

PRACTICE EXAM 7: ASE T2

SIMULATION

DOMAIN A — GENERAL ENGINE DIAGNOSIS (Questions 1–11)

1. A shop manager asks a technician to diagnose an intermittent stalling complaint on a Class 8 tractor. The driver reports the stall "happens randomly" about once per 500 miles. The BEST diagnostic approach is:

- A. Replace the fuel filter and road-test for several hundred miles
- B. Clear all DTCs and send the truck back to service
- C. Replace the fuel pump to eliminate supply issues
- D. Review stored DTCs and freeze frame data, query the driver for specific conditions, and plan targeted testing around the captured event parameters

2. A diesel engine at rated load has been showing slowly increasing exhaust back pressure over several months — from 3.2 psi initially to 6.1 psi currently. DPF differential pressure is also rising. The MOST likely cause is:

- A. Gradual DPF ash accumulation reaching service intervention threshold
- B. A sudden exhaust leak
- C. Turbocharger failure
- D. Air filter restriction

3. Technician A says visual inspection for leaks, damaged components, or tampering should always be part of the diagnostic process. Technician B says visual inspection is unnecessary when scan tool codes are present. Who is correct?

- A. Both Technician A and Technician B
- B. Technician B only
- C. Technician A only
- D. Neither Technician A nor Technician B

4. A heavy-duty diesel shows elevated oil temperature (235°F) at rated load while coolant remains at 195°F. Oil pressure is normal. The MOST likely cause is:

- A. Reduced oil cooler efficiency from fouled tubes or reduced coolant flow through the cooler
- B. Low oil level
- C. Excessive oil consumption
- D. Normal operating relationship

5. An oil analysis shows rising nickel levels (9, 10, 12, 45 ppm) over four consecutive samples. Nickel is a marker element found primarily in:

- A. Piston rings
- B. Valve materials and certain bearing alloys
- C. Water pump impellers
- D. Fuel injectors

6. A driver complains of engine vibration that appears only at specific RPM ranges — typically around 1,200 and 1,800 RPM. The vibration is absent at other speeds. The MOST likely cause is:

- A. A damaged harmonic balancer

- B. A bent crankshaft
- C. Normal engine operation
- D. Cylinder contribution imbalance or firing-interval resonance coinciding with natural vibration modes

7. Technician A says a compression test on a heavy-duty diesel typically requires a gauge rated 0-1000 psi. Technician B says a gasoline engine compression gauge (rated 0-200 psi) is adequate for diesel testing. Who is correct?

- A. Both Technician A and Technician B
- B. Technician A only
- C. Technician B only
- D. Neither Technician A nor Technician B

8. A heavy-duty diesel has been experiencing no-crank conditions intermittently. The engine cranks fine most of the time but occasionally produces no response when the key is turned. Battery voltage is normal when tested, and the starter is known good. The MOST likely cause is:

- A. Failed starter motor
- B. Discharged batteries
- C. Intermittent connection or relay issue in the starting control circuit
- D. ECM failure

9. Engine noise that is characteristically described as "ticking" on a heavy-duty diesel is MOST often traced to:

- A. Valve train issues — excessive lash, worn rocker components, or injector noise on unit-injector engines
- B. Rod bearing wear
- C. Turbocharger bearing failure
- D. Head gasket failure

10. A scan tool shows cylinder contribution data as follows: Cyl 1: 98%, Cyl 2: 95%, Cyl 3: 99%, Cyl 4: 23%, Cyl 5: 102%, Cyl 6: 97%. The appropriate next step is:

- A. Check all injector wiring simultaneously
- B. Perform cylinder 4 specific diagnostics — cutout test, compression test if indicated, and injector evaluation
- C. Replace all injectors
- D. Rebuild the cylinder head

11. A heavy-duty diesel ECM displays "DEF Level Low" warning. The driver has added a gallon of DEF from a commercial source. 30 minutes later, the truck is again warning of low DEF level. The MOST likely cause is:

- A. ECM software error
- B. The DEF tank has a leak
- C. The DEF tank level sensor is inaccurate, or the DEF quality is off-specification triggering additional dosing demand
- D. Normal operation

DOMAIN B — CYLINDER HEAD AND VALVE TRAIN (Questions 12–15)

12. A valve grinding specification calls for removing material only to restore a straight face, without making the valve head thinner than 0.060 inches margin. The technician sees a valve with 0.052-inch margin. The correct action is:

- A. Replace the valve — insufficient margin cannot be restored by grinding
- B. Grind the valve normally and reinstall
- C. Install a shim under the valve spring
- D. Use the valve without grinding

13. Cylinder head bolt torque specification for a modern heavy-duty diesel typically involves:

- A. Single-pass torquing to specification in any sequence
- B. Two-pass torquing with full torque applied initially
- C. Three-stage procedure: initial torque, second-stage torque, and final angle-of-rotation
- D. Hand-tightening only

14. Camshaft lobe lift measurement has identified one exhaust lobe with lift 0.015 inches below specification. The cam follower is a roller type. This pattern MOST likely indicates:

- A. Normal wear
- B. Camshaft lobe wear from oil supply restriction or follower bearing failure at that specific lobe
- C. Manufacturing defect
- D. Normal aging

15. A valve seat cutting operation uses three angles on the valve seat (typically 30°, 45°, and 60°). The purpose of the multiple angles is to:

- A. Facilitate removal of cutting debris
- B. Create visual reference marks
- C. Meet EPA emissions requirements
- D. Produce correct seat width and contact location on the valve face

DOMAIN C — ENGINE BLOCK (Questions 16–20)

16. A cylinder liner has been installed and the technician measures protrusion at four points around the circumference. The readings are: 0.004", 0.004", 0.005", 0.004". Specification is 0.001"-0.005" with max variation of 0.002" around the circumference. The correct action is:

- A. Reinstall the liner with additional shimming
- B. Verify counterbore cleanliness and reinspect
- C. All readings within specification and variation within tolerance — proceed with head installation
- D. Replace the liner

17. Piston ring end gap is measured with the ring positioned in the cylinder bore (without piston). The measurement determines:

- A. The clearance between ring ends, which must fall within specification to allow thermal expansion at operating temperature
- B. Cylinder taper measurement
- C. Ring radial tension
- D. Piston pin clearance

18. A connecting rod bolt that was reused after removal produces catastrophic failure in service. The root cause was:

- A. Incorrect assembly order
- B. Insufficient oil pressure
- C. Manufacturing defect in the rod
- D. Torque-to-yield bolts cannot reliably be reused because they have been permanently stretched beyond their yield point

19. A heavy-duty crankshaft has been reground to a standard undersize of 0.020 inches. The correct action regarding the main and rod bearings is:

- A. Use standard bearings with normal clearance
- B. Install 0.020" undersize bearings matching the ground journal diameter
- C. Install 0.010" undersize bearings for margin
- D. Install oversize bearings

20. A cracked engine block discovered during rebuild has a crack that passes through the main bearing saddle area. The correct action is:

- A. Replace the block — structural cracks in main bearing webs are not reliably repairable in commercial service
- B. Weld the crack and machine the saddle
- C. Install a reinforcement sleeve
- D. Drill-stop the crack and continue

DOMAIN D — LUBRICATION AND COOLING (Questions 21–26)

21. A heavy-duty diesel oil analysis report shows total base number (TBN) of 1.8. New oil for this engine has a TBN of 10.0. This reading indicates:

- A. Normal TBN range
- B. The oil has above-specification reserve alkalinity
- C. Additive package is strong
- D. The oil has consumed most of its acid-neutralizing capacity and should be changed immediately

22. An oil cooler on a heavy-duty diesel has been identified as plugged on the oil side. The MOST likely symptom during operation is:

- A. Reduced oil pressure
- B. Normal oil temperature
- C. Elevated oil pressure due to restriction across the cooler (if bypass valve is functional, pressure may remain normal but oil temperature elevates)
- D. Decreased coolant temperature

23. Technician A says that a properly functioning PCV system on a heavy-duty diesel routes blowby gases back through the intake for re-combustion. Technician B says PCV systems on diesel engines are typically different from gasoline engines, routing blowby through a filter to separate oil before returning it to the intake. 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

24. A cooling system pressure cap has failed. The result is:

- A. Lower coolant boiling point and increased risk of boiling at operating temperatures
- B. Better cooling system efficiency
- C. Normal operation
- D. Reduced coolant flow

25. Engine coolant should NOT be refilled using:

- A. 50/50 pre-mix of correct coolant chemistry

- B. OEM-specified coolant diluted with proper water
- C. Factory-fill coolant from the original system
- D. Tap water containing significant mineral content and calcium

26. Oil temperature on a heavy-duty diesel at rated load typically runs:

- A. The same as coolant temperature
- B. Below coolant temperature
- C. 10-20°F higher than coolant temperature
- D. 100°F higher than coolant temperature

DOMAIN E — AIR INDUCTION AND EXHAUST (Questions 27–32)

27. A heavy-duty diesel VGT actuator position sensor reports 85% open while the ECM commanded 30% open. This discrepancy indicates:

- A. A stuck vane mechanism, failed actuator motor, or drifted position sensor — further diagnosis needed
- B. Normal operation
- C. The ECM has intentionally increased the command
- D. The sensor is operating normally

28. An air cleaner restriction indicator mounted in the air intake pipe between the filter and turbocharger measures:

- A. The airflow rate
- B. Vacuum created by the air filter's resistance to flow, which rises as the filter loads
- C. Filter age
- D. Boost pressure

29. A failed compressor-side turbocharger seal will produce oil residue in:

- A. The water jacket
- B. The exhaust manifold only
- C. The fuel filter
- D. The charge air cooler and intake piping downstream of the turbo

30. An EGR cooler with a coolant-side leak will introduce coolant into which path?

- A. The air filter
- B. The fuel system
- C. The exhaust recirculation passage, which then mixes coolant with intake charge entering the cylinders
- D. The engine oil

31. Exhaust back pressure 40% above specification at rated load, traced to the aftertreatment system, with DPF differential pressure at 38 inches of water (spec 15 inches max), indicates:

- A. Heavy DPF loading requiring parked regeneration or physical cleaning/replacement
- B. Normal operation
- C. Fuel system problem
- D. Coolant system issue

32. Technician A says that turbocharger bearing oil supply is critical and must be verified before operating the engine. Technician B says insufficient oil supply causes immediate and often catastrophic turbo bearing failure. 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

DOMAIN F — FUEL SYSTEM (Questions 33–48)

33. A heavy-duty diesel HPCR system has rail pressure at 30,000 psi continuously during normal operation. Specification shows commanded pressure should vary between 5,000-30,000 psi based on load. This observation indicates:

- A. Normal operation
- B. Fuel economy is improved
- C. Rail pressure is stuck at maximum — pressure control valve is stuck closed or rail pressure sensor has failed reading low
- D. Engine is operating at rated load

34. An HPCR injector with a plugged nozzle hole out of the eight designed spray holes will produce:

- A. Asymmetric fuel distribution, cylinder imbalance, and reduced contribution from that cylinder
- B. Normal operation with no impact
- C. Improved combustion efficiency
- D. Reduced fuel consumption

35. Fuel system priming on a modern electric lift pump equipped heavy-duty diesel is:

- A. Performed with a manual hand pump on the filter housing
- B. Not required on any engine
- C. Done by cycling the ignition key to energize the electric lift pump repeatedly
- D. Automatic upon engine start

36. A water-in-fuel warning on a Class 8 tractor:

- A. Indicates the fuel is incompatible with the engine
- B. Is a diagnostic alert that water has accumulated in the separator bowl; the water should be drained
- C. Requires immediate engine shutdown
- D. Is normal and can be ignored

37. A heavy-duty diesel using biodiesel B20 (20% biodiesel blend) may experience:

- A. No change in operation
- B. Improved fuel economy
- C. Reduced emissions without service impact
- D. Reduced fuel filter service intervals due to biodiesel's solvent action dissolving deposits

38. An HPCR injector has been removed for testing. Return flow from this injector is 12 mL/minute while others return 15 mL/minute. This reading indicates:

- A. Normal variation within acceptable range
- B. Injector is over-fueling
- C. Injector has excessive internal leakage
- D. Injector will fail soon

39. A diesel engine shows these scan tool values: rail pressure 15,000 psi (command 25,000), lift pump pressure 40 psi (spec 45-60), cylinder contribution variance under 5%. The MOST likely cause of the rail pressure issue is:

- A. Failed rail pressure sensor
- B. Injector malfunction across all cylinders

- C. Inadequate lift pump supply pressure preventing HP pump from developing rated output
- D. Normal operating condition

40. Technician A says HPCR injectors require a calibration code to be programmed into the ECM when replaced. Technician B says without the calibration code, the ECM cannot compensate for individual injector flow characteristics, producing balance faults. 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

41. An EUI system uses which to control injection timing and quantity?

- A. Mechanical governor alone
- B. An ECM-commanded solenoid valve within each injector that controls when pressure begins building and when injection stops
- C. The camshaft only
- D. Rail pressure alone

42. A Class 8 tractor fuel tank vent valve has stuck closed. The result during engine operation is:

- A. Improved fuel economy
- B. Reduced fuel consumption
- C. Normal operation
- D. Vacuum development in the tank, opposing fuel flow and eventually starving the engine

43. A heavy-duty diesel has recently been operating on contaminated fuel containing water and sediment. After refilling with clean fuel, the engine still has cylinder contribution imbalance. The MOST likely condition is:

- A. The new fuel is contaminated
- B. Injectors and HP pump precision surfaces have been damaged by the previous contamination and require service or replacement
- C. The fuel filter was not replaced
- D. Normal break-in period

44. On a HEUI system, the Injection Control Pressure (ICP) regulator:

- A. Controls rail pressure
- B. Filters the fuel
- C. Regulates the high-pressure oil supplied to the injectors by the HP oil pump
- D. Sets cylinder timing

45. A fuel return line on a heavy-duty diesel with HPCR carries:

- A. Only cold, clean fuel back to the tank
- B. Nothing — it is sealed
- C. Purified exhaust back to the tank
- D. Hot return fuel from injectors, the pressure control valve, and the HP pump back to the tank

46. Primary filter water separator filtration on a heavy-duty diesel is approximately:

- A. 10-30 microns
- B. 2 microns

- C. Below 1 micron
- D. No filtration required

47. An EUI injector has developed reduced plunger travel due to a worn cam follower. The result on injection is:

- A. Normal operation
- B. Insufficient injection pressure and reduced fuel delivery from that cylinder
- C. Increased fuel delivery
- D. Higher rail pressure

48. Technician A says a pilot injection typically occurs approximately 15-25 degrees BTDC. Technician B says a post injection typically occurs approximately 25 degrees ATDC. Who is correct?

- A. Technician A only
- B. Technician B only
- C. Neither Technician A nor Technician B
- D. Both Technician A and Technician B

DOMAIN G — STARTING AND CHARGING (Questions 49–52)

49. A heavy-duty diesel cranks but will not fire. Scan tool shows all injectors receiving pulse-width commands, rail pressure adequate, and all sensor readings normal. Fuel is verified in the tank. No DTCs are present. The MOST appropriate next diagnostic step is:

- A. Inspect the low-pressure fuel supply for air leaks or restrictions and verify fuel reaches the injectors
- B. Replace the ECM
- C. Rebuild the HP pump

D. Replace all injectors

50. An alternator drive belt on a heavy-duty diesel appears glazed (shiny) on its back side. The MOST likely cause is:

A. Normal belt condition

B. Oil contamination requiring belt replacement

C. Belt slippage, which causes frictional heating and glazing — indicates belt tension or alignment issue requiring correction

D. Belt age alone

51. A starter solenoid on a heavy-duty diesel has developed welded contacts, causing the starter to continue operating after the key is released. The correct immediate action is:

A. Increase engine RPM

B. Continue to run the engine

C. Disconnect the alternator

D. Shut off the engine via fuel shutoff or battery disconnect to prevent starter destruction

52. An electrical load test applied to a parallel-wired battery pack with specified capacity should maintain voltage:

A. Above 12.6V at 70°F during the 15-second load test

B. Above 9.6V at 70°F during the 15-second load test

C. Above 14.0V during load

D. Below 8.0V during load

DOMAIN H — ENGINE BRAKES (Questions 53–55)

53. An engine brake on a Class 8 tractor engages but is noticeably louder than typical operation. The cause is MOST likely:

- A. Normal variation
- B. A coolant leak
- C. An exhaust system leak amplified during engine braking when exhaust pressure rises significantly
- D. Valve lash problem

54. Compression-release engine brakes require engine oil pressure to function because:

- A. The brake uses engine oil hydraulically to actuate the master/slave piston circuit that opens the exhaust valve during braking
- B. Oil lubricates the brake mechanism
- C. Engine oil is the coolant for the brake
- D. Oil monitors brake status

55. An exhaust brake provides less braking horsepower per cylinder than a compression-release engine brake because:

- A. Exhaust brakes use more cylinders
- B. Exhaust brakes have more mechanical complexity
- C. Exhaust brakes are digitally controlled while compression-release brakes are analog
- D. Exhaust brakes work by restricting exhaust flow (producing pumping losses) while compression-release brakes waste the full compression energy during each brake stroke

PRACTICE EXAM 7: ANSWER KEY AND EXPLANATIONS

1. D — Intermittent complaints require data-driven diagnosis, not parts substitution. Stored DTCs, freeze frame data captured during the event, and driver-specific condition information together allow the technician to plan targeted testing around the actual fault conditions. Random parts replacement rarely resolves intermittent faults.
2. A — Gradual back pressure increases over months on a DPF-equipped engine indicate progressive ash accumulation. Ash is incombustible and accumulates despite regeneration; when it reaches intervention threshold, the filter requires physical cleaning or replacement. This is normal DPF service life progression.
3. C — Only Technician A is correct. Visual inspection catches physical damage, tampering, modifications, and leaks that scan tool codes do not report. Even when DTCs are present, visual inspection often reveals the root cause or additional issues. Technician B is wrong — visual inspection is a small investment that prevents major diagnostic errors.
4. A — Elevated oil temperature with normal coolant temperature points to the oil cooler not transferring heat effectively. Fouled tubes, reduced coolant flow through the cooler, or internal restrictions prevent the cooler from performing its heat-rejection function even though the coolant system itself operates normally.
5. B — Nickel in oil analysis typically comes from valve materials (some high-nickel alloys) and certain bearing alloys used in heavy-duty applications. A sharp rise in nickel levels suggests wear of these specific components. Investigation focuses on the engine areas where nickel-containing components are present.
6. D — RPM-specific vibration that appears and disappears is characteristic of cylinder contribution imbalance or resonance effects. Certain engine speeds coincide with natural vibration modes, making cylinder imbalance more noticeable at those specific speeds. Damaged harmonic balancers and bent crankshafts produce continuous vibration across all speeds.
7. B — Only Technician A is correct. Heavy-duty diesel compression pressures reach 350-500 psi, well above the 200 psi range of a gasoline gauge. A properly rated diesel compression gauge (0-1000 psi) is required to accurately measure diesel compression. Using an underrated gauge will either damage the gauge or provide inaccurate readings.
8. C — Intermittent no-crank with normal battery voltage and known-good starter points to a connection or relay issue in the control circuit — corroded terminals, a failing magnetic switch, or

an intermittent key switch contact. The starter motor receives inconsistent power or control signals when the fault occurs, then operates normally at other times.

9. A — "Ticking" noises on heavy-duty diesels typically originate in the valve train — excessive valve lash produces rocker-against-stem tap, worn rocker components produce impact noise, and injector hydraulic noise (on unit-injector engines) presents as a ticking sound. Rod bearings produce deeper knocks, turbo bearings produce whines, and head gaskets produce hissing.
10. B — Cylinder 4 at 23% contribution is dramatically below others indicating specific cylinder-level failure. Targeted diagnosis — cutout test, compression test if indicated, and injector evaluation — isolates the cause without unnecessary work on healthy cylinders. Replacing all injectors or tearing down the head would be wasteful and non-diagnostic.
11. C — Rapidly returning DEF low warning after recent filling indicates either the tank level sensor is inaccurate or the DEF being added is off-specification, causing the SCR to demand additional dosing. Off-spec DEF dilutes properly formulated DEF, causing higher consumption rates. Quality testing and sensor verification should be performed.
12. A — A valve with 0.052-inch margin already below the 0.060-inch minimum has insufficient heat dissipation capacity. Grinding would remove additional material, making the condition worse. The valve must be replaced rather than reused even after grinding.
13. C — Modern head bolt torque specifications almost always use a three-stage procedure: initial torque to seat the gasket, second-stage torque to approach final clamping, and final-stage angle-of-rotation to produce yield-point stretch. This sequence develops correct clamping force with torque-to-yield fasteners.
14. B — Wear of one specific cam lobe while others remain normal indicates localized oil supply restriction or a follower failure at that specific location. The underlying cause — blocked oil passage, worn bearing in the follower, or debris — must be corrected before installing a replacement camshaft, or the new lobe will wear at the same location.
15. D — Three-angle valve seat cutting (typically 30°, 45°, and 60°) produces the correct seat width and contact location on the valve face. The angles work together to position a narrow, precise contact band that provides good sealing and optimal heat transfer. Single-angle cutting cannot achieve this geometry.
16. C — All four readings fall within the 0.001-0.005 inch specification range, and variation around the circumference is 0.001 inch (within the 0.002 inch max variation allowance). The protrusion is correct and uniform — the liner is ready for head installation.
17. A — Piston ring end gap measured in the cylinder bore determines the clearance that must exist when the ring is installed. Insufficient gap causes the rings to butt at operating temperature (causing catastrophic damage); excessive gap compromises sealing. Correct gap allows thermal expansion without ring collision.

18. D — TTY (torque-to-yield) bolts are stretched past their yield point during initial installation, permanently altering their dimensions and structural characteristics. Reused TTY bolts cannot reliably produce correct clamping force; when they fail under load, the consequence is catastrophic connecting rod separation and engine destruction.
19. B — A crankshaft ground to a standard undersize (0.020" in this case) requires matching 0.020" undersize bearings to restore correct clearance. Standard or smaller undersize bearings would produce inadequate clearance; oversize bearings would produce excessive clearance. Matching the bearing to the ground journal is the correct approach.
20. A — Structural cracks in main bearing webs of a heavy-duty diesel block are not reliably repairable in commercial service. The forces in this location are too high for weld repair to provide long-term reliability, and stress concentration at the crack tip continues to propagate. Replacement of the block is the correct action.
21. D — TBN of 1.8 where new oil has TBN of 10.0 indicates the oil has consumed more than 80% of its alkaline reserve. The oil can no longer neutralize combustion acids effectively, and continued operation risks bearing corrosion and wear. Oil change is required immediately.
22. C — Oil-side plugging of the oil cooler restricts oil flow through the cooler. If the filter bypass is functional, oil pressure may remain normal but oil temperature will rise because coolant cooling is reduced. If bypass is non-functional, elevated oil pressure results. Both conditions indicate cooler service is required.
23. C — Only Technician B is correct. Diesel engines typically use closed crankcase ventilation systems that filter blowby, separate oil from the gases, and return the cleaned gases to the intake. Technician A is incorrect — raw blowby is not returned directly to the intake; filtration and oil separation are essential to prevent oil fouling of the intake tract and aftertreatment.
24. A — A failed pressure cap allows the coolant system to operate at atmospheric or near-atmospheric pressure. Lower pressure reduces the boiling point of the coolant, so the cooling system becomes vulnerable to boiling at temperatures that would be safe under proper pressure. This compromises heat rejection capability.
25. D — Tap water containing significant mineral content and calcium deposits will cause scaling in the cooling system, reducing heat transfer. Minerals build up on cylinder liners, radiator tubes, and heater cores. Only distilled water or OEM-specified coolant/pre-mix should be used in heavy-duty diesel cooling systems.
26. C — Engine oil typically runs 10-20°F higher than coolant temperature at rated load. The oil absorbs heat directly from bearings, piston cooling jets, and friction surfaces that operate hotter than the coolant. This thermal relationship is normal and indicates both systems are functioning correctly.

27. A — VGT feedback not matching command indicates either the vane mechanism is stuck (from soot, carbon buildup, or thermal damage), the actuator motor has failed, or the position sensor has drifted. Each requires different diagnosis and repair. The mismatch is diagnostic evidence that the VGT control loop is not responding correctly.
28. B — Air filter restriction indicators measure vacuum (negative pressure) created as the filter loads with contamination and resists airflow. As filter loading increases, the restriction increases, and the indicator captures this progressively. High readings indicate filter service is needed.
29. D — A compressor-side seal failure allows oil to leak past the seal into the pressurized intake. The oil is then carried into the charge air cooler and intake piping, where it deposits on internal surfaces, reducing CAC efficiency and causing ongoing oil consumption through the intake tract.
30. C — An EGR cooler coolant-side leak allows coolant to enter the exhaust recirculation passage. When recirculated exhaust enters the intake, the coolant mixes with the intake charge, potentially reaching the cylinders. Severe leaks can cause hydrolock conditions.
31. A — DPF differential pressure at 38 inches of water (more than 2.5 times spec) with elevated back pressure indicates heavy soot accumulation that has exceeded normal operating levels. Parked regeneration should be attempted; if it cannot clear the filter, physical cleaning or replacement is required.
32. B — Both technicians are correct. Turbo bearings rely entirely on oil supply for lubrication and cooling; oil starvation destroys bearings within seconds. Verifying oil supply before operating the engine is essential to prevent immediate turbocharger failure after a rebuild or component replacement.
33. C — Rail pressure stuck at a fixed value regardless of load indicates the pressure control valve is stuck closed, preventing pressure relief, or the rail pressure sensor has failed reading a low value, causing the ECM to command maximum pump output. Either condition requires diagnosis of the specific component and typically replacement.
34. A — A plugged nozzle hole creates asymmetric fuel distribution within the cylinder. Fuel does not reach all intended combustion zones, producing cylinder imbalance and reduced contribution from the affected cylinder. This is a common cause of rough running on modern HPCR engines.
35. C — Modern electric lift pump equipped heavy-duty diesels prime automatically by cycling the ignition key. Each key cycle energizes the pump, pushing fuel through the system and driving air back to the tank via the return line. Multiple cycles may be needed for complete priming.
36. B — A WIF warning is a diagnostic alert that water has accumulated in the separator bowl to the sensor's level. The water should be drained via the manual drain valve. Once drained, the warning should clear; if it returns, the source of water contamination should be investigated.

37. D — Biodiesel acts as a solvent and dissolves accumulated deposits in fuel tanks, lines, and filters. When switching to a biodiesel blend, these deposits flush through the system and collect in the fuel filter, causing premature plugging. Filter service intervals should be reduced during the transition period.
38. A — An injector returning 12 mL/minute while others return 15 mL/minute represents less than 20% variation, which is within normal tolerance for most specifications. This is not excessive leakage; the injector appears to be functioning normally. Variation within specification does not indicate a fault.
39. C — Lift pump pressure at 40 psi (spec 45-60) is below specification, and the HP pump cannot develop rated rail pressure without adequate supply. The rail pressure deficit directly results from insufficient lift pump output. Inadequate supply is the root cause, not an HP system failure.
40. B — Both technicians are correct. HPCR injector coding transfers the individual factory flow characteristics of each injector to the ECM. Without this coding, the ECM cannot compensate for individual injector variation, producing balance rate faults and cylinder contribution imbalance. Coding is a required step after injector replacement.
41. B — EUI systems use an ECM-commanded solenoid valve within each injector. The solenoid opens when commanded to close the fuel metering passage, allowing the cam-driven plunger to build pressure. When the solenoid closes again, injection ends. This controls both timing and quantity of injection events.
42. D — A blocked tank vent prevents atmospheric air from entering the tank as fuel is drawn out. Vacuum develops in the tank, opposing fuel flow through the pickup. At low demand the engine may run, but at peak demand the vacuum progressively starves the engine, eventually causing stalling.
43. B — Contaminated fuel damages precision-machined surfaces in injectors and HP pumps through abrasive wear. Even after cleaning and refueling, the damage persists. Cylinder contribution imbalance after contaminated fuel use indicates components damaged from the prior contamination that require service or replacement to restore correct operation.
44. C — The ICP regulator controls the high-pressure oil supplied by the HP oil pump to the HEUI injectors. HEUI injection pressure is generated from this high-pressure oil acting on the hydraulic intensifier in each injector. The ICP regulator is the control element for the pressure that drives injection.
45. D — Fuel return lines on heavy-duty diesel HPCR systems carry hot return fuel (180°F+ during heavy-load operation) from injectors, the pressure control valve, and the HP pump back to the tank. The return fuel is excess fuel that circulates for cooling and lubrication of injection components before returning.

46. A — Primary fuel filter/water separators on heavy-duty diesels typically filter at 10-30 microns. This coarser filtration handles initial contamination while the finer secondary filter (2-4 microns) protects high-pressure injection components. Primary filters are sized to handle high flow with adequate contamination capture.
47. B — A worn cam follower produces reduced plunger travel within the EUI injector. Insufficient plunger travel cannot develop adequate injection pressure, resulting in reduced fuel delivery from that cylinder. The symptom appears as cylinder imbalance and reduced torque contribution, often mistaken for injector failure.
48. D — Both technicians are correct. Pilot injections typically occur 15-25 degrees BTDC to initiate combustion before main injection, reducing ignition delay and noise. Post injections typically occur approximately 25 degrees ATDC to extend combustion duration, reduce particulates, and moderate exhaust gas temperature profile.
49. A — All injectors receiving commands, adequate rail pressure, normal sensors, no DTCs, and fuel present — yet no fire. The remaining diagnostic gap is whether fuel actually reaches the injectors; the low-pressure supply may have air or restriction. Visual and pressure testing of the supply system is the correct next step.
50. C — A glazed alternator belt indicates belt slippage, which causes frictional heating and polishes the belt surface. The underlying issues are belt tension problems or pulley misalignment. The belt itself may need replacement, but correcting tension or alignment is essential to prevent recurrence.
51. D — A starter with welded solenoid contacts will destroy itself rapidly as the armature overspeeds against the flywheel ring gear. The only effective immediate action is to shut off the engine via fuel shutoff or battery disconnect. Continuing operation or normal engine operation will result in complete starter destruction.
52. B — Proper load-test specification for heavy-duty batteries maintains voltage above 9.6V at 70°F during a 15-second load test at half the battery's CCA rating. Voltage above this threshold confirms the battery can deliver rated current under load. Values below 12.6V and 14.0V are not valid for this specific test.
53. C — An exhaust leak is amplified when engine braking raises exhaust pressure significantly. The same leak that produces a small tick at normal operation becomes loud and obvious during engine braking because pressure increases dramatically. This is a common symptom indicating exhaust system repair is needed.
54. A — Compression-release engine brakes hydraulically actuate a master/slave piston circuit using engine oil pressure. The master piston (driven by a dedicated cam lobe or linkage) displaces oil through the hydraulic circuit to the slave piston, which pushes the exhaust valve open. Without adequate oil pressure, the hydraulic circuit cannot transmit the force.

55. D — Exhaust brakes work by restricting exhaust flow, creating back pressure the piston pumps against during the exhaust stroke (pumping losses only). Compression-release brakes waste the full compression energy by venting it through the exhaust valve near TDC (compression work absorbed directly). Per cylinder, compression-release brakes absorb significantly more power.