PRACTICE EXAM 15: A9 LIGHT VEHICLE DIESEL ENGINES SIMULATION (60 QUESTIONS)

1. The first step in any diesel diagnostic process should be to:

A. replace the most likely failed part

B. clear the stored trouble codes

C. verify the customer's reported complaint

D. perform a cylinder compression test

2. A stored diagnostic trouble code on a diesel primarily identifies:

A. the exact part that has failed

B. the dollar cost of the repair

C. the circuit or system at fault

D. the remaining engine service life

3. The primary purpose of the turbocharger on a diesel engine is to:

A. force more air into the cylinders for power

B. cool the exhaust before the catalyst

C. filter abrasive particles from the intake

D. recirculate exhaust into the intake

4. The valve margin on a diesel intake or exhaust valve refers to the:

A. clearance between the stem and guide

B. installed height of the valve spring

C. contact angle of the valve seat

D. thickness of the rim between face and head

5. In a common-rail diesel, the rail acts primarily as a:

A. water separator for the fuel

B. pressure accumulator for the injectors

C. cooler for the returning fuel

D. filter for fine contaminants

6. The primary purpose of a diesel's piston oil-cooling jets is to:

A. spray oil onto the piston underside for cooling

B. lubricate the camshaft lobes directly

C. pressurize the high-pressure fuel pump

D. cool the exhaust gas recirculation valve

7. In a common-rail system, the main job of the high-pressure pump is to:

A. atomize the fuel inside the cylinder

B. separate water from the fuel

C. meter air into the cylinders

D. generate the pressure stored in the rail

8. Crankshaft end-play is the amount of:

A. radial bearing clearance at each journal

B. taper measured along a cylinder bore

C. lengthwise movement of the crankshaft

D. side clearance between rod and crank cheek

9. Engine coolant in a diesel primarily serves to:

A. lubricate the cylinder walls

B. carry heat away from the engine

C. filter the intake air charge

D. raise the fuel's cetane number

10. The diesel particulate filter (DPF) is designed to:

A. trap soot particles from the exhaust

B. convert NOx into nitrogen and water

C. cool the compressed intake air

D. separate water from the fuel supply

11. Diesel exhaust fluid (DEF) is consumed by the:

A. diesel particulate filter

B. diesel oxidation catalyst

C. exhaust gas recirculation cooler

D. selective catalytic reduction system

12. A bent or worn valve guide will MOST likely cause:

A. excessive crankshaft end-play

B. excessive oil consumption past the valve

C. low common-rail fuel pressure

D. a no-crank starting condition

13. A diesel's fuel/water separator is located in the:

A. high-pressure rail circuit

B. exhaust after-treatment system

C. low-pressure supply circuit

D. engine cooling circuit

14. A knocking noise that occurs at crankshaft speed and increases with load MOST likely originates in the:

A. connecting-rod or main bearings

B. valve-train rocker arms

C. turbocharger center section

D. accessory drive belt tensioner

15. The cetane number of a diesel fuel is a measure of its:

A. energy content per gallon

B. resistance to autoignition

C. sulfur concentration level

D. ignition quality and delay

16. A charge-air cooler is mounted between the:

A. exhaust manifold and the turbine

B. turbocharger compressor and the intake

C. fuel tank and the lift pump

D. radiator and the water pump

17. Ultra-low-sulfur diesel (ULSD) was introduced primarily to:

A. enable modern exhaust after-treatment systems

B. raise the fuel's energy content

C. increase the fuel's cetane number

D. eliminate the need for fuel filters

18. A diesel's oil pressure is MOST directly created by the:

A. piston oil-cooling jets

B. coolant water pump

C. engine oil pump

D. high-pressure fuel pump

19. On a HEUI system, injection is powered by:

A. a shared common rail

B. a camshaft lobe per injector

C. compressed intake air

D. high-pressure engine oil

20. Cylinder bore taper is greatest at the top of the bore because that area experiences the:

A. highest combustion heat and pressure

B. least piston-ring contact

C. lowest operating temperature

D. greatest coolant flow

21. A pilot injection in a common-rail diesel occurs:

A. after the main injection event

B. just before the main injection event

C. during the exhaust stroke only

D. only while cranking the engine

22. The exhaust gas recirculation (EGR) system reduces NOx by:

A. trapping soot in a filter

B. dosing fluid into the exhaust

C. raising combustion temperature

D. lowering peak combustion temperature

23. An injector leak-off (return) test is used to evaluate injector:

A. spray pattern shape

B. electrical coil resistance

C. internal sealing condition

D. nozzle opening pressure

24. Freeze-frame data captured with a diesel trouble code records the:

A. operating conditions when the fault set

B. labor hours needed for the repair

C. exact failed component name

D. total dollar cost of the repair

25. The low-pressure lift pump in a diesel fuel system supplies fuel to the:

A. injector nozzles directly

B. high-pressure pump inlet

C. exhaust after-treatment system

D. engine cooling jacket

26. Excessive valve lash on a diesel engine will MOST likely cause:

A. continuously burned exhaust valves

B. low common-rail fuel pressure

C. coolant loss from the weep hole

D. valve-train noise and reduced lift

27. Biodiesel is produced primarily from:

A. refined crude petroleum

B. natural gas reforming

C. vegetable oils or animal fats

D. coal liquefaction processes

28. A wastegate is used on a fixed-geometry turbocharger to:

A. limit the maximum boost pressure

B. filter the incoming air charge

C. cool the compressed intake air

D. recirculate the exhaust gas

29. A connecting rod connects the piston to the:

A. camshaft lobe

B. crankshaft journal

C. valve rocker arm

D. oil pump drive

30. After replacing a common-rail injector, the calibration code must be programmed so the ECM can:

A. raise the engine idle speed

B. compensate for injector flow variation

C. adjust the coolant temperature

D. recalibrate the boost sensor

31. A diesel that loses power only under heavy load, with rail pressure falling below command, MOST likely has a:

A. faulty intake air temperature sensor

B. plugged engine air filter

C. stuck-open exhaust gas recirculation valve

D. worn high-pressure fuel pump

32. To separate an air-side from a fuel-side cause of black smoke and low boost, a technician compares actual boost to:

A. the engine coolant temperature

B. the battery terminal voltage

C. the commanded boost value

D. the DEF tank fluid level

33. Oil pooled in the charge-air cooler MOST likely indicates:

A. leaking turbocharger compressor seals

B. a stuck-closed EGR valve

C. a thermostat stuck open

D. a clogged engine air filter

34. Low-SAPS engine oil reduces the amount of ash that would otherwise:

A. raise the fuel's cetane number

B. plug the diesel particulate filter

C. lower the coolant boiling point

D. corrode the high-pressure pump

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

A. excessively high common-rail pressure

B. overcharged starting batteries

C. a stuck variable-geometry turbo vane

D. hard starting and rough running

36. A cylinder head is checked for flatness using a:

A. dial bore gauge and micrometer

B. depth micrometer and V-block

C. straightedge and feeler gauge

D. torque wrench and angle gauge

37. Multiple injection events per cycle in a common-rail diesel are used mainly to:

A. reduce combustion noise and emissions

B. separate water from the fuel

C. cool the after-treatment system

D. charge the batteries at idle

38. A variable-geometry turbocharger controls boost by:

A. bypassing exhaust around the turbine

B. opening a relief valve in the intake

C. cooling the compressed air charge

D. changing the angle of its vanes

39. A water-in-fuel warning indicates the technician should:

A. replace the high-pressure pump

B. drain the fuel/water separator

C. raise the commanded rail pressure

D. reprogram all the fuel injectors

40. A diesel vibration that changes with engine rpm but not road speed originates in the:

A. tires and wheels

B. transmission output

C. engine itself

D. drive axle assembly

41. The correct response to a sensor circuit code is to first:

A. test the wiring, connector, and component

B. replace the sensor immediately

C. clear the code and release the vehicle

D. disconnect the battery to relearn

42. A plugged diesel particulate filter raises exhaust back-pressure, which:

A. increases the alternator output

B. raises the fuel supply pressure

C. overcools the intake charge

D. reduces the turbocharger boost

43. Main bearing oil clearance that is too tight will MOST likely cause:

A. excessive crankshaft end-play

B. oil-film failure and bearing damage

C. high common-rail fuel pressure

D. a plugged particulate filter

44. Electronic unit injectors (EUI) develop injection pressure by being driven:

A. from a shared common rail

B. by high-pressure engine oil

C. mechanically by a camshaft lobe

D. by the lift pump alone

45. A thermostat stuck closed on a diesel will MOST likely cause:

A. engine overheating

B. cold running and white smoke

C. oil and coolant mixing

D. low oil pressure when cold

46. A return-line fuel cooler is installed to:

A. raise the fuel's cetane rating

B. separate water from the fuel

C. add lubricity additives to fuel

D. shed heat from the returning fuel

47. Aggressive abrasive pads on an aluminum cylinder head should be avoided because they can:

A. raise the valve-spring installed height

B. increase the camshaft lobe lift

C. remove metal and ruin flatness

D. lower the fuel's cetane number

48. Torque-to-yield head bolts are designed to be tightened:

A. to a single low torque value only

B. into their yield range, then often replaced

C. finger-tight and then left alone

D. without any specified tightening sequence

49. A diesel's low-pressure supply pressure should be checked before suspecting the high-pressure pump because:

A. the high-pressure pump can only pressurize what it is fed

B. the lift pump atomizes the fuel in the cylinder

C. low supply raises the rail pressure too high

D. supply pressure directly controls injector timing

50. Selective catalytic reduction (SCR) lowers NOx by converting it into:

A. carbon monoxide and soot

B. sulfur dioxide and water

C. trapped particulate matter

D. nitrogen and water vapor

51. The cold filter plugging point of diesel fuel describes the temperature at which:

A. the fuel ignites without a spark

B. the fuel reaches maximum lubricity

C. wax begins to plug the fuel filter

D. the fuel loses all of its sulfur

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

A. connecting-rod bearings

B. valve-train components

C. crankshaft main bearings

D. turbocharger center bearings

53. The mass airflow (MAF) sensor on a diesel is used heavily to control:

A. EGR flow and smoke-limited fueling

B. the coolant temperature target

C. the alternator charging output

D. the starter cranking current

54. Cylinder bore out-of-round is found by measuring the bore diameter:

A. only near the bottom of travel

B. at the crankshaft main journal

C. across to an adjacent cylinder bore

D. in two directions at one depth

55. A worn injector identified on a leak-off test is one that returns:

A. no fuel at all to the tank

B. fuel at exactly the rated flow

C. only air through the return line

D. far more fuel than the others

56. Coolant dripping from the water-pump weep hole indicates a failed:

A. radiator pressure cap

B. water-pump shaft seal

C. thermostat housing gasket

D. cylinder head gasket

57. An internal leak in an oil-to-coolant oil cooler will MOST likely produce:

A. a no-crank starting condition

B. high common-rail fuel pressure

C. oil and coolant cross-contamination

D. a plugged diesel particulate filter

58. A diesel oxidation catalyst (DOC) assists regeneration by:

A. oxidizing hydrocarbons to create heat

B. dosing diesel exhaust fluid into the flow

C. trapping the soot particles physically

D. recirculating exhaust to the intake

59. A main bearing surface with embedded grit and fine scratches indicates:

A. oil starvation and film loss

B. fatigue from heavy combustion loads

C. abrasive dirt carried in the oil

D. correct clearance and a strong film

60. A common-rail diesel idles well but stumbles under acceleration with rail pressure dropping. The technician should suspect the:

A. intake air temperature sensor

B. high-pressure pump or pressure control

C. glow plug control module

D. exhaust back-pressure sensor

PRACTICE EXAM 15 — ANSWER KEY (Questions 1–60)

1. C — Verifying the customer's complaint is the first diagnostic step because the technician must confirm and reproduce the actual symptom before testing. Skipping verification risks chasing the wrong problem. A confirmed complaint anchors the entire diagnosis.

2. C — A trouble code identifies the circuit or system at fault, not the specific failed part. Wiring, connectors, and the monitored system can all set the code. This is why testing follows the code rather than immediate replacement.

3. A — A turbocharger forces more air into the cylinders, packing in additional oxygen so more fuel can burn for greater power. It is fundamentally an air-delivery device. More air mass is the basis of the diesel's power and efficiency.

4. D — Valve margin is the thickness of the rim between the valve face and the head, and adequate margin lets the valve shed heat without burning. Too little margin overheats. Margin is checked before regrinding a valve.

5. B — The common rail acts as a pressure accumulator, storing high-pressure fuel so every injector fires at a consistent, controlled pressure independent of engine speed. This decoupling enables precise injection. The rail is central to common-rail control.

6. A — Piston oil-cooling jets spray oil onto the piston underside to carry away combustion heat. This protects the piston from overheating and scuffing. Blocked jets allow localized piston damage.

7. D — The high-pressure pump's main job is to generate the pressure stored in the rail for the injectors. The injectors, not the pump, atomize the fuel. Pump output determines achievable rail pressure.

8. C — Crankshaft end-play is the lengthwise (axial) movement of the crankshaft, controlled by the thrust bearing. Excessive end-play indicates thrust-bearing wear. It is measured with a dial indicator during assembly.

9. B — Engine coolant's primary role is to carry heat away from the engine to the radiator. It does not lubricate or filter air. Maintaining coolant flow prevents overheating.

10. A — The diesel particulate filter traps soot particles from the exhaust, which are later burned off during regeneration. It is a physical filter. NOx reduction is handled separately by SCR.

11. D — Diesel exhaust fluid is consumed by the selective catalytic reduction system, which uses ammonia from the DEF to reduce NOx. The DPF and DOC do not use DEF. Adequate DEF is required for NOx compliance.

12. B — A worn valve guide lets oil pass down the stem into the cylinder, causing excessive oil consumption past the valve. The clearance allows the oil leak. Worn guides are addressed during a valve job.

13. C — The fuel/water separator is located in the low-pressure supply circuit, removing water before it reaches the high-pressure components. Its upstream position protects the injection system. It is drained on schedule.

14. A — A knock at crankshaft speed that grows with load points to the connecting-rod or main bearings, since load increases the force on a loose bearing. Valve-train noise instead occurs at half crank speed. Load and timing localize the source.

15. D — Cetane number measures a fuel's ignition quality and delay; higher cetane shortens the ignition delay for smoother starting and combustion. It is the opposite of gasoline octane. Cetane governs cold-start and noise behavior.

16. B — A charge-air cooler sits between the turbocharger compressor and the intake, cooling the compressed air before it enters the cylinders. Cooling raises air density. The denser charge improves power and lowers combustion temperature.

17. A — Ultra-low-sulfur diesel was introduced primarily to enable modern after-treatment systems, since sulfur poisons catalysts and filters. Low sulfur protects the DOC, DPF, and SCR. It is a prerequisite for emissions compliance.

18. C — Engine oil pressure is created by the engine oil pump forcing oil through the galleries against system resistance. The cooling jets and fuel pump do not generate oil pressure. Oil-pump output and clearances set the pressure.

19. D — A HEUI system powers injection with high-pressure engine oil regulated by the IPR valve. Injection therefore depends on the high-pressure oil system and oil condition. This distinguishes HEUI from common-rail and unit-injector designs.

20. A — Bore taper is greatest at the top of ring travel because that area sees the highest combustion heat and pressure, accelerating wear there. The difference from the bottom is the taper. It determines whether the bore can be honed.

21. B — A pilot injection occurs just before the main event, introducing a small charge to soften the pressure rise and reduce noise. Common-rail pressure control enables it. It is a noise- and emissions-control strategy.

22. D — EGR reduces NOx by recirculating inert exhaust that lowers the peak combustion temperature, since NOx forms at high temperatures. Cooler combustion produces less NOx. This is EGR's fundamental purpose.

23. C — An injector leak-off (return) test evaluates internal sealing by measuring return flow; an injector returning far more than the others is leaking internally. The excess return isolates the failing unit. It pinpoints the bad injector without disassembly.

24. A — Freeze-frame data records the operating conditions present when the fault set, helping reproduce intermittent problems. It is a diagnostic snapshot, not a part name or cost record. This makes it valuable for hard-to-catch faults.

25. B — The low-pressure lift pump supplies fuel to the high-pressure pump inlet so the high-pressure pump can build rail pressure. It does not feed the injectors directly. Inadequate supply causes hard starting and low power.

26. D — Excessive valve lash creates valve-train noise and reduces effective valve lift and duration, hurting breathing. The extra clearance delays valve opening. Correct lash restores proper performance.

27. C — Biodiesel is produced primarily from vegetable oils or animal fats through transesterification. It is a renewable fuel, unlike petroleum diesel. Its solvent properties affect filters on first use.

28. A — A wastegate limits maximum boost on a fixed-geometry turbo by bypassing exhaust around the turbine so it cannot overspeed. It is an exhaust-side control. This protects the engine from overboost.

29. B — A connecting rod links the piston to the crankshaft journal, converting reciprocating motion into rotation. A bent rod misaligns this connection. Its integrity is essential to even cylinder loading.

30. B — The injector calibration code lets the ECM compensate for that injector's flow variation, so a new injector must be programmed. Without it the cylinder runs rough and sets a balance code. Programming the code resolves the issue.

31. D — Power loss only under heavy load with rail pressure falling below command points to a worn high-pressure pump short on volume. At light load the pump keeps up. Comparing commanded to actual pressure across load isolates it.

32. C — Comparing actual boost to the commanded boost separates an air-side from a fuel-side cause of black smoke. A gap points to the air system; a match shifts suspicion to fueling. This comparison directs diagnosis efficiently.

33. A — Oil pooled in the charge-air cooler comes from leaking turbocharger compressor seals pushing oil into the intake. It signals a failing turbo. Finding oil there directs diagnosis to the turbocharger.

34. B — Low-SAPS oil reduces ash that would otherwise plug the diesel particulate filter, since regeneration cannot burn ash. The correct oil slows ash loading. The wrong oil shortens filter life.

35. D — A suction-side air leak draws air into the fuel, causing hard starting and rough running that often come and go. The air disrupts delivery. Sealing the suction side restores smooth running.

36. C — Cylinder-head flatness is checked with a straightedge and feeler gauge, measuring any gap against the warpage limit. A gap means the head needs machining. This is the standard flatness check.

37. A — Multiple injection events per cycle in a common-rail system are used mainly to reduce combustion noise and emissions while improving combustion quality. Stored rail pressure enables this flexibility. These events are a defining advantage of common rail.

38. D — A variable-geometry turbo controls boost by changing the angle of its vanes, adjusting exhaust flow across the turbine. Closing the vanes raises boost and back-pressure. This gives strong low-speed response without a wastegate.

39. 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 risks corrosion of high-pressure parts.

40. C — A vibration that changes with engine rpm but not road speed originates in the engine itself. Driveline vibrations track road speed instead. Correlating to engine versus road speed localizes the source.

41. A — The correct response to a sensor circuit code is to first test the wiring, connector, and component, since the code names a circuit. Faults often live in the harness, not the sensor. Testing first prevents replacing a good part.

42. D — A plugged particulate filter raises exhaust back-pressure that starves the turbine, reducing turbocharger boost. The restriction limits the turbo's drive energy. This places a plugged DPF on the low-boost differential.

43. B — Main bearing clearance that is too tight prevents an adequate oil film, causing film failure and bearing damage. The bearing cannot maintain hydrodynamic lubrication. Correct clearance is verified during assembly.

44. C — Electronic unit injectors generate injection pressure mechanically, driven by a camshaft lobe under electronic control. They use neither a shared rail nor high-pressure oil. Identifying this architecture shapes the diagnostic approach.

45. A — A thermostat stuck closed blocks coolant flow to the radiator, causing the engine to overheat. The trapped heat cannot escape. This is the opposite of a stuck-open thermostat, which runs cold.

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

47. C — Aggressive abrasive pads can remove metal from an aluminum head and ruin the flatness needed to seal, especially with MLS gaskets. Preserving flatness protects the seal. Careful cleaning avoids ruining the head.

48. B — Torque-to-yield bolts are tightened into their yield range for consistent clamping force and are often single-use, requiring replacement. Reusing them when replacement is specified risks lost clamp load. Following the spec prevents gasket failure.

49. A — Low-pressure supply is checked first because the high-pressure pump can only pressurize the fuel it is fed. Inadequate supply mimics a high-pressure fault. Confirming supply prevents replacing a good high-pressure pump.

50. D — Selective catalytic reduction lowers NOx by converting it into harmless nitrogen and water vapor using ammonia from DEF. It is the primary NOx-control technology on modern diesels. Proper dosing and catalyst function are required for compliance.

51. C — The cold filter plugging point is the temperature at which wax crystals begin to plug the fuel filter, governing cold-weather operability. Below it the engine is starved. Winter fuel and a heater address this property.

52. B — 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. This timing clue localizes the source.

53. A — 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 functions. It does not set coolant temperature or charging.

54. D — Out-of-round is found by measuring the bore in two directions at the same depth and comparing them. The difference is the out-of-round value. It determines whether the bore can be honed or must be machined.

55. D — A worn injector on a leak-off test returns far more fuel than the others because its internal sealing has degraded. The excess return isolates the failing unit. The test pinpoints the bad injector without disassembly.

56. B — Coolant weeping from the water-pump weep hole is the designed indication of a failed pump shaft seal. The hole signals seal failure. Replacing the pump restores cooling-system integrity.

57. 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.

58. A — The diesel oxidation catalyst assists regeneration by oxidizing hydrocarbons to generate the heat that burns soot in the filter. It also converts CO and HC. Its heat-generating role is essential to active regeneration.

59. C — Embedded grit and fine scratches across a bearing face indicate abrasive dirt contamination carried in the oil. A wiped, heat-discolored surface would instead mean oil starvation. Reading the pattern identifies the root cause.

60. B — An idle-smooth diesel that stumbles under acceleration with dropping rail pressure points to the high-pressure pump or pressure control failing to keep up with demand. The shortfall appears under load. Comparing commanded and actual pressure isolates the fault.