PRACTICE EXAM 8: A9 LIGHT VEHICLE DIESEL ENGINES SIMULATION (60 QUESTIONS)

1. In a common-rail fuel system, the component that meters how much fuel the high-pressure pump draws in is the:

A. rail-pressure sensor

B. fuel/water separator

C. injector leak-off line

D. inlet (suction-control) metering valve

2. A diesel's exhaust smoke is black only under hard acceleration. This indicates the problem appears when:

A. the engine is cold and only lightly loaded

B. fuel demand is high relative to available air

C. the engine is burning oil past the rings

D. coolant is entering the combustion chamber

3. Technician A says a piezo injector can fire more injection events per cycle than a solenoid type. Technician B says common-rail systems use pilot, main, and post injections. Who is correct?

A. Technician A only

B. Both Technician A and Technician B

C. Technician B only

D. Neither Technician A nor Technician B

4. A valve guide is worn beyond specification. An acceptable reconditioning method is to:

A. grind the valve face thinner to fit

B. increase the valve spring tension

C. knurl, ream for an oversize stem, or replace the guide

D. install a thicker head gasket

5. A turbocharger is driven by:

A. exhaust gas flowing through the turbine

B. a belt from the crankshaft pulley

C. high-pressure engine oil pressure

D. the low-pressure fuel transfer pump

6. A diesel's oil pressure relief valve is stuck closed. The MOST likely result is:

A. low oil pressure at all engine speeds

B. coolant contamination of the engine oil

C. a no-crank starting condition

D. higher-than-specified oil pressure

7. A diesel runs rough, and a cylinder-balance test flags one cylinder needing far more fuel; its leak-off is normal. The next check should be that cylinder's:

A. diesel exhaust fluid quality

B. battery cable connections

C. compression and injector spray quality

D. cooling-system thermostat

8. Valve margin is the rim of metal between the valve face and the top of the valve head. Adequate margin is important because it:

A. helps carry heat away and prevents the edge from burning

B. increases the camshaft lobe lift

C. raises the engine's compression ratio

D. seals the head-gasket fire ring

9. A boost leak between the turbocharger and intake manifold will MOST likely cause:

A. excessively low engine coolant temperature

B. low power and black smoke under load

C. overcharging of the starting batteries

D. a no-crank condition at the starter

10. A diesel will not build rail pressure during cranking, but low-pressure supply and the metering valve test good. The technician should next check the injectors and pressure-control valve for:

A. correct calibration codes

B. proper spray pattern at idle

C. electrical resistance only

D. excessive leak-off bleeding the rail

11. Excessive cylinder bore taper allows:

A. the crankshaft to lose end-play

B. the camshaft to lose lobe lift

C. compression and oil to pass the rings

D. the head gasket to be over-torqued

12. A road test is used in diagnosis primarily to:

A. reproduce a conditions-dependent complaint under observation

B. permanently clear the stored trouble codes

C. recalibrate the accelerator pedal sensor

D. reset the adaptive fuel trims to zero

13. Diesel fuel lubricity is important because the fuel must:

A. cool the particulate filter during regeneration

B. supply ammonia to the SCR catalyst

C. raise the coolant boiling point

D. lubricate the high-pressure pump and injectors

14. A diesel exhaust fluid (DEF) tank is heated because DEF:

A. boils at a very low temperature

B. loses its ammonia content when warm

C. must remain pressurized at all times

D. freezes at around 12°F (−11°C)

15. A diesel produces blue exhaust smoke. The technician should consider all of these oil-burning sources EXCEPT:

A. worn piston rings or cylinder walls

B. a thermostat stuck in the open position

C. worn valve guides or valve stem seals

D. a turbocharger leaking oil past its seals

16. Used-oil analysis reports glycol in the engine oil. This indicates:

A. fuel dilution of the engine oil

B. normal soot loading from combustion

C. coolant entering the lubrication system

D. the wrong oil viscosity was installed

17. A diesel that has been hard to start in cold weather has a failed glow plug system. Glow plugs aid cold starting by:

A. preheating the combustion chambers so fuel ignites

B. cooling the intake air for greater density

C. recirculating exhaust to lower NOx

D. storing high-pressure fuel for the injectors

18. Head bolts identified as torque-to-yield are tightened to an initial torque, then:

A. loosened one full turn and retorqued

B. turned a specified number of additional degrees

C. tightened to a single higher value only

D. left at the initial torque value

19. A diesel runs poorly only in severe cold with the fuel filter waxed and the fuel heater confirmed dead. The correct repair is to:

A. replace the injectors as a complete set

B. raise the commanded rail pressure value

C. reprogram the injector calibration codes

D. repair the heater and use winter-blend fuel

20. A diesel particulate filter is regenerated to:

A. permanently remove accumulated ash

B. cool the exhaust before the SCR catalyst

C. burn off accumulated soot and restore flow

D. lower the sulfur content of the fuel

21. A connecting-rod bearing shows wear concentrated on only one end. This indicates:

A. a bent rod or a tapered crankshaft journal

B. abrasive dirt distributed evenly in the oil

C. correct clearance and normal seating

D. loss of oil pressure across all bearings

22. A water-in-fuel sensor warning on a diesel means the technician should:

A. replace the high-pressure pump

B. drain the water from the separator bowl

C. raise the commanded rail pressure

D. reprogram the injector codes

23. A diesel meets NOx limits with SCR. If the downstream NOx sensor nearly equals the upstream sensor, this indicates:

A. fully effective NOx reduction

B. an overfilled diesel exhaust fluid tank

C. poor NOx conversion from a dosing or catalyst fault

D. excessive turbocharger boost pressure

24. A diagnostic trouble code identifies the affected circuit. The MOST professional next step is to:

A. replace the named part immediately

B. clear the code and release the vehicle

C. disconnect the battery to force a relearn

D. test the circuit and component before replacing

25. Ultra-low-sulfur diesel is required mainly to:

A. protect the exhaust after-treatment catalysts

B. raise the fuel's energy content for power

C. lower the fuel's cetane number

D. eliminate the need for a fuel/water separator

26. A diesel uses an oil-to-coolant oil cooler. An internal leak in this cooler will MOST likely cause:

A. a no-crank starting condition

B. high common-rail fuel pressure

C. cross-contamination of the oil and coolant

D. a plugged diesel particulate filter

27. A HEUI injection system actuates injection using:

A. fuel from a shared common rail

B. high-pressure engine oil via the IPR valve

C. a camshaft lobe at each injector

D. compressed intake air

28. A plugged diesel particulate filter raises exhaust back-pressure, which affects the turbocharger by:

A. raising the low-pressure fuel supply

B. overcooling the intake air charge

C. increasing the alternator output

D. starving the turbine of flow needed for boost

29. A piston ring's end gap is measured by squaring the ring in the bore and using a feeler gauge. Too little end gap will:

A. let the ring ends butt and scuff the bore when hot

B. increase crankshaft thrust end-play

C. cause a stuck variable-geometry turbocharger

D. lower the boost pressure produced

30. In a common-rail system, the rail acts as a high-pressure accumulator. Its main function is to:

A. separate water from the fuel

B. cool the fuel returning to the tank

C. store pressurized fuel for all the injectors

D. meter air into the high-pressure pump

31. A noise occurring at one-half crankshaft speed on a four-stroke diesel points to the:

A. connecting-rod bearings

B. crankshaft main bearings

C. turbocharger center bearings

D. valve-train components

32. A diesel's low-pressure supply to the high-pressure pump is below specification. The result is MOST likely:

A. overcharging of the starting batteries

B. inability to build proper rail pressure

C. excessively low engine coolant temperature

D. a stuck-open exhaust gas recirculation valve

33. A cylinder head is suspected of a crack that leaks only when hot and pressurized. The BEST confirmation method is a:

A. pressure test of the coolant passages

B. dry visual inspection of the surface

C. compression test on the assembled engine

D. straightedge check of the deck for warpage

34. A diesel runs cold, gets poor economy, makes white smoke, and won't complete regeneration. The MOST likely cause is a:

A. leaking water-pump shaft seal

B. radiator clogged externally with debris

C. thermostat stuck in the open position

D. head gasket leaking combustion gas

35. A variable-geometry turbocharger gives low boost off idle, and the vanes are heavily sooted. The cause is MOST likely:

A. a cracked charge-air cooler core

B. a stuck-open cooling thermostat

C. a failed low-pressure lift pump

D. carbon binding the variable vanes

36. After replacing a common-rail injector, the engine runs rough with a balance code though the injector tests good. The technician overlooked:

A. flushing the engine coolant

B. programming the injector's calibration code

C. replacing the low-pressure lift pump

D. testing the alternator output

37. Before disassembling an engine, a professional technician should FIRST:

A. verify the concern and research service information and TSBs

B. replace the most commonly worn parts

C. flush the engine cooling system

D. road test only at maximum engine load

38. Electronic unit injectors (EUI) generate high pressure at each injector by being driven:

A. by a shared common rail

B. by high-pressure engine oil

C. mechanically, usually by a camshaft lobe

D. by the low-pressure lift pump alone

39. Crankshaft end-play is controlled by the:

A. main-bearing radial clearance

B. thrust bearing or thrust washers

C. connecting-rod bearings

D. camshaft journal bearings

40. A diesel loses power under load only, with rail pressure dropping below command at high flow. The MOST likely faulty part is the:

A. intake air temperature sensor

B. exhaust back-pressure sensor

C. low-pressure return fuel cooler

D. high-pressure fuel pump

41. A water pump's weep hole is leaking coolant on an overheating diesel. This indicates a:

A. failed water-pump shaft seal

B. thermostat stuck in the closed position

C. cracked radiator end tank

D. leaking EGR cooler core

42. A charge-air cooler (intercooler) raises power and lowers combustion temperature by:

A. raising exhaust temperature for regeneration

B. filtering abrasive particles from the air

C. cooling the compressed intake air to increase density

D. recirculating exhaust into the intake manifold

43. A suction-side air leak in the low-pressure fuel circuit will MOST likely cause:

A. high rail pressure during cranking

B. overcharging of the starting batteries

C. a stuck variable-geometry turbocharger

D. hard starting, stalling, and rough running

44. A camshaft lobe is measured for lift by comparing the lobe height to the:

A. valve spring free length

B. base circle of the camshaft

C. piston protrusion height

D. cylinder bore diameter

45. To separate an air-side from a fuel-side cause of black smoke with low boost, the technician compares scan-tool:

A. actual boost to commanded (desired) boost

B. coolant temperature to engine oil temperature

C. battery voltage to alternator output

D. DEF level to the NOx sensor data

46. A diesel fuel/water separator protects the injection system mainly by removing:

A. air drawn in on the suction side

B. heat from the fuel returning to the tank

C. water that would corrode high-pressure parts

D. ash that would plug the particulate filter

47. Exhaust gas recirculation (EGR) lowers NOx by:

A. adding oxygen to the combustion charge

B. raising peak combustion temperature

C. recirculating inert exhaust to lower combustion temperature

D. trapping soot in the particulate filter

48. A diesel fuel cooler on the return line is used to:

A. raise the fuel's cetane number

B. add lubricity additives to the fuel

C. separate water from the returning fuel

D. shed heat from fuel returning hot from the high-pressure system

49. A main bearing shows surface flaking and fatigue cracking. This MOST likely results from:

A. abrasive dirt contamination in the oil

B. high cyclic loads, age, or abnormal combustion

C. correct clearance and a strong oil film

D. a lightly used, properly seated bearing

50. A pilot injection in a common-rail system is delivered before the main event to:

A. soften the pressure rise and reduce combustion noise

B. burn soot in the diesel particulate filter

C. cool the SCR catalyst before dosing

D. raise rail pressure quickly during cranking

51. On a diesel, the mass airflow (MAF) sensor is used heavily to control:

A. the coolant temperature target

B. the alternator's voltage output

C. EGR flow and smoke-limited fueling

D. the starter motor's cranking current

52. A no-start diesel builds no rail pressure, and one injector returns far more fuel than the others during cranking. The cause is MOST likely:

A. a contaminated mass airflow sensor

B. a stuck-open cooling-system thermostat

C. a worn camshaft lobe reducing valve lift

D. an internally failed injector bleeding off rail pressure

53. Low-SAPS engine oil is required on after-treatment diesels mainly to:

A. raise the fuel's cetane number

B. protect the particulate filter and catalysts

C. increase the coolant's boiling point

D. eliminate the piston oil-cooling jets

54. A valve face can be reconditioned on a valve grinder only if the valve retains:

A. adequate margin after grinding

B. a bent stem that is within limits

C. a worn keeper groove at the tip

D. excessive guide clearance in the head

55. A diesel particulate filter accumulates a residue that regeneration cannot remove. To slow this, the engine should use:

A. a higher-cetane diesel fuel

B. a thicker engine oil viscosity

C. a richer fuel-control calibration

D. the specified low-SAPS engine oil

56. A diesel oxidation catalyst (DOC) ahead of the particulate filter:

A. physically traps the soot particles

B. injects diesel exhaust fluid into the stream

C. oxidizes CO and HC and generates regeneration heat

D. measures NOx after the SCR catalyst

57. A boost/MAP sensor reads several psi of boost with the engine off and the key on. This MOST likely indicates:

A. normal sensor operation at key-on

B. a faulty sensor or circuit reporting false pressure

C. the turbocharger making boost at rest

D. the engine is in active regeneration

58. A diesel's low-pressure (lift) pump primarily serves to:

A. ensure the high-pressure pump has an adequate supply

B. atomize the fuel inside the cylinder

C. store high-pressure fuel for the injectors

D. cool the SCR catalyst during dosing

59. A wet-liner diesel must use coolant with cavitation-protection additives to prevent:

A. cavitation erosion and pitting of the cylinder liners

B. fuel gelling at the filter in cold weather

C. an overadvanced injection timing condition

D. a permanently stuck variable-geometry turbocharger

60. During bottom-end reassembly, rotating the crankshaft by hand after each torque stage confirms:

A. the piston rings are fully seated

B. the assembly turns freely with no binding

C. the high-pressure pump is primed

D. the camshaft-to-crankshaft timing is set

PRACTICE EXAM 8 — ANSWER KEY (Questions 1–60)

1. D — The inlet (suction-control) metering valve controls how much fuel the high-pressure pump is allowed to draw in, which sets rail pressure at the pump inlet. Limiting inlet volume regulates output pressure efficiently. It is the pressure-control element on the supply side of the pump.

2. B — Black smoke only under hard acceleration means the problem shows up when fuel demand is high relative to the available air, producing incomplete combustion. Idle (low fuel demand) stays clean. This points to an air-side restriction, a boost leak, or overfueling.

3. B — Both technicians are correct. A piezo injector's faster actuation allows more injection events per cycle, and common-rail systems do use pilot, main, and post injections. These multiple events improve noise, emissions, and combustion control.

4. C — A worn valve guide is reconditioned by knurling, reaming for an oversize-stem valve, or replacing the guide, depending on the design. Restoring guide clearance is essential to sealing and oil control. Grinding the valve or changing the spring does not address guide wear.

5. A — A turbocharger is driven by exhaust gas flowing through its turbine, which spins the compressor on the same shaft. It recovers otherwise-wasted exhaust energy. This is why it adds power without a direct mechanical drive penalty.

6. D — A relief valve stuck closed cannot bleed off excess pressure, so oil pressure rises higher than specification, especially when cold. The valve's job is to cap maximum pressure. A stuck-closed valve removes that protection.

7. C — A cylinder needing far more fuel with a normal leak-off test shifts suspicion to that cylinder's compression or injector spray quality. The balance flag shows low contribution while normal return rules out leak-off. Checking compression and spray quality continues the diagnosis.

8. A — Valve margin carries heat away from the valve edge; adequate margin keeps the edge from overheating and burning. Too thin a margin runs the edge too hot. This is why a valve without enough margin must be replaced rather than ground thinner.

9. B — A boost leak between the turbo and intake manifold lets pressurized air escape, reducing the air delivered to the cylinders and causing low power and black smoke under load. The fuel system delivers fuel for air that never arrives. Boost leaks are a common, easily overlooked fault.

10. D — With good supply and a working metering valve, no rail-pressure buildup points to the injectors or pressure-control valve leaking off and bleeding the rail. The leak-off prevents the rail from charging. Leak-off testing isolates the offending component.

11. C — Excessive bore taper opens the clearance the rings must seal, allowing compression and oil to pass the rings. The result is low power, blowby, and oil consumption. This is why taper is measured to decide whether the bore can be honed or must be machined.

12. A — A road test reproduces a conditions-dependent complaint under observation, often while monitoring scan data. Reproducing the fault is what makes it diagnosable and lets the repair be verified. A road test does not clear codes or recalibrate sensors.

13. D — Diesel fuel must lubricate the precision high-pressure pump and injector components, which is why lubricity matters and why additives restore it in low-sulfur fuel. Low-lubricity fuel accelerates wear of those parts. Adequate lubricity protects injection-system durability.

14. D — DEF is stored in a heated tank because it freezes at around 12°F (−11°C) and cannot be dosed when frozen. The heater keeps it usable in cold weather. Frozen DEF disrupts NOx control until it thaws.

15. B — Blue smoke is burning oil, so the technician considers worn rings, worn guides or seals, and turbo seal leakage—but not a stuck-open thermostat, which causes overcooling and white smoke. The thermostat is the exception. Keeping oil-burning causes separate from cooling faults focuses the diagnosis.

16. C — Glycol in the oil means coolant is entering the lubrication system through an internal leak such as a head gasket, cracked component, or oil cooler. Fuel dilution shows as thinning, not glycol. This finding directs the technician to an internal coolant leak.

17. A — Glow plugs preheat the combustion chambers so fuel ignites reliably during cold starting, which is why a failed glow system causes cold-start hard starting. They warm the chamber, not the intake air or fuel. The glow system is the cold-start heating function.

18. B — Torque-to-yield bolts are tightened to an initial torque, then turned a specified number of additional degrees, stretching them into yield for consistent clamping. A torque-angle gauge is required. This produces the high, even clamping load diesel head sealing needs.

19. D — A waxed filter in severe cold with a dead fuel heater is corrected by repairing the heater and using winter-blend fuel. Reprogramming or pressure changes ignore the cold-flow cause. Addressing fuel waxing and the heater resolves it.

20. C — Regeneration burns off accumulated soot to restore the filter's flow and lower back-pressure. It cannot remove incombustible ash, which builds up permanently. Understanding that regeneration targets soot explains why filters eventually need cleaning.

21. A — Wear concentrated on only one end of a rod bearing indicates misalignment from a bent rod or a tapered crankshaft journal. Even grit wear instead points to dirty oil. Reading the wear pattern identifies the underlying mechanical cause.

22. B — A water-in-fuel warning means the separator has collected water that must be drained before it reaches the injection system. Draining removes the damaging contaminant. Ignoring it allows water to corrode high-pressure components.

23. C — A downstream NOx sensor nearly equal to the upstream sensor shows little NOx is being converted, indicating a dosing or SCR catalyst fault. Effective reduction would show a much lower downstream value. Comparing the two sensors directly measures conversion efficiency.

24. D — A trouble code identifies the affected circuit, so the professional step is to test the circuit and component before replacing anything. Wiring, connectors, and the monitored system can set the code. Testing first prevents replacing good parts.

25. A — Ultra-low-sulfur diesel caps sulfur at very low levels mainly to protect the exhaust after-treatment catalysts, which sulfur would poison. It is required on modern diesels for that reason. The low sulfur reduces lubricity, which additives offset.

26. C — An internal leak in an oil-to-coolant oil cooler cross-contaminates the oil and coolant, producing milky oil or oil in the coolant. It does not cause a no-crank or rail-pressure fault. This finding points to the oil cooler or another internal crossover.

27. B — A HEUI system actuates injection with high-pressure engine oil regulated by the injection pressure regulator (IPR) valve. Injection therefore depends on oil condition and the high-pressure oil system. This distinguishes HEUI from common-rail and unit-injector designs.

28. D — A plugged particulate filter raises back-pressure that starves the turbine of the flow it needs to spin the compressor, so boost falls. The exhaust restriction limits the turbo's drive energy. This is why a plugged DPF belongs on the low-boost differential.

29. A — Too little ring end gap lets the ring ends butt together as the ring expands when hot, scuffing the bore and risking damage. End gap is measured with the ring squared in the bore. Correct gap prevents this thermal-expansion problem.

30. C — The common rail acts as a high-pressure accumulator, storing pressurized fuel that all injectors draw from on demand. This decouples pressure generation from injection events. It does not separate water, cool fuel, or meter air.

31. D — A noise at one-half crankshaft speed points to the valve train, because the camshaft turns at half crank speed on a four-stroke engine. Rod and main noises track crankshaft speed instead. This timing clue localizes the source.

32. B — Low low-pressure supply starves the high-pressure pump, so it cannot build proper rail pressure, causing hard starting, low power, or a no-start. The pump can only pressurize what it is fed. This is why supply pressure is checked before suspecting high-pressure parts.

33. A — A crack that leaks only when hot and pressurized is best confirmed by pressure-testing the head's coolant passages, which reproduces those conditions. A dry visual or deck check will not reveal it. Matching the test to the fault condition makes the diagnosis reliable.

34. C — An engine that runs cold with poor economy, white smoke, and failed regenerations points to a thermostat stuck open. The engine never reaching operating temperature is the defining clue. The other choices cause overheating or external leaks.

35. D — Low boost off idle with heavily sooted vanes indicates carbon binding the variable vanes so they cannot close to build boost early. Sticking vanes are a common VGT problem. Cleaning or replacing the affected parts restores boost response.

36. B — A new injector that runs rough and sets a balance code despite testing good was installed without programming its calibration code. The ECM cannot correct for the injector's variation without the code. Programming the code resolves the rough running.

37. A — A professional first verifies the concern and researches service information, TSBs, and recalls before any disassembly. This confirms the real fault and may reveal a documented cause or procedure. Skipping verification is a leading cause of misdiagnosis.

38. C — Electronic unit injectors generate their high pressure mechanically, with a camshaft lobe driving each injector under electronic control. They do not use a shared rail or high-pressure oil. Identifying this architecture shapes the diagnostic approach.

39. B — Crankshaft end-play is controlled by the thrust bearing or thrust washers, so their wear causes excessive end-play. Main and rod bearings control radial clearance, not end-play. Correct end-play ensures proper crankshaft location.

40. D — Power loss under load with rail pressure dropping below command at high flow points to a worn high-pressure fuel pump that cannot supply enough volume. At light load the pump keeps up. Comparing commanded and actual pressure across load isolates the fault.

41. A — Coolant weeping from the water-pump weep hole is the designed indication of a failed pump shaft seal allowing coolant past it. This confirms the pump as the leak source. Replacing the pump restores cooling-system integrity.

42. C — A charge-air cooler raises power and lowers combustion temperature by cooling the compressed intake air to increase its density. Denser air carries more oxygen into the cylinder. It cools intake air rather than exhaust or recirculated gas.

43. D — A suction-side air leak introduces air into the fuel, causing hard starting, stalling, and rough running that often come and go. It is a frequently overlooked low-pressure fault. Confirming an air-free supply prevents needless component replacement.

44. B — Camshaft lobe lift is determined by comparing the lobe height to the camshaft's base circle; the difference is the lift. It is checked against specification. A worn lobe shows reduced lift and poorer cylinder breathing.

45. A — To separate an air-side from a fuel-side cause of black smoke with low boost, the technician compares actual boost to commanded (desired) boost. A gap points to the air system; matching values shift suspicion to fueling. This comparison directs the diagnosis efficiently.

46. C — The fuel/water separator protects the injection system mainly by removing water, which would corrode the high-pressure pump and injectors. Water is diesel fuel's most damaging contaminant. Draining the collected water on schedule protects those parts.

47. C — EGR lowers NOx by recirculating inert exhaust gas into the intake, displacing oxygen and lowering peak combustion temperature. NOx forms at high combustion temperatures, so reducing temperature reduces it. It does not add oxygen or trap soot.

48. D — A return-line fuel cooler sheds heat from fuel returning hot from the high-pressure system, protecting tank and pump components and maintaining fuel density. Excess fuel temperature can harm those parts. The cooler manages return-fuel heat.

49. B — Surface flaking and fatigue cracking on a bearing result from high cyclic loads, age, or abnormal combustion. This differs from the embedded grit of dirt or the smearing of oil starvation. Reading the pattern identifies the underlying cause.

50. A — The pilot injection introduces a small fuel quantity before the main event to soften the rapid pressure rise and reduce combustion noise. Common-rail pressure control enables these multiple events. It is a noise- and emissions-control strategy.

51. C — On a diesel the mass airflow sensor is used heavily to control EGR flow and to smoke-limit fueling based on actual air mass. A contaminated MAF disturbs both. It does not set coolant temperature, charging, or cranking current.

52. D — No rail pressure during cranking with one injector returning far more fuel than the others identifies an internally failed injector bleeding off the rail. The excess leak-off prevents the rail from charging. Leak-off testing pinpoints the offending injector.

53. B — Low-SAPS oil limits sulfated ash, phosphorus, and sulfur to protect the diesel particulate filter and catalysts from contamination and plugging. The correct oil preserves after-treatment life. The wrong oil accelerates ash loading and can damage the system.

54. A — A valve face can be reground only if the valve retains adequate margin after grinding; a thin margin overheats and burns. Without enough margin the valve must be replaced. Checking margin determines whether the valve is serviceable.

55. D — Ash that regeneration cannot remove comes largely from oil additives, so using the specified low-SAPS oil slows the ash buildup in the filter. Low-SAPS oil reduces the ash-forming content. This extends filter service life.

56. C — The diesel oxidation catalyst oxidizes carbon monoxide and hydrocarbons and generates the heat used to drive particulate-filter regeneration. It does not trap soot, dose DEF, or measure NOx. Its heat-generating role is essential to regeneration.

57. B — A boost/MAP sensor cannot read real boost with the engine off, so several psi at key-on indicates a faulty sensor or circuit reporting false pressure. With the engine off it should read atmospheric. This plausibility check exposes the fault.

58. A — The low-pressure lift pump ensures the high-pressure pump always has an adequate fuel supply so it can build rail pressure. The pump can only pressurize the fuel it receives. Inadequate supply causes hard starting, low power, or a no-start.

59. A — A wet-liner diesel must use coolant with cavitation-protection additives to prevent cavitation erosion that pits the liners on the coolant side. The additives suppress the collapsing-bubble action that causes the pitting. Using the specified coolant protects the liners.

60. B — Rotating the crankshaft by hand after each torque stage confirms the assembly turns freely with no binding, catching a misassembly before startup. A bind found by hand is far cheaper than one found running. This check is standard reassembly discipline.