PRACTICE EXAM 5: T2 SIMULATION (55 QUESTIONS)

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1. The most accurate diesel smoke color interpretation when the smoke appears blue continuously during operation is:

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

B. A rich fuel mixture from over-fueling the engine during operation

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

D. Insufficient air or excess fuel during the combustion event

2. A heavy-duty diesel produces a knocking noise that occurs only at idle and disappears when the engine is loaded. The most likely cause is:

A. A worn main bearing producing noise during the compression stroke

B. Worn camshaft lobes producing valve train clatter at higher speeds

C. A loose accessory drive belt slapping the timing cover

D. A failed harmonic balancer with internal delamination damage

3. The most likely cause of a heavy-duty diesel that suddenly produces large quantities of white smoke during normal operation is:

A. End-of-life piston rings allowing oil consumption past the rings

B. A failed cooling fan running continuously at improper temperatures

C. A failed catalytic converter creating excessive exhaust restriction

D. Coolant entering the cylinders from EGR cooler or head gasket failure

4. A LEAST likely cause of a diesel engine that produces black smoke under all operating conditions is:

A. Worn fuel injectors with degraded spray patterns and elevated flow rates

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

C. A failed turbocharger producing inadequate boost pressure during operation

D. A restricted air filter limiting intake airflow to the engine

5. The most reliable way to identify a head gasket failure between two adjacent cylinders is:

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

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

C. Compression test both cylinders showing equal low readings

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

6. The proper diagnostic approach to a diesel engine that has lost power gradually over time is to:

A. Investigate gradual component degradation including injectors, DPF restriction, and air system

B. Replace the high-pressure pump as the primary repair component

C. Disconnect the engine ECM to clear adaptive memory completely

D. Replace all injectors as a complete set during the repair procedure

7. The most accurate description of compression ignition is:

A. Spark plug ignition similar to gasoline engine designs

B. Continuous combustion throughout the entire cycle

C. Pressure ignition from the heat of intake air alone

D. Autoignition from compression heat after fuel injection

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

A. 100 to 150 PSI on each cylinder consistently

B. 350 PSI or above on each cylinder consistently

C. 600 to 800 PSI on each cylinder consistently

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

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

A. Head gasket failure between the affected cylinders

B. A failed crankshaft position sensor producing intermittent signals

C. A failed cooling fan running continuously at improper temperatures

D. A failed catalytic converter creating excessive exhaust restriction

10. The proper way to verify a heavy-duty diesel head gasket failure to coolant is to:

A. Apply battery voltage to the head gasket area for diagnostic testing

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

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

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

11. The most likely cause of injector cup or sleeve failure on a heavy-duty diesel is:

A. A failed crankshaft position sensor producing intermittent signals

B. A failed cooling fan running continuously at improper temperatures

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

D. Coolant entering the cylinder past the failed cup or sleeve seal

12. A LEAST likely cause of a heavy-duty diesel engine with poor combustion is:

A. Low cranking compression from worn rings or valve sealing failures

B. A failed cooling fan running continuously at improper temperatures

C. Failed or worn injectors producing poor fuel atomization at injection

D. Air system restrictions reducing combustion air to the engine

13. The proper sequence for diesel engine diagnosis when codes do not point to a specific component is to:

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

B. Apply battery voltage to engine sensors for diagnostic testing

C. Verify mechanical condition before electronic system diagnosis

D. Replace all injectors as a complete set during repair procedures

14. The most accurate description of diesel cylinder leakage testing is:

A. Pressurizing each cylinder at TDC compression and measuring leakage

B. Measuring compression pressure during cranking with a pressure gauge

C. Testing manifold vacuum at idle to identify cylinder problems

D. Listening for engine roughness using a stethoscope at idle conditions

15. Heavy-duty diesel engine valve seat recession is identified by:

A. Excessive valve clearance after extended operation in the engine

B. White smoke during cold-start that clears with engine warm-up

C. Failure of the valve to close completely during the compression stroke

D. Reduced compression and progressively reduced valve lift over time

16. The proper way to verify diesel valve seat width is to:

A. Apply battery voltage to the valve seat for diagnostic testing

B. Measure the contact width with a precision scale or gauge

C. Use Plastigauge between the valve face and the seat surface

D. Listen for valve operation with a stethoscope during service

17. The most reliable way to detect cracks in a heavy-duty diesel cylinder head is:

A. Magnetic particle inspection or dye penetrant testing methods

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

C. Listen for cracks with a stethoscope during normal operation

D. Pressure test the cylinder head at rated cap pressure for diagnostic

18. A LEAST likely cause of a heavy-duty diesel engine bearing failure is:

A. Inadequate engine oil pressure during normal operation

B. Contaminated engine oil from extended service intervals

C. A failed cooling fan running continuously at improper temperatures

D. Improper installation procedures during engine reassembly service

19. The proper procedure for identifying piston-to-bore clearance is:

A. Apply battery voltage to the piston during diagnostic testing

B. Listen for piston slap with a stethoscope at cold-start

C. Use Plastigauge between the piston and bore for measurement

D. Measure piston diameter at the skirt and bore at corresponding height

20. The most likely cause of a diesel engine with rapid piston ring wear is:

A. A failed cooling fan running continuously at improper temperatures

B. Contamination from intake air or oil affecting cylinder lubrication

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

D. A failed catalytic converter creating excessive exhaust restriction

21. The proper way to inspect engine bearings during diesel rebuild is to:

A. Visual inspection for wear pattern and verification of clearance with Plastigauge

B. Reuse bearings without measurement procedures during assembly

C. Listen for bearing noise during initial engine startup operation

D. Apply battery voltage to the bearing surfaces during testing

22. Wet cylinder liner replacement during diesel rebuild requires:

A. Reusing existing sleeve seals if they appear in good condition during inspection

B. Applying anti-seize compound to all sleeve sealing surfaces during installation

C. Heat-treating the sleeves before installation for proper sealing performance

D. Verification of liner protrusion and replacement of all O-rings and seals

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

A. Visual inspection of the oil pump for external damage during service

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

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

D. Replace the pump as preventive maintenance during routine service

24. A LEAST likely cause of low oil pressure that improves significantly when oil viscosity is increased is:

A. Worn engine main bearings allowing excessive oil leakage at the journals

B. A clogged oil filter restricting flow regardless of viscosity values

C. A worn oil pump with internal leakage between pump components

D. Worn engine rod bearings allowing excess oil flow past the bearings

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

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

B. Lubricating the wrist pin during normal engine operation

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

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

26. The proper procedure when diesel oil cooler internal failure is suspected is to:

A. Apply battery voltage to the oil cooler housing for diagnostic testing

B. Listen for oil cooler operation with a stethoscope at idle during operation

C. Replace the oil cooler as preventive maintenance procedure during service

D. Inspect engine oil and coolant for cross-contamination evidence

27. Heavy-duty diesel coolant SCA testing is performed using:

A. Apply battery voltage to the coolant for diagnostic testing

B. Listen for coolant flow with a stethoscope during operation

C. Test strips or refractometer at scheduled service intervals

D. Visual inspection of coolant color and clarity during service

28. The most accurate description of coolant pressure cap function on a heavy-duty diesel 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

29. The most reliable way to verify a stuck-open thermostat on a heavy-duty diesel is to:

A. Apply battery voltage to the thermostat housing for diagnostic testing

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

C. Replace the thermostat with a new component for diagnostic testing

D. Monitor coolant temperature through the engine warm-up cycle

30. The most likely cause of a heavy-duty diesel that overheats only at highway speed is:

A. A failed cooling fan that does not engage at proper temperature

B. A coolant flow problem from water pump or thermostat issues

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

D. A failed catalytic converter creating excessive exhaust restriction

31. The proper way to test charge air cooler integrity on a turbocharged diesel is to:

A. Apply battery voltage to the cooler housing for diagnostic testing

B. Listen for charge air cooler operation with a stethoscope during operation

C. Pressure test the cooler with shop air or specialized testing equipment

D. Replace the cooler as preventive maintenance during routine service

32. The most likely cause of low boost pressure on a turbocharged diesel with normal exhaust flow is:

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

B. Charge air cooler internal leakage from cracked tubes or connections

C. A failed cooling fan running continuously at improper temperatures

D. A failed catalytic converter creating excessive exhaust restriction

33. A LEAST likely cause of low boost pressure on a turbocharged diesel is:

A. Worn turbocharger shaft bearings allowing leakage during operation

B. Sticking VGT vanes preventing proper boost development under load

C. Damaged turbocharger compressor wheel from foreign object ingestion

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

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

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

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

C. Replace the turbocharger as preventive maintenance during service

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

35. The most accurate description of EGR cooler operation on a heavy-duty diesel is:

A. Cooling intake air after compression by the turbocharger during operation

B. Reducing engine block temperature during high-load operating conditions

C. Cooling exhaust gases before recirculation to the intake stream

D. Cooling exhaust gases at the catalytic converter inlet location

36. The most likely cause of EGR valve sticking is:

A. A failed cooling fan running continuously at improper temperatures

B. Carbon buildup at the valve seat or actuator pivot points

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

D. A failed catalytic converter creating excessive exhaust restriction

37. The proper way to verify EGR cooler internal leakage is to:

A. Apply battery voltage to the EGR cooler for diagnostic testing

B. Listen for EGR cooler operation with a stethoscope during operation

C. Replace the EGR cooler as preventive maintenance during service

D. Pressure test the cooler with shop air at the specified pressure

38. 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

39. 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

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

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

B. Initiate parked regeneration to complete soot removal manually

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

D. Disconnect the DPF differential pressure sensor to clear codes

41. The proper procedure when DPF ash loading exceeds service threshold is to:

A. Initiate parked regeneration cycles to remove the ash deposits during service

B. Physically clean the DPF on specialized equipment at extended service intervals

C. Apply battery voltage to the DPF for diagnostic testing during service

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

42. A LEAST likely cause of a heavy-duty diesel that fails active DPF regeneration is:

A. Insufficient exhaust temperature from low engine load conditions

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

C. Excessive fuel dilution in engine oil affecting regeneration parameters

D. A faulty post-injection injector failing to deliver regeneration fuel

43. The most likely cause of an SCR system fault that triggers vehicle derate 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. DEF quality problems or DEF dosing system component failure

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

D. Replace the SCR catalyst as preventive maintenance during service

45. The most accurate description of DEF dosing rate during heavy-load operation is:

A. 1 to 3 percent of fuel consumption by volume during operation

B. 10 to 15 percent of fuel consumption by volume during operation

C. 25 to 30 percent of fuel consumption by volume during operation

D. Less than 0.5 percent of fuel consumption during all operation

46. 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 catalytic converter creating excessive exhaust restriction

D. A failed cooling fan running continuously at improper temperatures

47. The proper diagnostic approach when an HPCR diesel has erratic injection contribution is to:

A. Apply battery voltage to all injectors as primary diagnostic procedure

B. Replace all injectors as preventive maintenance during service

C. Listen for injector clicking with a stethoscope at idle conditions

D. Use scan tool injector contribution test to identify specific injector issues

48. The most likely cause of multiple HPCR injector failures simultaneously is:

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

B. Fuel system contamination from fuel quality problems or system damage

C. A failed cooling fan running continuously at improper temperatures

D. A failed catalytic converter creating excessive exhaust restriction

49. The proper procedure for purging air from a diesel fuel system is to:

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

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

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

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

50. 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

51. The most likely cause of a HEUI injector that produces erratic operation is:

A. Engine oil quality problems affecting injector hydraulic operation

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

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

D. A failed catalytic converter creating excessive exhaust restriction

53. The proper diagnostic approach for a heavy-duty diesel charging system complaint begins with:

A. Replacing the alternator regardless of any test results obtained

B. Verifying battery condition and state of charge before further testing

C. Replacing the batteries with new components for the application

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

54. A LEAST likely cause of compression engine brake failure is:

A. A failed engine brake control switch on the dashboard or steering column

B. Hydraulic leakage in the brake actuation circuit components

C. A failed engine brake solenoid in the activation circuit

D. A failed mass airflow sensor reading falsely low to the ECM

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

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

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

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

D. Replace the engine brake assembly as preventive maintenance procedure

ANSWER KEY AND EXPLANATIONS

1. C — Oil consumption from worn rings, valve guide seals, or turbocharger seals. Continuous blue smoke indicates oil reaching the combustion chamber consistently. The most common sources include worn piston rings, worn valve guide seals, or failed turbocharger seals allowing oil into the intake or exhaust stream.
2. A — A worn main bearing producing noise during the compression stroke. Main bearing knock often appears at idle when oil pressure is lowest and disappears under load when increased pressure compensates for clearance. The pattern is opposite to rod bearing knock, which becomes more pronounced under load.
3. D — Coolant entering the cylinders from EGR cooler or head gasket failure. Sudden large quantities of white smoke indicate coolant entering the combustion chamber through internal failure. EGR cooler failure (allowing coolant into exhaust gas that reaches intake) and head gasket failure (allowing coolant directly into a cylinder) are the most common sources.
4. B — A failed coolant temperature sensor reading falsely cold to ECM. ECT sensor errors affect fuel mixture but typically would not produce continuous black smoke under all conditions. The other choices all describe conditions that directly produce black smoke through fuel or air system problems.
5. C — Compression test both cylinders showing equal low readings. Two 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.
6. A — Investigate gradual component degradation including injectors, DPF restriction, and air system. Gradual power loss over time typically points to gradual component degradation. Fuel injector wear, DPF restriction from soot accumulation, and air system problems are the most common contributors and must be investigated systematically.
7. D — Autoignition from compression heat after fuel injection. Compression ignition relies on the heat generated by compressing intake air to autoignition temperatures, then injecting fuel that ignites spontaneously from this heat. The fuel is injected near top dead center after the air has been fully compressed.
8. B — 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.

9. A — 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 common cause of multiple-cylinder compression loss.

10. C — 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.

11. D — Coolant entering the cylinder past the failed cup or sleeve seal. Injector cups (sleeves) seal the injector against both combustion gases and the cooling jacket. Failed cups allow coolant to enter the cylinder, producing white smoke, coolant loss, and potential hydraulic lock if severe.

12. B — A failed cooling fan running continuously at improper temperatures. Cooling fan operation does not directly cause poor combustion. The other choices all describe direct causes of poor combustion through compression problems, injector issues, or air system restrictions.

13. C — Verify mechanical condition before electronic system diagnosis. Diagnosis must establish that mechanical components are operating correctly before pursuing electronic system diagnosis. Mechanical problems (compression, injector spray patterns, air system integrity) frequently produce symptoms that look like electronic faults.

14. A — Pressurizing each cylinder at TDC compression and measuring leakage. Cylinder leakage testing pressurizes the cylinder at TDC compression (both valves closed) with shop air and measures the percentage of leakage. Listening for the source of escaping air pinpoints the leak path.

15. D — Reduced compression and progressively reduced valve lift over time. Valve seat recession is the gradual sinking of the valve face into the seat, accumulating with service hours. This reduces compression and disrupts valve timing as the valve sits progressively deeper into the head over time.

16. B — Measure the contact width with a precision scale or gauge. Valve seat width is measured directly across the contact area between the valve face and seat. Acceptable width typically ranges from 0.040 to 0.080 inches for intake valves, with exhaust valves slightly wider.

17. A — 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.

18. C — A failed cooling fan running continuously at improper temperatures. Cooling fan operation does not directly cause bearing failure. The other choices all describe direct causes of bearing failure through lubrication, contamination, or installation problems.

19. D — Measure piston diameter at the skirt and bore at corresponding height. Piston-to-bore clearance is the difference between piston diameter (measured at the specified location, typically the skirt) and bore diameter at the corresponding height. Both measurements use precision instruments.

20. B — Contamination from intake air or oil affecting cylinder lubrication. Rapid piston ring wear typically results from contamination — either intake air contamination from compromised filtration or oil contamination from extended service intervals. The contamination accelerates wear by introducing abrasive particles between the rings and cylinder walls.

21. A — Visual inspection for wear pattern and verification of clearance with Plastigauge. Bearing inspection during rebuild requires both visual evaluation of wear patterns and clearance verification using Plastigauge or precision micrometers. Visual inspection alone cannot quantify clearance, which determines whether bearings can be reused or must be replaced.

22. D — Verification of liner protrusion and replacement of all O-rings and seals. 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.

23. C — 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.

24. B — A clogged oil filter restricting flow regardless of viscosity values. A clogged filter typically affects pressure across all conditions, not specifically improving with thicker oil. The other choices all involve clearance or pump leakage that thicker oil can partially compensate for.

25. A — Spraying pressurized oil onto the underside of the 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.

26. D — Inspect engine oil and coolant for cross-contamination evidence. Internal oil cooler failure allows coolant into oil or oil into coolant. Inspecting both fluids for the contamination signature (milky oil, oil film in coolant) provides immediate evidence of internal cooler leakage.

27. C — Test strips or refractometer at scheduled service intervals. SCA concentration testing uses test strips or refractometer reading at scheduled intervals. This is part of routine fleet maintenance because SCAs deplete over time and must be replenished to maintain protection.

28. 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.

29. D — Monitor coolant temperature through the engine warm-up cycle. The proper in-vehicle test observes coolant temperature during warm-up to identify whether the engine reaches normal operating temperature on schedule. A stuck-open thermostat produces slow warm-up; this pattern is visible through temperature monitoring.

30. B — A coolant flow problem from water pump or thermostat issues. Highway-speed overheating typically indicates a coolant flow problem rather than an airflow problem. Failed water pump impellers, restricted thermostats, or restricted radiator passages reduce coolant flow when demand is highest at high engine speeds.

31. C — Pressure test the cooler with shop air or specialized testing equipment. Charge air cooler internal leaks are identified by pressurizing the cooler with shop air and observing for pressure decay or audible leakage. Specialized testing equipment provides controlled pressurization for precise diagnosis.

32. B — Charge air cooler internal leakage from cracked tubes or connections. Low boost pressure with normal exhaust flow indicates the boost is being lost between the turbocharger and the engine. Charge air cooler internal leakage is a common cause, particularly from cracked tubes resulting from thermal cycling.

33. D — A failed coolant temperature sensor reading falsely cold to ECM. ECT sensor errors affect fuel mixture but do not directly cause low boost pressure. The other choices all directly affect boost generation through turbocharger or charge air system problems.

34. A — 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.

35. C — Cooling exhaust gases before recirculation to the intake stream. The EGR cooler reduces the temperature of recirculated exhaust gas before it reaches the intake. Cooler EGR provides better NOx reduction and prevents the intake from reaching damaging temperatures.

36. B — Carbon buildup at the valve seat or actuator pivot points. Diesel EGR valves operate in a high-temperature carbon-rich environment. Carbon buildup at the valve seat or actuator pivot points causes sticking, producing inconsistent EGR operation and possible derate codes.

37. D — Pressure test the cooler with shop air at the specified pressure. EGR cooler internal leakage is verified by pressurizing the cooler with shop air at specified pressure and observing for leakage. A failed cooler must be replaced rather than repaired.

38. 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.

39. 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.

40. B — 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.

41. B — Physically clean the DPF on specialized equipment at extended service intervals. DPF ash loading requires physical cleaning on specialized equipment at extended service intervals (typically measured in hundreds of thousands of miles). Regeneration cycles cannot remove ash; only physical cleaning is effective.

42. B — A failed coolant temperature sensor reading falsely high to ECM. ECT sensor errors affect fuel mixture but do not directly cause regeneration failure. The other choices all describe direct causes of failed regeneration through temperature, oil dilution, or post-injection issues.

43. D — 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.

44. C — 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.

45. A — 1 to 3 percent of fuel consumption by volume during operation. DEF dosing rates vary with engine load — typically 1 to 3 percent of fuel consumption by volume during heavy-load operation. The exact rate is calculated by the ECM based on engine operating conditions and exhaust temperature.

46. 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.

47. D — Use scan tool injector contribution test to identify specific injector issues. Modern scan tools can disable HPCR injectors individually while monitoring engine RPM and other parameters. The change in operation when each injector is disabled reveals its actual contribution, identifying specific injector problems.

48. B — Fuel system contamination from fuel quality problems or system damage. Multiple injector failures simultaneously typically indicate a system-wide contamination problem. Fuel quality

issues, water contamination, or upstream component damage can affect multiple injectors at once, requiring system cleaning before injector replacement.

49. C — 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.

50. 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.

51. A — Engine oil quality problems 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.

52. C — 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.

53. B — Verifying battery condition and state of charge before further testing. Charging system diagnosis must start with battery verification because a discharged or failing battery produces symptoms that look like charging system problems. Without confirming battery condition, alternator and circuit testing cannot be properly evaluated.

54. D — A failed mass airflow sensor reading falsely low to the ECM. MAF sensor failures affect fuel mixture but not engine brake operation. The other choices all describe direct causes of engine brake operation failure through control switches, hydraulic systems, or solenoid components.

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.