PRACTICE EXAM 7: T2 SIMULATION (55 QUESTIONS)

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1. A heavy-duty diesel arrives with stored DTCs for low rail pressure, white smoke at startup, and gradual coolant loss with no visible external leakage. The proper diagnostic priority is to:

A. Replace the high-pressure pump as the most likely component failure

B. Replace the EGR cooler as preventive maintenance procedure during service

C. Investigate head gasket and EGR cooler integrity before fuel system diagnosis

D. Disconnect the engine ECM to clear adaptive memory completely

2. The minimum acceptable cranking compression on a healthy heavy-duty diesel engine is approximately:

A. 350 PSI or above on each cylinder consistently

B. 100 to 150 PSI on each cylinder consistently

C. 600 to 800 PSI on each cylinder consistently

D. 900 to 1,000 PSI on each cylinder consistently

3. Technician A says diesel engines reach autoignition temperature through compression of intake air to high compression ratios. Technician B says diesel engines require spark plugs at all operating temperatures for ignition. Who is correct?

A. Both Technician A and Technician B

B. Technician B only

C. Neither Technician A nor Technician B

D. Technician A only

4. The most accurate description of diesel smoke color interpretation when the smoke appears black continuously under heavy acceleration is:

A. Coolant entering the combustion chamber from a head gasket failure

B. Insufficient air or excess fuel during the combustion event

C. Oil consumption from worn rings, valve guide seals, or turbocharger seals

D. Normal exhaust appearance during heavy load operating conditions

5. The proper diagnostic sequence for a diesel engine driveability complaint begins with:

A. Verifying the customer concern through observation and road test

B. Replacing the most commonly failed components for the symptom

C. Disconnecting the battery to clear the ECM memory and reset

D. Performing a complete compression test on every engine cylinder

6. The most likely cause of low compression on multiple adjacent diesel cylinders is:

A. A failed coolant temperature sensor reading falsely cold to ECM

B. A failed cooling fan running continuously at improper temperatures

C. Head gasket failure between the affected cylinders

D. A failed catalytic converter creating excessive exhaust restriction

7. The proper way to verify a diesel head gasket failure is to:

A. Apply battery voltage to the cylinder head bolts for diagnostic testing

B. Visual inspection of the head gasket after head removal during service

C. Listen for combustion gas leakage with a stethoscope at the gasket

D. Use a chemical block tester to detect combustion gases in the coolant

8. A LEAST likely cause of low cranking compression on a single diesel cylinder is:

A. A burned exhaust valve in the affected cylinder location

B. A vacuum leak at the intake manifold gasket area

C. Worn piston rings allowing pressure escape past the rings

D. Localized head gasket failure between two adjacent cylinders

9. The proper measurement procedure for diesel cylinder head deck warpage is:

A. Use a precision straightedge with feeler gauges across the deck surface

B. Apply a torque wrench to the head bolts at specification during testing

C. Use a bore gauge inserted through the head bolt holes for measurement

D. Apply battery voltage to the cylinder head for diagnostic testing

10. The most reliable method to detect cracks in a diesel cylinder head is:

A. Visual inspection with adequate shop lighting only during service

B. Pressure testing with engine coolant at rated cap pressure during testing

C. Magnetic particle inspection or dye penetrant testing methods

D. Compression testing on adjacent cylinders for comparison during operation

11. The proper torque application sequence for diesel cylinder head bolts is:

A. Random sequence with calibrated torque wrench at specification

B. Center of the head working outward in a star pattern

C. Outside corners working toward the center of the head deck

D. Numerical order from front to rear of the head deck surface

12. Heavy-duty diesel valve seat width on intake valves typically falls in which range?

A. 0.010 to 0.020 inches across the contact area on the seat

B. 0.100 to 0.150 inches across the contact area on the seat

C. 0.200 to 0.250 inches across the contact area on the seat

D. 0.040 to 0.080 inches across the contact area on the seat

13. The proper procedure when reusing torque-to-yield head bolts is:

A. Always replace with new bolts; torque-to-yield bolts cannot be reused

B. Reuse if visual inspection shows no thread damage during inspection

C. Apply anti-seize compound to threads before installation procedures

D. Heat-treat the bolts before reinstallation for proper clamping force

14. Technician A says wet liner protrusion above the deck must be within specification for proper head gasket sealing. Technician B says wet liners contact the engine coolant directly through their outer surface. Who is correct?

A. Technician A only

B. Technician B only

C. Both Technician A and Technician B

D. Neither Technician A nor Technician B

15. The most likely cause of cylinder liner cavitation erosion is:

A. A failed cooling fan running continuously at improper temperatures

B. Inadequate supplemental coolant additives in the cooling system

C. Excessive boost pressure during normal engine operation conditions

D. A failed coolant temperature sensor reading falsely cold to ECM

16. The proper procedure for installing wet cylinder liners during diesel rebuild is to:

A. Verify liner protrusion and replace all O-rings and seals during installation

B. Reuse existing sleeve seals if they appear in good condition during inspection

C. Apply anti-seize compound to all sleeve sealing surfaces during installation

D. Heat-treat the sleeves before installation for proper sealing performance

17. The proper measurement procedure for diesel main bearing clearance during reassembly is:

A. Apply battery voltage to the bearing surfaces during testing

B. Reuse bearings without measurement procedures during assembly

C. Listen for bearing knock during initial engine startup operation

D. Use Plastigauge or precision micrometer measurements

18. The most accurate description of piston cooling jet operation is:

A. Lubricating the wrist pin during normal engine operation

B. Cooling the engine crankcase during high-load conditions during operation

C. Spraying pressurized oil onto the underside of each piston for thermal management

D. Reducing piston-to-cylinder wall friction during normal operation

19. The proper way to verify oil pump output on a heavy-duty diesel is to:

A. Measure oil pressure at the engine main oil gallery test port

B. Listen for pump operation with a stethoscope at idle conditions

C. Replace the oil pump as preventive maintenance during routine service

D. Apply battery voltage to the oil pump for diagnostic testing only

20. The most likely cause of oil cooler internal failure showing coolant in oil is:

A. A failed cooling fan running continuously at improper temperatures

B. Internal oil cooler element failure or cracked sealing surfaces

C. A failed coolant temperature sensor reading falsely cold to ECM

D. A failed catalytic converter creating excessive exhaust restriction

21. The most accurate description of heavy-duty diesel cooling system pressure cap function is to:

A. Raise the coolant boiling point for higher temperature operation

B. Increase coolant flow through the radiator passages during operation

C. Improve coolant heat transfer through the engine block during operation

D. Cool the coolant before it returns to the engine during operation

22. The proper procedure when servicing a heavy-duty diesel cooling system is to:

A. Apply maximum pressure to the system to verify component integrity

B. Open the pressure cap immediately after the engine has been running

C. Allow the engine to cool to ambient temperature before opening the cap

D. Allow the engine to reach operating temperature before any service

23. Heavy-duty diesel cooling fan clutch operation typically uses:

A. Direct mechanical coupling without any clutch mechanism for operation

B. Viscous fluid couplings or air-actuated clutches based on temperature

C. Electronic motors driven by the engine ECM at all engine speeds

D. Belt-driven systems with no thermal control during operation

24. The most likely cause of a heavy-duty diesel that overheats only at idle in stop-and-go traffic is:

A. A failed coolant temperature sensor reading falsely cold to ECM

B. A failed catalytic converter creating excessive exhaust restriction

C. A failed crankshaft position sensor producing intermittent signals

D. A failed cooling fan or slipping fan clutch unable to drive the fan adequately

25. The most accurate description of charge air cooler operation is:

A. Cooling intake air after compression by the turbocharger

B. Cooling exhaust gases before recirculation to the intake stream

C. Reducing engine block temperature during high-load operation

D. Cooling exhaust gases at the catalytic converter inlet location

26. The proper way to identify VGT vane sticking on a turbocharged diesel is to:

A. Apply battery voltage to the VGT actuator for diagnostic testing

B. Replace the turbocharger as preventive maintenance during service

C. Use scan tool to monitor commanded vs. actual VGT position values

D. Listen for VGT operation with a stethoscope during engine operation

27. The most likely cause of charge air cooler internal leakage is:

A. A failed coolant temperature sensor reading falsely cold to ECM

B. Cracked tubes from thermal cycling during normal operation

C. A failed cooling fan running continuously at improper temperatures

D. A failed catalytic converter creating excessive exhaust restriction

28. The most likely cause of EGR cooler internal failure showing white smoke and coolant consumption is:

A. A failed crankshaft position sensor producing intermittent signals during operation

B. Excessive boost pressure damaging the cooler internal components

C. A failed coolant temperature sensor reading falsely cold to ECM

D. Cracked or corroded cooler tubes allowing coolant into exhaust gas

29. The proper diagnostic approach when DPF differential pressure is elevated is to:

A. Distinguish between soot loading (regenerable) and ash loading (cleanable)

B. Apply battery voltage to the DPF for diagnostic testing procedures

C. Replace the DPF as preventive maintenance procedure during service

D. Listen for DPF operation with a stethoscope during engine operation

30. The most accurate description of active DPF regeneration is:

A. Continuous regeneration during all normal operating conditions

B. Manual regeneration requiring driver intervention to initiate

C. ECM-initiated regeneration when soot loading exceeds threshold

D. Regeneration that occurs only during cold-start operation conditions

31. The proper procedure when active DPF regeneration fails to complete is to:

A. Replace the DPF as the primary repair regardless of conditions

B. Disconnect the DPF differential pressure sensor to clear codes

C. Apply battery voltage directly to the DPF heating elements for testing

D. Initiate parked regeneration to complete soot removal manually

32. Technician A says ash accumulated in a diesel particulate filter must be physically cleaned at extended service intervals. Technician B says soot and ash both burn off during normal regeneration cycles. Who is correct?

A. Technician A only

B. Technician B only

C. Both Technician A and Technician B

D. Neither Technician A nor Technician B

33. The most accurate description of selective catalytic reduction (SCR) operation is:

A. Filtration of particulate matter through ceramic substrate during operation

B. Cooling of exhaust gases before discharge to the atmosphere during operation

C. Reduction of NOx through DEF injection upstream of the SCR catalyst

D. Increasing exhaust flow to improve engine power output during operation

34. The diesel exhaust fluid (DEF) used in SCR systems is:

A. A petroleum distillate similar to standard diesel fuel

B. A 32.5% urea solution in deionized water

C. A glycol mixture similar to engine coolant formulations

D. A hydrocarbon-based fuel additive for diesel applications

35. The proper procedure when DEF quality test results are out of specification is to:

A. Apply battery voltage to the DEF tank for diagnostic testing only

B. Listen for DEF system operation with a stethoscope during operation

C. Replace the SCR catalyst as preventive maintenance during service

D. Drain the DEF tank completely and refill with proper specification fluid

36. The most likely cause of an SCR system fault that triggers vehicle derate is:

A. DEF quality problems or DEF dosing system component failure

B. A failed cooling fan running continuously at improper temperatures

C. A failed coolant temperature sensor reading falsely cold to ECM

D. A failed catalytic converter creating excessive exhaust restriction

37. The progressive vehicle derate sequence for DEF system faults includes:

A. Immediate engine shutdown without warning to the driver

B. Limited fuel injection regardless of any other operating conditions

C. Dashboard warning, speed limitation, severe derate, and no-restart progression

D. Speed limitation only without any other operational restrictions

38. The high-pressure common rail (HPCR) fuel injection system delivers fuel at pressures up to:

A. 5,000 PSI on most current applications now in service

B. 35,000 PSI on the latest current systems in service

C. 15,000 PSI on most current applications now in service

D. 50,000 PSI in current heavy-duty diesel applications

39. The most accurate description of HPCR injector operation is:

A. Direct mechanical actuation from the camshaft profile during operation

B. Vacuum signal from the intake manifold during normal operation

C. Pneumatic actuation from the truck's air supply system

D. Solenoid or piezoelectric actuator commanded by the ECM

40. The most likely cause of a no-start condition on an HPCR diesel with low rail pressure is:

A. A failed coolant temperature sensor reading falsely cold to ECM

B. A failed high-pressure pump or low-pressure supply problem

C. A failed cooling fan running continuously at improper temperatures

D. A failed catalytic converter creating excessive exhaust restriction

41. The proper procedure when an HPCR injector requires replacement is to:

A. Apply battery voltage directly to the injector terminals for testing

B. Replace the high-pressure pump as preventive maintenance procedure

C. Replace the injector with a properly coded replacement unit

D. Listen for clicking with a stethoscope at idle conditions during operation

42. The most accurate description of EUI operation is:

A. Combines high-pressure pumping and injection in a single assembly

B. Continuous high-pressure rail supplies fuel directly to injectors

C. Vacuum signal modulation actuates the injection plunger during operation

D. Pneumatic actuation from the truck's air supply system

43. The most accurate description of HEUI injector operation is:

A. Direct mechanical actuation from the camshaft profile during operation

B. Continuous high-pressure rail supplies fuel directly to the injectors

C. Vacuum signal modulation actuates the injection plunger during operation

D. High-pressure engine oil drives a piston that actuates the fuel plunger

44. The most likely cause of erratic HEUI injector operation is:

A. A failed cooling fan running continuously at improper temperatures

B. Engine oil contamination affecting injector hydraulic operation

C. A failed coolant temperature sensor reading falsely cold to ECM

D. A failed catalytic converter creating excessive exhaust restriction

45. The proper way to verify HEUI injection actuation pressure is to:

A. Listen for fuel pump operation with a stethoscope at idle conditions

B. Apply battery voltage directly to the IPR valve for diagnostic testing

C. Measure IAP at the high-pressure oil rail with a pressure gauge

D. Replace the high-pressure pump as preventive maintenance procedure

46. The proper procedure for purging air from a diesel fuel system after filter service is to:

A. Use the manual priming pump and cycle through cranking sequences

B. Apply battery voltage directly to the fuel injection components for testing

C. Replace the high-pressure pump as preventive maintenance procedure

D. Operate the engine until air is naturally purged through normal use

47. The most likely cause of low fuel pressure on the low-pressure supply circuit is:

A. A failed cooling fan running continuously at improper temperatures

B. A failed coolant temperature sensor reading falsely cold to ECM

C. A failed catalytic converter creating excessive exhaust restriction

D. A clogged primary fuel filter restricting fuel flow to the pump

48. The proper procedure when water is detected in the diesel fuel filter water separator is to:

A. Apply battery voltage to the fuel filter for diagnostic testing only

B. Drain the water and inspect for the source of fuel contamination

C. Continue operation since water has minimal effect on diesel fuel systems

D. Replace the high-pressure pump as preventive maintenance procedure

49. The most accurate description of heavy-duty diesel battery testing is:

A. Apply battery voltage across the terminals during diagnosis only

B. Listen for battery activity with a stethoscope during cranking

C. Use a load tester or conductance tester at rated load capacity

D. Replace the battery without testing for proper diagnosis

50. The most likely cause of slow cranking on a heavy-duty diesel with proper battery state of charge is:

A. A failed coolant temperature sensor reading falsely cold to ECM

B. A failed cooling fan running continuously at improper temperatures

C. A failed catalytic converter creating excessive exhaust restriction

D. Excessive resistance in cables, connections, or starter components

51. The proper diagnostic sequence for a heavy-duty diesel charging system complaint is:

A. Replace the alternator regardless of any test results obtained

B. Verify battery condition, then perform voltage drop tests on cables

C. Replace the batteries with new components for the application

D. Test the alternator output amperage at idle without any load

52. The most accurate description of compression engine brake operation is:

A. Closing exhaust valves to create maximum exhaust backpressure during operation

B. Reducing fuel injection during deceleration to slow engine speed

C. Applying mechanical force to the engine output shaft directly during operation

D. Opening exhaust valves near top of compression stroke to dump compressed air

53. Compression engine brake operation requires three conditions simultaneously. Which is one of these conditions?

A. Engine operating at maximum boost pressure for proper operation

B. Throttle fully released with no fuel injection commanded by ECM

C. Cooling fan engaged at maximum speed for engine operation

D. Engine operating at idle speed with no load applied during operation

54. The most likely cause of weak compression engine brake performance is:

A. A failed coolant temperature sensor reading falsely cold to ECM

B. A failed cooling fan running continuously at improper temperatures

C. Valve adjustment problems affecting brake actuation timing

D. A failed catalytic converter creating excessive exhaust restriction

55. The proper procedure for testing engine brake operation is:

A. Verify enable conditions, electrical control circuit, and oil pressure

B. Apply battery voltage directly to the engine brake solenoid for testing

C. Replace the engine brake assembly as preventive maintenance procedure

D. Listen for engine brake operation with a stethoscope during testing

ANSWER KEY AND EXPLANATIONS

1. C — Investigate head gasket and EGR cooler integrity before fuel system diagnosis. White smoke at startup combined with gradual coolant loss without external leakage strongly suggests internal coolant entry into the combustion chamber. Head gasket failure or EGR cooler internal failure must be ruled out before pursuing fuel system diagnosis to avoid unnecessary parts replacement.

2. A — 350 PSI or above on each cylinder consistently. Healthy heavy-duty diesel engines produce minimum cranking compression in the 350 PSI range or above on the lowest cylinder. Cylinders below this threshold typically indicate significant sealing problems requiring further investigation.

3. D — Technician A only. Diesel engines reach autoignition temperatures through compression of intake air to compression ratios of 16:1 to 22:1. Diesel engines do not use spark plugs at any temperature; they rely entirely on compression ignition. Technician B's claim about spark plugs is incorrect.

4. B — Insufficient air or excess fuel during the combustion event. Black smoke from a diesel indicates the air-fuel ratio has tilted toward excess fuel relative to available air. Causes include too much fuel (failed injectors), too little air (restricted filter, failed boost), or EGR malfunction.

5. A — Verifying the customer concern through observation and road test. The proper diagnostic process begins with verification — confirming the symptom is actually present and understanding when it occurs. Without verification, diagnostic time is often spent pursuing the wrong problem.

6. C — Head gasket failure between the affected cylinders. Two or more adjacent cylinders with equal low compression strongly indicates head gasket failure between them, allowing pressure transfer between cylinders during compression strokes. This pattern is the most reliable diagnostic indication of inter-cylinder gasket failure.

7. D — Use a chemical block tester to detect combustion gases in the coolant. The chemical block tester provides direct, definitive identification of combustion gases entering the cooling system. Color change in the test fluid confirms head gasket failure between cylinder and cooling system.

8. B — A vacuum leak at the intake manifold gasket area. Diesel engines do not depend on intake manifold vacuum the way gasoline engines do, so vacuum leaks have minimal effect. The other choices all describe sealing failures within a specific cylinder that allow compression loss.

9. A — Use a precision straightedge with feeler gauges across the deck surface. Cylinder head deck warpage is measured by laying a precision straightedge across the deck in multiple directions, with feeler gauges measuring any gap between the straightedge and the head surface.

10. C — Magnetic particle inspection or dye penetrant testing methods. These nondestructive testing methods reveal hairline cracks invisible to visual inspection. Magnetic particle works on cast iron heads; dye penetrant works on aluminum heads where magnetic methods cannot be used.

11. B — Center of the head working outward in a star pattern. Diesel cylinder head bolt sequences typically start at the center and work outward in a star pattern to distribute clamping force evenly across the head, preventing localized distortion. Multiple passes at progressively higher torque values complete the procedure.

12. D — 0.040 to 0.080 inches across the contact area on the seat. Acceptable valve seat width balances heat transfer from the valve to the seat against sealing pressure. Seats too narrow burn the valve face from inadequate heat transfer; seats too wide reduce sealing force per unit area.

13. A — Always replace with new bolts; torque-to-yield bolts cannot be reused. Torque-to-yield bolts stretch into plastic deformation during initial torquing, providing precise clamping force. They cannot reliably maintain proper clamping force when reused, regardless of visual condition.

14. C — Both Technician A and Technician B. Wet liner protrusion above the deck must fall within specification (typically 0.001 to 0.005 inches) for proper head gasket sealing. Wet liners contact the engine coolant directly through their outer surface, which is why proper liner installation and seal integrity are critical to prevent coolant leakage.

15. B — Inadequate supplemental coolant additives in the cooling system. Cylinder liner cavitation is caused by collapsing vapor bubbles eroding the outer liner surface. Proper SCA concentration prevents cavitation; conventional automotive coolants lack the additives needed and lead to liner damage over time.

16. A — Verify liner protrusion and replace all O-rings and seals during installation. Wet sleeve installation requires verification that liner protrusion meets specification along with replacement of all O-rings and lower seals. Reused seals do not provide reliable sealing once disturbed.

17. D — Use Plastigauge or precision micrometer measurements. Plastigauge crushes between the bearing and journal to reveal actual running clearance from the crushed width. Alternatively, micrometer measurements of journals and bores allow clearance calculation. Both methods provide accurate clearance values during reassembly.

18. C — Spraying pressurized oil onto the underside of each piston for thermal management. Piston cooling jets manage piston crown temperature by spraying pressurized oil onto the underside of the piston. This is essential for diesel pistons that handle high combustion temperatures and pressures, particularly under load conditions.

19. A — Measure oil pressure at the engine main oil gallery test port. Direct oil pressure measurement with a calibrated mechanical gauge connected to the main gallery provides accurate pressure information for diagnosis. Visual inspection and listening cannot quantify pressure deficiency.

20. B — Internal oil cooler element failure or cracked sealing surfaces. Internal oil cooler failure allows coolant into engine oil through cracked or damaged sealing surfaces within the cooler. The contamination is visible as milky oil during inspection, providing immediate diagnostic evidence.

21. A — Raise the coolant boiling point for higher temperature operation. The pressure cap maintains system pressure typically at 13 to 16 PSI on heavy-duty applications. Higher pressure raises the coolant boiling point, allowing the engine to operate at higher temperatures without coolant boiling.

22. C — Allow the engine to cool to ambient temperature before opening the cap. The pressure cap must never be opened on a hot engine. Releasing pressure suddenly causes the coolant to flash to steam, with serious burn risk. The engine must cool to ambient temperature before service.

23. B — Viscous fluid couplings or air-actuated clutches based on temperature. Heavy-duty cooling fans typically use viscous fan clutches or air-actuated fan clutches that engage based on coolant temperature. The clutch allows the fan to disengage when not needed, reducing parasitic load and fuel consumption.

24. D — A failed cooling fan or slipping fan clutch unable to drive the fan adequately. Low-speed overheating typically indicates an airflow problem. The fan must move air through the radiator when ram-air through the front of the truck is minimal at idle. Failed fans or slipping clutches eliminate this airflow.

25. A — Cooling intake air after compression by the turbocharger. The charge air cooler (intercooler) cools compressed intake air after the turbocharger, increasing air density and reducing combustion temperature. This is part of standard turbocharged diesel architecture.

26. C — Use scan tool to monitor commanded vs. actual VGT position values. Modern scan tools display both commanded and actual VGT position. Significant deviation between these values indicates vane sticking or actuator problems requiring further investigation.

27. B — Cracked tubes from thermal cycling during normal operation. Charge air cooler internal leaks typically result from cracked tubes that develop over time from thermal cycling. The cooler experiences large temperature variations during normal operation, eventually causing fatigue cracking in the tubes.

28. D — Cracked or corroded cooler tubes allowing coolant into exhaust gas. EGR cooler internal failure typically results from cracked tubes or corrosion damage that allows coolant to enter the exhaust gas stream. The failure produces white smoke, coolant consumption, and potential damage to downstream components.

29. A — Distinguish between soot loading (regenerable) and ash loading (cleanable). Elevated DPF differential pressure can result from either soot or ash. Soot responds to regeneration; ash does not and requires physical cleaning. Distinguishing between the two determines the proper service action.

30. C — ECM-initiated regeneration when soot loading exceeds threshold. Active regeneration is initiated by the ECM when soot load exceeds a calibrated threshold. The ECM injects post-injection fuel to raise DPF temperatures sufficient to combust accumulated soot, typically completing in 20 to 40 minutes during normal operation.

31. D — Initiate parked regeneration to complete soot removal manually. When active regeneration cannot complete (typically due to insufficient exhaust temperature), parked regeneration is initiated. The driver parks the truck, sets the parking brake, and the engine runs at elevated idle for 30 to 45 minutes to complete the cycle.

32. A — Technician A only. Soot accumulated in the DPF is removed during regeneration. Ash, however, is non-combustible residue from oil additives and fuel impurities; it does not burn during regeneration and must be physically cleaned at extended intervals through specialized equipment. Technician B's claim that ash burns off is incorrect.

33. C — Reduction of NOx through DEF injection upstream of the SCR catalyst. SCR systems reduce NOx through DEF (urea solution) injection upstream of the SCR catalyst. The urea decomposes thermally into ammonia, which reacts with NOx in the catalyst to produce nitrogen and water vapor.

34. B — A 32.5% urea solution in deionized water. DEF is a precise solution of 32.5% urea in deionized water. The urea decomposes thermally into ammonia, which reacts with NOx in the SCR catalyst to produce nitrogen and water vapor.

35. D — Drain the DEF tank completely and refill with proper specification fluid. Out-of-specification DEF must be drained and replaced with proper concentration fluid. DEF quality affects NOx reduction effectiveness and can trigger derate codes if allowed to remain in the system.

36. A — DEF quality problems or DEF dosing system component failure. SCR system fault codes triggering vehicle derate most commonly result from DEF quality problems (contamination, dilution, aging) or DEF dosing system component failures. The federally mandated derate sequence specifically addresses DEF system faults.

37. C — Dashboard warning, speed limitation, severe derate, and no-restart progression. The federally mandated DEF system derate sequence progresses through dashboard warnings, speed limitations (typically 55 mph maximum, then 5 mph maximum), and finally a no-restart condition with empty DEF tank.

38. B — 35,000 PSI on the latest current systems in service. Modern HPCR systems operate at pressures up to 35,000 PSI on the latest applications. Earlier systems operated at lower pressures, but current technology has continued to push pressures higher for better atomization and emissions control.

39. D — Solenoid or piezoelectric actuator commanded by the ECM. HPCR injectors use either solenoid or piezoelectric actuators that respond to electrical commands from the ECM. The

actuator opens the injector against high rail pressure, releasing fuel into the cylinder at electronically controlled timing and quantity.

40. B — A failed high-pressure pump or low-pressure supply problem. No-start with low rail pressure indicates the high-pressure pump cannot deliver commanded pressure. The cause may be either high-pressure pump failure or low-pressure supply problems preventing the pump from operating properly.

41. C — Replace the injector with a properly coded replacement unit. HPCR injectors require manufacturer-coded replacement units that match the engine's specifications. The injector code is entered into the ECM during installation to ensure proper flow rate calibration.

42. A — Combines high-pressure pumping and injection in a single assembly. EUI injectors combine the high-pressure pumping element and the injection nozzle in a single assembly mounted in each cylinder head bore. The injector is mechanically actuated by camshaft, with a solenoid controlling injection timing.

43. D — High-pressure engine oil drives a piston that actuates the fuel plunger. HEUI systems use high-pressure engine oil at 500 to 4,500 PSI. When the injector solenoid opens, the high-pressure oil acts on a piston that drives the fuel plunger, generating injection pressures up to 21,000 PSI without requiring high-pressure fuel rail.

44. B — Engine oil contamination affecting injector hydraulic operation. HEUI systems require very clean engine oil to function correctly because the high-pressure oil actuates the injectors. Contaminated oil causes injector wear and erratic operation, making oil quality critical to HEUI system health.

45. C — Measure IAP at the high-pressure oil rail with a pressure gauge. HEUI injection actuation pressure is measured directly at the high-pressure oil rail with a pressure gauge. The reading verifies that the IAP pump and IPR valve are maintaining proper pressure for injector operation.

46. A — Use the manual priming pump and cycle through cranking sequences. Air must be purged from the fuel system after filter service or component replacement. The proper procedure uses the manual priming pump (or electric prime if equipped) combined with controlled cranking sequences to evacuate air from the system.

47. D — A clogged primary fuel filter restricting fuel flow to the pump. Low pressure on the low-pressure supply circuit commonly results from filter restriction. As filters age and accumulate contamination, they progressively restrict flow until the transfer pump cannot deliver adequate volume to the high-pressure pump.

48. B — Drain the water and inspect for the source of fuel contamination. Water in the separator must be drained, and the source of contamination must be identified to prevent recurrence. Common sources include condensation, contaminated fuel from suppliers, or compromised fuel system components allowing water entry.

49. C — Use a load tester or conductance tester at rated load capacity. Heavy-duty battery testing requires applying realistic load to the battery and observing voltage response. Carbon pile load testers and electronic conductance testers each provide reliable assessment of battery state of health.

50. D — Excessive resistance in cables, connections, or starter components. Slow cranking with proper battery state of charge typically indicates voltage drop somewhere in the cranking circuit. Voltage drop testing under cranking load identifies the specific location of the high resistance.

51. B — Verify battery condition, then perform voltage drop tests on cables. Charging system diagnosis must start with battery verification because a discharged or failing battery produces symptoms that look like charging system problems. Voltage drop tests on cables then isolate any high-resistance connections.

52. D — Opening exhaust valves near top of compression stroke to dump compressed air. Compression engine brakes work by opening exhaust valves near TDC of the compression stroke. The compressed air escapes through the open exhaust valve rather than expanding back against the piston, eliminating the power stroke and absorbing energy from the drivetrain.

53. B — Throttle fully released with no fuel injection commanded by ECM. Compression engine brake operation requires three conditions simultaneously: brake switch on, throttle fully released, and clutch engaged (or transmission in a driven gear). Throttle release ensures no fuel injection, allowing the engine to absorb energy rather than produce it.

54. C — Valve adjustment problems affecting brake actuation timing. Compression engine brake performance depends on precise valve actuation timing. Valve adjustment problems prevent the brake from opening exhaust valves at the optimum point in the cycle, reducing braking effectiveness and producing weak performance.

55. A — Verify enable conditions, electrical control circuit, and oil pressure. Engine brake testing requires verifying multiple parameters: enable conditions (throttle position, clutch engagement), electrical control circuit, and oil pressure (which operates the valve actuators). Each must be checked to identify the specific fault.