 3, and 5 for a shared wiring fault** — Confirmed misfires on three cylinders that are all on the same bank with coil swaps ruling out individual coil failures points to a fault in the shared circuitry serving those coils. Multiple cylinders on the same bank sharing a common power supply, ground, or PCM driver circuit is the most likely explanation for a simultaneous multi-cylinder misfire pattern after individual coil faults are eliminated. A shared wiring fault — such as an open ground or power supply wire — would affect all coils connected to that shared circuit.

DOMAIN C — FUEL, AIR INDUCTION, AND EXHAUST SYSTEMS

21. **A. The fuel pump fuse and the fuel pump itself for an open circuit** — The relay clicks, confirming the relay coil is receiving command voltage and the relay is activating. However, no fuel pressure builds during cranking, indicating no fuel is being delivered despite the relay activating. The relay click confirms the command side works. The absence of fuel pressure with a confirmed relay activation points to the pump side of the circuit — specifically the pump fuse protecting the output circuit or the pump motor itself having an open circuit preventing operation despite receiving a relay command.

22. **C. A MAF sensor reading correctly at idle but underreporting airflow at higher RPM** — Negative LTFT at idle with strongly positive LTFT at higher RPM is an unusual pattern that indicates the fuel metering error reverses with RPM. A MAF sensor that reads accurately at low airflow rates but cannot accurately track the higher airflow at 2,500 RPM underreports actual airflow at speed, causing the PCM to under-deliver fuel and generate positive LTFT corrections.

At idle where airflow is low and within the sensor's accurate range, trims remain near zero or slightly negative from residual learned correction.

23. **B. The fuel pump is delivering adequate flow but the pressure regulator is bleeding excess pressure** — When pinching the return line causes pressure to immediately rise to specification, the pump is confirmed capable of generating adequate pressure. The fault is downstream of the pump — the pressure regulator is allowing too much fuel to return to the tank, bleeding rail pressure below specification. A return-line pinch test that instantly restores correct pressure is the definitive diagnostic result confirming a regulator stuck open or with a weakened spring as the cause of the P0087 code.

24. **D. Fuel vaporization in the high-pressure fuel rail** — A GDI engine that misfires on multiple cylinders after extended highway driving with no cold codes points to a heat-related fuel system fault. Under sustained high-temperature operation, fuel in the high-pressure rail can reach temperatures where vapor bubbles form — particularly if the vehicle is shut off and restarted hot or if sustained high-load operation heats the underhood environment significantly. Fuel vapor in the rail prevents injectors from delivering consistent liquid fuel charges, causing the misfires that clear once the engine cools and fuel temperature drops below the vaporization threshold.

25. **A. The fault is not a vacuum leak — a fuel delivery or sensor fault is more likely** — A propane enrichment test that does not improve idle quality when propane is directed near the bank 1 intake manifold rules out a vacuum leak as the cause of the lean condition. A vacuum leak draws propane into the intake stream through the leak point, temporarily enriching the mixture and improving idle. When propane enrichment produces no response, no unmetered air entry point exists in that area. The lean condition on bank 1 must originate from a fuel delivery fault, a restricted injector, or a contaminated upstream O2 sensor.

26. **C. The MAP and TPS signals do not agree with each other** — A P0068 MAP-throttle position correlation code is specifically set when the PCM determines the MAP sensor reading and the TPS reading are incompatible for the current operating conditions. At idle on a normally operating engine, MAP should reflect the high vacuum of closed-throttle idle conditions — typically 25–45 kPa — and TPS should reflect a near-zero or very small throttle opening. A MAP reading of 35 kPa with a TPS reading of 12% throttle at idle do not correlate correctly, triggering the code regardless of whether either individual sensor is at fault.

27. **D. A failing fuel pump with insufficient volume output** — Fuel pressure is correct at idle, which confirms the pump can build adequate static pressure at low demand. The P0087 code setting only during hard acceleration combined with a volume test showing only 50% of specified flow rate confirms the pump cannot sustain the high volume required under maximum demand. A partially restricted filter or a kinked line would reduce volume but would typically also affect idle pressure. A pump that maintains idle pressure while failing under volume demand is the classic pattern of a worn pump impeller.

28. **B. A worn turbocharger shaft seal allowing oil into the intake side** — Blue smoke under boost on a turbocharged engine with a dry air filter and dry intercooler confirms oil is entering the intake system downstream of those components — specifically at the turbocharger compressor side. A worn shaft seal allows oil from the center bearing section to be pushed by boost pressure into the compressor housing and intake stream during acceleration. The dry air filter and intercooler eliminate oil sources upstream of the turbo, directly implicating the turbo shaft seal as the entry point.

29. **A. The fuel pump has failed and requires replacement** — The relay and fuse are confirmed functional, confirming the pump is receiving a command. Scan tool confirms the PCM is commanding the pump on. Direct battery voltage applied to the pump connector produces no operation, confirming the pump motor itself has failed mechanically or electrically. With all external circuit components confirmed functional and direct voltage producing no response, the fault is definitively inside the pump assembly. No further circuit testing will change this result — the pump requires replacement.

30. **C. The backpressure reading is within acceptable range — the P0420 is not from physical restriction** — A backpressure reading of 2.2 psi at 2,500 RPM is below the 3.0 psi maximum limit, confirming the catalytic converter substrate is not physically collapsed or restricted to a degree that causes backpressure. The P0420 catalyst efficiency code in this case is caused by reduced precious metal washcoat efficiency — the converter is chemically degraded but not physically blocked. Physical restriction and chemical degradation are two separate failure modes, and backpressure testing only identifies the former.

DOMAIN D — EMISSIONS CONTROL SYSTEMS

31. **D. The engine for excessive blowby overpowering the PCV system** — The new PCV valve is confirmed functional and the fresh air inlet is confirmed unobstructed — both sides of the crankcase ventilation circuit are clear. Despite a fully functional PCV system, crankcase pressure persists and oil continues to leak from seals. When the ventilation system is confirmed operational but crankcase pressure cannot be controlled, the source of the pressure is excessive blowby from worn piston rings producing more combustion gas than the PCV system's designed capacity can handle. A cylinder leakage test quantifies the ring seal condition.

32. **A. An EGR valve stuck open delivering maximum flow** — A P0402 excessive flow code indicates the PCM is detecting more EGR flow than it commanded. The most direct mechanical cause is an EGR valve that is stuck in the open position, continuously routing exhaust gases into the intake manifold regardless of PCM command. This produces the rough idle, stumble under acceleration, and excessive flow reading that characterize P0402. A faulty DPFE sensor that misreports flow would set a code but would not cause the actual excessive flow that creates driveability symptoms associated with this code.

33. **C. A blocked vacuum supply line between the purge solenoid and the intake manifold** — The purge solenoid activates on command, confirming the electrical circuit is functioning. However, no vacuum is felt at the solenoid outlet when commanded open with the engine running. The solenoid opens but no vacuum flows through it, indicating the vacuum source side of the circuit is blocked. The purge solenoid relies on intake manifold vacuum to draw vapors from the canister. A blocked or disconnected vacuum supply line between the solenoid and the intake manifold prevents any flow despite a functional solenoid.

34. **B. A downstream sensor contaminated by fuel or silicone producing a falsely high voltage** — A downstream O2 sensor reading a fixed 0.85 volts at all operating conditions is not actively monitoring exhaust oxygen content — it is stuck in the high-voltage range. Contamination from silicone-based sealants used during engine repairs, fuel additives, or coolant intrusion can coat the sensor element and bias its output toward the rich voltage range. A failed catalytic converter would cause the downstream sensor to follow the upstream sensor's switching pattern, not produce a fixed high reading independent of operating conditions.

35. **D. Elevated coolant temperature above the normal operating range** — When EGR operation is confirmed and passages are clear but NOx remains elevated, factors that increase peak combustion temperature beyond normal must be considered. A cooling system fault that allows coolant temperature to rise above the normal operating range directly raises combustion chamber temperatures, increasing the thermal conditions that promote NOx formation. Elevated coolant temperature combined with confirmed EGR operation points to the cooling system as an overlooked contributor to the NOx failure.

36. **A. Replace the cracked vapor line and retest** — The smoke test has directly identified the specific fault — a cracked rubber vapor line section between the fuel tank and charcoal canister. The correct repair is replacing the identified faulty component and confirming the repair by retesting with the smoke machine. Replacing the charcoal canister, fuel tank pressure sensor, or purge solenoid without evidence of their involvement wastes parts and does not address the confirmed leak location. A confirmed component-specific leak requires only that component's replacement followed by verification testing.

37. **B. A partially degraded catalytic converter with reduced HC oxidation efficiency** — HC that is slightly elevated at idle but increases significantly at 2,500 RPM with near-neutral fuel trims and no misfire codes indicates the combustion process is largely complete but the exhaust aftertreatment is failing to convert HC adequately under higher flow conditions. A healthy catalyst easily handles the increased HC volume at 2,500 RPM. A degraded catalyst that is marginally effective at idle loses its ability to oxidize HC when exhaust flow rate increases at higher RPM, causing HC to rise disproportionately with engine speed.

DOMAIN E — COMPUTERIZED ENGINE CONTROLS INCLUDING OBD II

38. **D. Fuel control is operating normally** — STFT at +1% to +2% and LTFT at +2% to +3% at all engine speeds represent minimal fuel corrections well within the normal acceptable range of ±10%. These values indicate the PCM is making only very small adjustments to the base fuel delivery calculation, confirming the air-fuel metering system is functioning correctly. Near-zero trims across the entire RPM range are the expected result of a properly functioning closed-loop fuel control system with no vacuum leaks, correct MAF operation, and accurate sensor inputs.

39. **A. A propane enrichment test near the intake manifold that improves idle quality and reduces misfire activity** — A propane enrichment test that improves idle quality and reduces random misfire activity when propane is directed near the intake manifold provides functional confirmation that a vacuum leak is introducing unmetered air at that location. Propane drawn into the leak point temporarily compensates for the excess unmetered air, enriching the mixture toward stoichiometry and stabilizing combustion. This response directly links the lean condition and the resulting misfires to the unmetered air entry, confirming a vacuum leak as the cause of both findings.

40. **A. An intermittent lean exhaust event on bank 1** — A fixed 0.1-volt reading from an upstream O2 sensor for 8 seconds represents a sustained lean signal — the sensor is detecting a genuine absence of fuel in the exhaust stream during that interval. The STFT spiking to +22% confirms the PCM is responding to a real lean condition by aggressively adding fuel. An actual lean exhaust event — such as an intermittent fuel injector dropout or a momentary vacuum excursion — produces a fixed low O2 voltage and a corresponding STFT spike before normal combustion and sensor switching resume.

41. **B. The bank 1 upstream O2 sensor for contamination or a false rich signal** — An injector balance test confirming all bank 1 injectors within 2% of each other eliminates injector leakage as the cause of the bank-specific rich condition. With fuel delivery confirmed balanced and fuel pressure normal, a contaminated or degraded upstream O2 sensor producing a persistently rich signal is the most likely remaining cause. The PCM cannot distinguish between actual rich exhaust and a sensor biased toward the rich voltage range — it responds to both the same way, reducing fuel delivery and generating negative LTFT on bank 1.

42. **D. The ECT sensor for a fault producing an elevated reading** — Before pursuing cooling system component diagnosis on an elevated temperature reading, the accuracy of the temperature measurement itself must be verified. An ECT sensor with a drift fault or a failing thermistor can produce a reading above actual coolant temperature, triggering fan activation and potentially setting a code without any actual overheating. Confirming the ECT reading against an independent temperature measurement — such as an infrared thermometer at the thermostat housing — verifies whether the high temperature is real or a sensor artifact before any cooling system component is replaced.

43. **A. PCM replacement** — A P0606 internal processor fault code specifically indicates the PCM has detected an error in its own internal processing hardware or memory — not in external sensors, wiring, or other systems. Unlike codes triggered by external circuit faults, a P0606 originates from within the PCM's self-diagnostic routines. While ground and power supply faults can occasionally trigger processor codes, a confirmed P0606 with all other systems testing normally points to internal PCM hardware failure requiring replacement. Software updates address software-based calibration issues, not internal processor hardware faults.

44. **C. A MAP sensor vacuum supply line that is disconnected or blocked** — A MAP sensor reading 98 kPa at idle — near atmospheric pressure — on a running engine confirms the sensor is not receiving intake manifold vacuum. At idle with the throttle mostly closed and the pistons pumping, manifold pressure should be significantly below atmospheric — typically 30–45 kPa depending on engine. A sensor reading near barometric pressure with the engine running is receiving ambient air pressure rather than manifold vacuum, most commonly because its vacuum supply line is disconnected or has become blocked, isolating it from the intake manifold entirely.

45. **B. The thermostat was the cause of the P0128 and the repair is confirmed successful** — The pre-repair ECT reading of 172°F after 25 minutes of highway driving confirmed the engine was not reaching operating temperature. The post-repair reading of 198°F on the same drive cycle falls within the 190–210°F specification, confirming the engine now reaches and maintains its designed operating temperature. The thermostat was the only component changed, and the temperature normalized after replacement. This is a confirmed, successful repair with no additional action required.

46. **D. A fuel pump failing gradually and reducing fuel pressure** — IAC steps dropping to zero and throttle at 0% confirm the engine is not receiving additional airflow to maintain idle — the IAC has commanded minimum bypass air. RPM dropping gradually over 2 seconds before the stall, rather than cutting out instantly, indicates a progressive reduction in combustion energy rather than a sudden signal loss. A gradual stall with confirmed minimum IAC position and minimum throttle opening points to a fuel delivery fault — specifically a failing fuel pump that loses pressure progressively over those 2 seconds until combustion can no longer be sustained.

47. **A. A cold-sensitive vacuum leak that seals as the engine warms** — A lean code that sets consistently on cold mornings with strongly positive LTFT that normalizes completely when the engine warms is the classic presentation of a temperature-sensitive vacuum leak. Rubber intake manifold gaskets, vacuum hoses, and EGR hoses can shrink in cold temperatures, creating a gap that allows unmetered air entry when cold. As the engine warms and rubber components expand back to their normal dimensions, the leak seals and LTFT returns to normal. The fault is intermittent and temperature-dependent, making it difficult to find during a warm inspection.

48. **C. Inform the customer the upstream O2 sensor response is degrading** — Mode 6 data showing an oxygen sensor monitor test value near the minimum response time threshold indicates the sensor is producing slower switching responses than optimal but has not yet crossed the failure

threshold. Proactively informing the customer of this finding allows them to plan replacement before the response time crosses the threshold, the MIL illuminates, and the vehicle potentially fails an emissions inspection. This is the intended use of Mode 6 predictive data — identifying gradual degradation before it becomes a confirmed fault.

49. **D. Test the reluctor wheel reference gap orientation** — Wiring, connector, and resistance are all confirmed normal, eliminating electrical circuit faults. A CKP sensor that produces no signal despite a confirmed functional circuit and a physically installed sensor points to a problem at the sensing interface. An incorrectly oriented reluctor wheel — installed 180 degrees off or with the reference gap positioned incorrectly — can prevent the sensor from generating a usable signal pattern even when mechanically installed correctly. This is particularly relevant after timing chain, crankshaft, or bottom-end service where the reluctor wheel may have been disturbed.

50. **B. Both banks are within the normal acceptable fuel trim range** — LTFT at +3% on bank 1 and -2% on bank 2 are both well within the normal ±10% acceptable operating range for long-term fuel trim. The slight asymmetry between banks — one slightly positive and one slightly negative — is within the normal variation expected from two separate fuel control loops operating independently on a V-type engine. Near-zero LTFT values on both banks confirm no persistent lean or rich bias exists on either bank. No codes, no driveability complaint, and normal fuel trims on both banks indicate a fully functional fuel control system.