PRACTICE EXAM 14: ASE T1 GASOLINE ENGINES SIMULATION

1. A heavy-duty gasoline truck has been brought in with a complaint of "engine misfiring at highway speeds only." Long-term fuel trim is at +5% on both banks. The technician retrieves DTC P0303 (Cylinder 3 Misfire). The MOST appropriate first diagnostic step is to:

A. Replace the cylinder 3 spark plug as the most common cause of single-cylinder misfires

B. Replace the cylinder 3 ignition coil based on the misfire DTC presence

C. Test compression, ignition, and fuel delivery on cylinder 3 to identify the cause

D. Replace the engine controller since misfires indicate PCM failure patterns

2. A vacuum gauge at idle shows 17 in. Hg with the needle steady. The vehicle elevation is 4,000 feet above sea level. The reading is:

A. Within normal range when adjusted for the altitude during operation

B. Below normal indicating exhaust restriction requiring immediate investigation

C. Above normal indicating possible improper sensor calibration during operation

D. Indeterminate without specific OEM specifications for the engine and altitude

3. The customer reports a Class 5 truck "stalls when coming to a stop, then restarts immediately and runs fine." The MOST diagnostic interview question is:

A. What grade of fuel does the customer typically purchase from the gas station weekly?

B. How many miles does the truck currently have on the odometer at this time?

C. Where is the truck typically parked when not in active service operation today?

D. Does the symptom occur in any specific operating condition such as hot or cold?

4. A LEAST-likely cause of an oil leak appearing at the bell housing on a 6.0L Vortec is:

A. Valve cover gasket leak migrating down the rear of the engine assembly

B. A failed catalytic converter creating exhaust gas leakage at the joint area

C. Intake manifold gasket leak migrating to the rear of the engine assembly

D. Oil pan rear gasket leak migrating to the bell housing area during operation

5. A power balance test on a 7.3L Godzilla shows cylinder 5 contributes 30 RPM less than the average of the other seven cylinders. Compression on cylinder 5 measures 165 psi, matching the other cylinders. The MOST likely cause is:

A. An ignition or fuel delivery issue specific to cylinder 5 location during operation

B. A failed compression ring on cylinder 5 requiring engine teardown for repair

C. A blown head gasket between cylinder 5 and an adjacent cylinder location

D. Mechanical wear that affects compression but not power production at cylinder 5

6. A heavy-duty gasoline truck has been brought in with a "ticking noise from the valve cover area that worsens with engine speed." A stethoscope confirms the noise is loudest at the rocker arm assembly. The MOST likely cause is:

A. A failed crankshaft main bearing producing crankshaft-speed noise at idle

B. A failing harmonic balancer producing rotational imbalance under all loads

C. Worn rocker arms, lifters, or pushrods producing camshaft-speed noise

D. A failed catalytic converter producing exhaust noise transmitted to the head

7. A vacuum gauge connected to a heavy-duty gasoline V8 produces a steady 19 in. Hg reading at idle, but drops to 12 in. Hg under steady cruise at 2,000 RPM and remains there. The MOST likely cause is:

A. Exhaust restriction creating backpressure that builds with sustained higher RPM

B. Worn valve guides producing irregular sealing under load conditions during operation

C. Normal engine response to load changes during typical highway operation conditions

D. A failed fuel pump unable to maintain pressure at higher engine demand

8. A LEAST-likely diagnostic step in evaluating a coolant loss complaint with no visible external leak is:

A. Pressure-testing the cooling system at the radiator filler neck location for leaks

B. Performing a combustion gas leak test using chemical indicator fluid testing

C. Inspecting the engine oil for milky appearance indicating coolant intrusion in the system

D. Replacing the radiator cap as the most likely cause without further testing

9. A heavy-duty gasoline truck has been brought in with multiple complaints: rough idle, hesitation off-idle, occasional stalling. Long-term fuel trim is at +20% on both banks. The MOST likely cause is:

A. A failed engine controller producing random fuel trim values across the system

B. A vacuum leak or PCV system contamination affecting both banks symmetrically

C. A failed fuel pump producing intermittent pressure drops affecting all conditions

D. A failed catalytic converter creating excessive backpressure during all conditions

10. A heavy-duty gasoline truck has been brought in with a "loss of power on grades when hot only." Live data captured during the symptom shows commanded ignition advance at 24° with knock retard at 11°. The MOST likely cause is:

A. Real detonation occurring under load — investigate fuel quality, carbon, or cooling

B. A failed knock sensor producing false detection signals continuously during operation

C. Normal operation with appropriate timing retard for the operating conditions

D. A failed engine controller commanding excessive timing retard during operation

11. The customer reports a Class 6 work truck "runs rough only when the air conditioning is engaged at idle." Disengaging the AC compressor immediately smooths the idle. The MOST likely cause is:

A. The PCM is failing to compensate for the AC load with throttle plate adjustment

B. The AC compressor has failed and is creating excessive parasitic load on engine

C. The serpentine belt is slipping when the AC compressor engages during operation

D. The AC compressor clutch is binding and not engaging properly during operation

12. A LEAST-likely cause of a sudden loss of power complaint on a heavy-duty gasoline truck is:

A. A clogged catalytic converter producing severe exhaust restriction during operation

B. Normal aging of the engine producing gradually reduced power over time

C. A failed turbocharger on a turbocharged application reducing intake charge volume

D. A failed mass airflow sensor reading low and reducing fuel delivery commands

13. The technician determines that a customer's heavy-duty gasoline truck requires a head gasket replacement. The customer asks if the repair "is really necessary." The MOST appropriate response is:

A. Tell the customer the repair is optional and they can decide based on cost considerations

B. Refuse to discuss the diagnosis with the customer until they pay for the diagnostic time

C. Tell the customer the repair must be done immediately or the truck will explode

D. Explain the consequences of continued operation with a head gasket failure clearly

14. A Class 6 work truck has been involved in a minor front-end collision. The customer reports the engine now overheats and the cooling fan does not engage. The MOST likely cause is:

A. Damage to the cooling fan electrical wiring or controller relay from the impact

B. The thermostat has failed coincidentally with the collision damage to the front end

C. The water pump impeller has been damaged by debris during the collision event

D. The engine controller has failed during the collision and requires immediate replacement

15. A cylinder head warpage measurement reveals 0.001 inch in all measured directions. OEM specification limits warpage to 0.003 inch per 6 inches of length. The technician should:

A. Send the head out for resurfacing despite the in-spec measurement results

B. Replace the head as a preventive measure based on age and prior service

C. Reuse the head as the warpage is well within OEM service specifications

D. Apply RTV silicone to compensate for any minor warpage during reassembly

16. A LEAST-likely consequence of insufficient valve margin on an exhaust valve is:

A. Inadequate heat transfer from valve face to seat causing valve burning over time

B. Reduced valve life from sustained operation under heavy load conditions

C. Possible valve failure during sustained operation under heavy load conditions

D. Improved cylinder sealing due to the reduced valve mass and faster closing speeds

17. Technician A says torque-to-yield head bolts can be reused if measured length is within specification. Technician B says torque-to-yield head bolts must be replaced after every removal. 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

18. A timing belt replacement on a Class 4 truck with an OHC gasoline engine has just been completed. After installation, the engine cranks but will not start. Compression test results show all cylinders at 30 psi. The MOST likely cause is:

A. The timing belt is installed off by multiple teeth, causing valve-to-piston damage

B. The fuel pump has failed during the timing belt replacement procedure performed

C. The ignition system has been damaged during the timing belt replacement service

D. The cylinder head warpage has occurred from the timing belt replacement work

19. A piston-to-cylinder wall clearance measurement produces 0.0040 inch. OEM specification is 0.0010 to 0.0030 inch. The MOST appropriate action is:

A. Reuse the existing piston with the current cylinder bore as-is during reassembly

B. Install a thicker connecting rod bearing to compensate for the clearance during operation

C. Bore the cylinder oversize and install a corresponding oversize piston during repair

D. Apply assembly lubricant generously to compensate for the gap during operation

20. Plastigage on a connecting rod bearing produces a width corresponding to 0.0008 inch clearance. OEM specification is 0.0010 to 0.0026 inch. The technician should:

A. Verify the journal and bearing dimensions to identify the cause of tight clearance

B. Reinstall the bearing as the clearance is acceptable for service operation

C. Apply additional assembly lubricant during installation to improve clearance

D. Tighten the connecting rod bolt beyond specification to widen the clearance

21. A LEAST-likely cause of bottom-end engine knocking on a heavy-duty gasoline V8 is:

A. Worn connecting rod bearings on one or more cylinders affected during operation

B. Worn main bearings allowing crankshaft movement under heavy load conditions

C. A failing oxygen sensor providing incorrect feedback to the controller during operation

D. A loose flywheel that has lost retention bolt torque specification entirely

22. A connecting rod that has been bent due to valve-to-piston contact MOST likely:

A. Can be reused as-is since the engine has already been disassembled for inspection

B. Requires only the rod bearing to be replaced before reassembly during repair

C. Should be heated and bent back to the correct alignment in the shop equipment

D. Must be replaced or reconditioned by a qualified machine shop facility

23. Oil pressure on a 6.4L HEMI measures 12 psi at hot idle and 35 psi at 2,000 RPM. OEM specification is 25–40 psi at idle and 50–65 psi at 2,000 RPM. The MOST likely cause is:

A. Worn engine bearings increasing the cumulative clearance volume the pump must fill

B. Wrong viscosity oil that is too thin for the operating temperature conditions

C. A failed oil pump producing inadequate pressure under all operating conditions

D. A clogged oil filter forcing oil through the bypass valve continuously during operation

24. A heavy-duty gasoline truck overheats only after extended idling in hot weather. Highway operation produces normal temperatures. Cooling fan, water pump, and thermostat all test within specification. The MOST likely cause is:

A. A clogged radiator that requires immediate replacement before further operation

B. Normal operating limits being exceeded due to the demanding hot-idle duty cycle

C. Air pockets in the cooling system from a recent service procedure performed

D. A failed cooling fan clutch that does not engage during idle conditions specifically

25. The MOST appropriate response when a customer requests "any oil" be installed in a heavy-duty gasoline truck to save money is to:

A. Use the cheapest available oil since all oils provide similar protection regardless

B. Mix half OEM-specified oil with half generic oil to achieve a cost compromise solution

C. Use the OEM-specified oil regardless of customer cost concerns and explain why required

D. Use the OEM-specified oil and explain the cost of damage from incorrect oil to customer

26. A coil-on-plug ignition coil shows a primary winding resistance of 1.2 ohms. OEM specification is 0.4 to 0.8 ohms. The reading indicates:

A. A normal reading that requires no further investigation or service action

B. A shorted primary winding requiring immediate replacement to prevent damage

C. An open or high-resistance condition in the primary winding requiring replacement

D. The need to test the secondary winding before any replacement decision is made

27. Two technicians discuss spark plug heat range. Technician A says cold plugs transfer heat from the electrode to the cylinder head more quickly than hot plugs. Technician B says heavy-duty truck applications generally use plugs in the mid-to-cold heat range. 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

28. A LEAST-likely cause of an intermittent misfire on multiple cylinders during cold start that disappears when warm is:

A. Hydraulic lifters that have bled down during the engine-off period of operation

B. Spark plug carbon tracking that conducts more readily when the porcelain is cool

C. Fuel injectors with deposits that affect spray pattern when fuel is cold

D. A failed engine controller producing intermittent firing commands continuously

29. A heavy-duty gasoline truck has been diagnosed with a failed coil pack on cylinder 5. The technician swaps the cylinder 5 coil with cylinder 8. After clearing codes and driving, the misfire moves to cylinder 8. The MOST likely conclusion is:

A. The original cylinder 5 ignition coil is defective and produces misfire when relocated

B. Both cylinders had failing coils that produced misfire at different operating conditions

C. The PCM has failed and is misreporting cylinder location randomly across the engine

D. The cylinder 5 spark plug is defective and produces misfire when relocated to cylinder 8

30. A LEAST-likely cause of a no-spark condition with normal cranking on a coil-on-plug equipped V8 is:

A. A failed crankshaft position sensor producing no signal during cranking attempts

B. A failed mass airflow sensor providing incorrect airflow data to the controller

C. A failed PCM unable to send firing signals to any of the eight ignition coils

D. A failed ignition switch preventing power supply to the entire ignition system

31. A spark plug shows a small bridge of conductive material between the center electrode and the ground electrode. The MOST likely cause is:

A. Pre-ignition damage requiring engine teardown for inspection of internals immediately

B. A rich fuel mixture caused by a sticking fuel injector on that cylinder location

C. Normal high-mileage wear that requires no further action at this time during operation

D. Carbon or oil bridging the gap, often from fuel quality or oil consumption issues

32. A heavy-duty gasoline truck has fuel pressure of 35 psi at idle and 35 psi at WOT on a return-style fuel system. OEM specification is 35 psi at idle and 45 psi at WOT (with vacuum disconnected). The MOST likely cause is:

A. A vacuum line missing or disconnected from the fuel pressure regulator port

B. A failed fuel pressure regulator allowing maximum pressure under all conditions

C. A clogged fuel filter restricting flow throughout the entire fuel delivery system

D. A failed fuel pressure sensor providing incorrect signal data to the controller

33. A heavy-duty gasoline truck has set DTC P0103 (MAF Sensor Circuit High Voltage). A scan tool reads 5.0 V at idle and 5.0 V at WOT. The MOST likely cause is:

A. The MAF sensor is reading correctly with high airflow at idle indicated continuously

B. The MAF sensor is reading correctly with low airflow at WOT indicated continuously

C. The MAF sensor or its wiring has an open or short to power circuit fault

D. The PCM is failing to read the MAF signal correctly at all engine speeds

34. The MOST appropriate response to an exhaust backpressure measurement of 0.8 psi at idle on a heavy-duty gasoline truck is:

A. Replace the catalytic converter as a preventive measure for the borderline reading

B. Replace the muffler as a preventive measure for the borderline reading found

C. Schedule the truck for catalytic converter replacement at the next service

D. Accept the reading as within the typical 1.5 psi maximum at idle specification

35. A LEAST-likely cause of a P0171 (System Too Lean, Bank 1) DTC is:

A. A leaking fuel pressure regulator dumping fuel into the manifold causing rich mixture

B. A vacuum leak at the bank 1 intake manifold gasket sealing surface area

C. A clogged fuel injector on bank 1 reducing fuel delivery to that bank only

D. An exhaust leak ahead of the bank 1 upstream oxygen sensor location

36. A heavy-duty gasoline truck has reduced power and a glowing-red exhaust manifold under heavy load. The MOST likely cause is:

A. A vacuum leak at the intake manifold gasket sealing surface area

B. A failed mass airflow sensor providing incorrect signal data continuously

C. A plugged catalytic converter creating excessive exhaust system backpressure

D. A loose or cracked accessory drive belt slipping during heavy load conditions

37. Technician A says GDI fuel rail pressures can exceed 2,000 psi during normal operation. Technician B says GDI systems require pressure relief through OEM-specified procedures before service work begins. 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

38. A heavy-duty gasoline truck has set DTC P0455 (Gross EVAP Leak Detected). The technician's FIRST diagnostic step should be to:

A. Replace the EVAP canister based on the gross leak code presence in the system

B. Inspect the fuel cap for proper seating, condition, and sealing surface integrity

C. Replace the purge valve solenoid as the most common gross leak cause

D. Replace the fuel cap regardless of inspection findings to address the code

39. An EGR valve commanded 50% open by the scan tool produces a 75 RPM idle drop. The MOST likely interpretation is:

A. The EGR valve is functioning correctly with proper exhaust gas flow occurring

B. The EGR valve is mechanically stuck and not responding to controller commands

C. The EGR passages are blocked with carbon preventing actual exhaust gas flow

D. The PCM is failing to send the bidirectional command signal correctly to the valve

40. The downstream oxygen sensor on a healthy converter at steady-state cruise should produce:

A. A signal that switches rapidly between rich and lean values continuously

B. A signal that mirrors the upstream sensor's switching pattern across all conditions

C. A relatively flat signal due to oxygen storage capacity buffering exhaust composition

D. A signal that varies randomly with no consistent pattern in any conditions

41. The federal Clean Air Act prohibits a technician from performing which of the following?

A. Installing an OEM-equivalent catalytic converter on a vehicle requiring a converter

B. Installing a "delete tune" that disables the EGR system or catalyst monitoring

C. Installing an OEM-equivalent oxygen sensor on a vehicle requiring a sensor replacement

D. Installing an aftermarket air filter that meets OEM filtration standards on a vehicle

42. A heavy-duty gasoline truck has set DTC P0420 (Catalyst Efficiency Below Threshold). The downstream oxygen sensor signal mirrors the upstream sensor switching almost identically during steady cruise. This pattern indicates:

A. The downstream sensor has failed and is incorrectly reporting converter status

B. The upstream sensor is reading rich and the downstream sensor is reading correctly

C. The catalytic converter has lost its oxygen storage capacity and requires replacement

D. Normal converter operation with proper oxygen storage capacity intact during cruise

43. A scan tool reads "PCM communication lost" intermittently during operation. The MOST likely cause is:

A. Network communication issue — investigate CAN bus voltage, terminating resistance

B. The PCM has failed and requires immediate replacement service before further driving

C. The scan tool battery is low and needs to be replaced before continuing diagnosis

D. The fuel pump has failed and is causing power supply issues to the PCM during operation

44. A bidirectional command from the scan tool causes the EGR valve to cycle audibly. Exhaust gas analysis shows no change in NOx levels. The MOST likely cause is:

A. The EGR valve is functioning correctly with proper exhaust gas flow during cycling

B. The scan tool is producing false bidirectional command signals to the EGR valve

C. The EGR valve position sensor has failed and is providing incorrect feedback signal

D. The EGR valve is opening but the EGR passages are blocked with carbon deposits

45. A reprogramming session on a heavy-duty gasoline truck PCM shows "Battery Voltage Low" message before installation. The MOST likely cause is:

A. The PCM has failed before the reprogramming session could begin properly working

B. The vehicle battery voltage is below the minimum required for safe reprogramming

C. The selected calibration file does not match the vehicle's VIN-specific configuration

D. The scan tool is incompatible with this generation of vehicle architecture used

46. A J1939 SPN/FMI code shows SPN 91 (Accelerator Pedal Position 1) with FMI 4 (Voltage Below Normal). The MOST likely cause is:

A. The accelerator pedal sensor 1 is producing low voltage from a short to ground or sensor failure

B. The accelerator pedal is being depressed beyond the normal operating range continuously

C. The PCM has failed and is misreading the accelerator pedal sensor signal during operation

D. The accelerator pedal sensor 2 has failed in the high voltage state requiring replacement

47. A LEAST-likely cause of multiple unrelated DTCs across many control modules is:

A. A network communication issue affecting bus traffic between modules at all times

B. A PCM power supply problem causing intermittent module operation across systems

C. A faulty PCM ground connection producing erratic module behavior across systems

D. A single failed engine coolant temperature sensor on the engine control module only

48. A scan tool live data display shows commanded throttle position at 25% and actual TPS feedback at 26%. Engine RPM responds correctly to the throttle command. The MOST likely interpretation is:

A. The throttle is responding correctly within typical bidirectional control tolerance

B. The throttle motor has failed and cannot move the plate to the commanded position

C. The TPS sensors have failed and are not reading the throttle plate position correctly

D. The PCM has failed and is sending incorrect commands to the throttle motor system

49. After replacing a transmission on a heavy-duty gasoline truck, the customer returns with harsh shifts. The MOST likely cause is:

A. The new transmission has a defect and requires immediate warranty replacement

B. The PCM has failed during the transmission replacement procedure performed

C. The transmission adapt reset procedure was not performed after the replacement

D. The wrong transmission fluid was installed during the transmission replacement

50. CAN High measures 0 V and CAN Low measures 0 V with the engine running. The vehicle has multiple U-codes and complete network communication failure. The MOST likely cause is:

A. Both CAN High and CAN Low are shorted to ground or power is missing entirely

B. The bus is in the recessive idle state with normal voltage levels at rest

C. Normal CAN bus operation during heavy message traffic across the network

D. The bus is operating correctly and the U-codes are spurious from scan tool error

PRACTICE EXAM 14: ANSWER KEY AND EXPLANATIONS

1. C — A misfire DTC identifies which cylinder is affected, but not why. The technician must test compression, ignition, and fuel delivery on cylinder 3 to identify the root cause. Replacing components based solely on the DTC location wastes parts and frequently fails to resolve the underlying issue.

2. A — A vacuum gauge reading loses approximately 1 in. Hg per 1,000 feet of elevation. At 4,000 feet, the normal 17–22 in. Hg range drops by about 4 in. Hg, making 17 in. Hg consistent with healthy operation at altitude. Always adjust expected vacuum readings for elevation before drawing diagnostic conclusions.

3. D — Operating-condition specifics (hot, cold, load conditions) are the most diagnostic interview information. Stalls only when coming to a stop suggest specific operating conditions — possibly idle air control, fuel system thermal effects, or transmission torque converter issues. Vague questions about fuel grade, mileage, or parking location rarely contribute.

4. B — A failed catalytic converter is an exhaust system component, not a source of engine oil leakage. Oil migrating to the bell housing originates from oil-bearing engine components — valve covers, intake manifolds, oil pans. The catalytic converter has no oil pathway to leak.

5. A — A weak cylinder with normal compression points to ignition or fuel delivery — not mechanical issues. Compression is healthy, ruling out rings, valves, and head gasket. The diagnostic next steps focus on spark verification at that cylinder and injector function testing.

6. C — Ticking noise loudest at the rocker arm assembly with stethoscope confirmation is camshaft-speed valve train noise. Worn rocker arms, lifters, or pushrods produce this signature pattern. The location at the rocker assembly directly identifies the failure area.

7. A — A vacuum reading that drops under sustained higher RPM and stays low indicates exhaust restriction. As exhaust gas volume increases, backpressure builds and reduces effective intake vacuum. Healthy exhausts maintain vacuum across the operating range without sustained drops.

8. D — Replacing the radiator cap without further testing is not a diagnostic step — it is a guess. Proper diagnosis includes pressure-testing, combustion gas leak testing, and inspecting oil for coolant contamination. Component replacement without verification wastes parts and rarely resolves the actual issue.

9. B — Multiple driveability complaints with both-bank +20% LTFT indicates a common-cause issue affecting fuel mixture across the entire engine. Vacuum leaks or PCV system contamination produce this symptom pattern. Bank-specific causes would produce bank-specific imbalance; controller failures don't typically produce systematic positive trim values.

10. A — 11° of knock retard during loss of power confirms real detonation occurring under load. The controller is responding correctly by reducing timing to protect the engine. The underlying cause must be investigated — fuel quality, carbon buildup, cooling system performance, or other detonation-promoting conditions.

11. A — When idle smooths immediately upon AC compressor disengagement, the engine itself is healthy — the controller is failing to compensate for the AC parasitic load. Modern PCMs should adjust throttle position to maintain idle when accessory loads engage. Failure to compensate produces idle drop or rough running specifically when AC engages.

12. B — Sudden loss of power is, by definition, a sudden event — not the gradual decline of normal aging. Sudden symptoms trace to specific component failures: clogged converter, failed turbocharger, or MAF sensor failure that occurs at a specific moment. Gradual aging produces gradual power loss, not sudden complaints.

13. D — Customers deserve clear explanation of what their truck needs and why. Explaining the consequences of continued operation with a head gasket failure (further damage, complete engine failure) helps the customer make an informed decision. Refusing to discuss, treating the repair as optional, or using fear tactics ("explode") are all unprofessional responses.

14. A — Recent collision damage points first to physical damage of the cooling system components. Wiring harnesses to fan motors, relays, and sensors are common collision casualties. Investigating impact-related damage before pursuing internal component failures is the appropriate diagnostic sequence.

15. C — 0.001 inch is well below the 0.003 inch per 6 inches OEM tolerance, meaning the head is within service specification. Resurfacing or replacing components within spec is wasteful and unprofessional. RTV silicone is incorrect for sealing surface compensation.

16. D — Insufficient valve margin does not improve cylinder sealing. The valve runs hotter, transfers insufficient heat to the seat, and burns over time. The other listed consequences (inadequate heat transfer, reduced valve life, valve failure under heavy load) are all real consequences of insufficient margin.

17. B — Technician B is correct; Technician A is wrong. TTY bolts stretch into the elastic-plastic transition zone during installation and cannot be reused regardless of length measurement. Once stretched, the bolt's clamping characteristics are altered. Reusing TTY bolts is a common cause of premature head gasket failure.

18. A — All cylinders showing 30 psi compression after timing belt replacement strongly indicates the belt was installed off by multiple teeth, causing valve-to-piston damage in an interference engine. The damaged valves no longer seal, producing universal compression loss. This is a common failure scenario in OHC interference engines.

19. C — 0.0040 inch clearance exceeds the 0.0030 inch maximum specification. The cylinder must be bored oversize and a corresponding oversize piston installed to restore proper clearance. Reusing the existing piston, installing wrong components, or applying excess lubricant are all incorrect responses.

20. A — Tight clearance below the minimum specification (0.0008 inch vs. 0.0010 inch minimum) requires investigation. The journal and bearing inside diameter must be measured to identify whether the journal is oversize, the bearing is undersize, or wrong components are mismatched. Tight clearance can cause inadequate oil film and bearing failure.

21. C — A failing oxygen sensor affects fuel mixture and emissions, not mechanical bottom-end noise. Bottom-end knocking originates from rotating assembly mechanical issues — rod bearings, main bearings, loose flywheel. The oxygen sensor has no mechanical relationship to bearing-area noise.

22. D — Bent connecting rods from valve-to-piston contact are typically replaced or sent to a qualified machine shop for reconditioning. Reconditioning involves machining the cap parting surface and resizing the big end. Field-bending or reusing as-is leads to rapid bearing failure and engine damage.

23. A — Low oil pressure at hot idle on an engine, with normal pressure not reached at higher RPM, points to worn engine bearings increasing the cumulative clearance volume. The pump cannot fill the increased clearance fast enough at low pump speeds. This is the classic high-mileage wear pattern.

24. B — When all individual cooling components test within specification but overheating occurs only during the most demanding duty cycle (extended idling in hot weather), the cooling system is at its design limit for that duty cycle. Severe-duty cooling packages or load-appropriate vehicle selection address this; replacing in-spec components doesn't.

25. D — Using OEM-specified oil and explaining the cost of damage from incorrect oil is the proper professional response. Wrong-specification oil can damage emissions controls, accelerate bearing wear, and void warranty coverage. The cost of correct oil is far less than the cost of damage from incorrect oil.

26. C — Primary winding resistance of 1.2 ohms exceeds the 0.8 ohm maximum specification. The high reading indicates an open or partially-open winding that cannot deliver full primary current to the magnetic core. The coil cannot produce normal secondary voltage and must be replaced.

27. A — Both technicians are correct. Cold plugs have a shorter insulator path that transfers heat from electrode to head more quickly, running cooler. Heavy-duty truck applications use mid-to-cold

heat range plugs because of the sustained heavy duty cycles that demand faster heat transfer to prevent pre-ignition.

28. D — A failed engine controller does not produce intermittent firing commands; it would produce continuous problems or no operation. Intermittent cold-start misfires that clear when warm trace to bled-down lifters, plug carbon tracking on cold porcelain, or cold injectors with deposit-affected spray patterns. Random PCM failure is not the cause.

29. A — When the misfire follows the swapped coil to its new location, the coil is the defective component. The original cylinder 5 coil now in the cylinder 8 position is causing the cylinder 8 misfire. The swap-and-watch technique definitively confirms the coil as the cause, justifying its replacement.

30. B — A failed MAF sensor affects fuel mixture, not ignition spark generation. No-spark conditions trace to CKP signal loss, ignition switch failures, PCM failures affecting coil output drivers, or coil power supply issues. The MAF sensor's role is in fuel calculation, not spark delivery.

31. D — A bridge of conductive material between the center and ground electrodes is typically carbon or oil bridging the gap. The cause is fuel quality or oil consumption — material that builds up in the gap and creates a low-resistance path that prevents proper sparking. The fouling clears when the underlying cause is addressed.

32. A — Constant 35 psi at idle and WOT on a return-style system indicates the regulator is not receiving its vacuum reference. With vacuum disconnected (or missing), the regulator should hold the higher base pressure (45 psi). 35 psi at all conditions matches the vacuum-applied pressure setting, suggesting the vacuum line is missing or has fallen off the regulator.

33. C — Constant 5.0 V output regardless of engine condition indicates an open or short-to-power circuit fault in the MAF sensor or its wiring. A healthy MAF produces a voltage that varies with airflow. The constant maximum voltage means no current is flowing through the sensing element correctly.

34. D — 0.8 psi at idle is well below the 1.5 psi maximum specification, indicating a healthy exhaust system. There is no service requirement for readings within specification. Replacing the converter or muffler as preventive measures based on within-spec readings is unjustified and wasteful.

35. A — A leaking fuel pressure regulator dumps fuel into the manifold, producing a rich condition (negative fuel trim), not a lean one. The other listed causes — vacuum leaks, clogged injectors, exhaust leaks ahead of the upstream sensor — all produce or contribute to the lean condition characteristic of a P0171 DTC.

36. C — Glowing-red exhaust manifolds combined with reduced power is the textbook symptom set for a plugged catalytic converter. Backpressure prevents proper cylinder scavenging, traps heat in the manifold, and the engine cannot exhaust efficiently. Backpressure testing confirms this diagnosis.

37. D — Both technicians are correct. GDI fuel rail pressures can exceed 2,000 psi during normal operation, dramatically higher than port injection systems (35–60 psi). GDI systems require pressure relief through OEM-specified procedures before service to prevent injury from injected fuel. Both statements reflect critical GDI service safety considerations.

38. B — The first diagnostic step for a P0455 (gross EVAP leak) DTC is inspecting the fuel cap. A loose or damaged fuel cap is the most common cause of gross leaks. Replacing the cap, canister, or purge valve without first identifying the actual leak location is wasteful and may not address the actual cause.

39. A — A 75 RPM idle drop in response to commanded EGR opening indicates the valve is opening AND exhaust gas is actually flowing into the intake manifold. The idle is destabilized by the exhaust dilution, which is the expected response. The system is functioning correctly.

40. C — A healthy converter has oxygen storage capacity that buffers the downstream signal, keeping it relatively flat. The converter "stores" oxygen during lean phases and releases it during rich phases, smoothing the downstream signal. This is the OBD-II monitoring strategy for catalyst efficiency.

41. B — The Clean Air Act prohibits installing "delete tunes" that disable emissions controls or monitors. Installing OEM-equivalent catalytic converters and oxygen sensors are legal service operations. Aftermarket air filters that meet OEM filtration standards are not regulated emissions modifications. The delete tune is the regulated tampering activity.

42. C — A downstream sensor mirroring the upstream sensor's switching pattern indicates the converter has lost its oxygen storage capacity. A healthy converter buffers exhaust composition variations, producing a flat downstream signal. Loss of buffering capacity confirms catalytic converter failure.

43. A — Intermittent "PCM communication lost" messages typically trace to network communication issues — CAN bus voltage problems, terminating resistance issues, or wiring damage. Verifying CAN bus integrity through voltage measurement and resistance testing is the appropriate diagnostic step. PCM replacement or fuel pump issues are not the typical cause.

44. D — A cycling EGR valve with no NOx change indicates the valve is mechanically opening but the EGR passages are blocked. Carbon accumulation in the EGR ports prevents exhaust gas from actually reaching the intake manifold even when the valve is fully open. This is one of the most common high-mileage EGR-related issues.

45. B — A "Battery Voltage Low" message before reprogramming indicates the vehicle battery voltage is below the minimum required for safe reprogramming. The technician must connect a battery maintainer or charge the battery before proceeding. PCM failure, scan tool incompatibility, and calibration mismatch produce different error messages.

46. A — SPN 91 identifies accelerator pedal position 1; FMI 4 identifies "Voltage Below Normal." The combination indicates the APP1 sensor circuit is reading low voltage, typically caused by a short to ground in the wiring or a sensor failure. The signal characteristic is the diagnostic information, not actual pedal position.

47. D — A single failed sensor produces one DTC related to that sensor's circuit, not multiple unrelated codes across many modules. Multiple-module DTC patterns point to network or PCM ground/power issues that affect communication or operation across the entire vehicle system.

48. A — A 1° difference between commanded (25%) and actual (26%) throttle position is within typical bidirectional control tolerance. Modern ETC systems do not require perfect agreement — small variations are expected and accepted. RPM responding correctly to the throttle command confirms the system is functional.

49. C — Modern PCM-controlled transmissions require an adapt reset after replacement to allow the controller to learn the new transmission's shift characteristics. Without the reset, the controller continues commanding shifts based on the previous transmission's learned values, producing harsh or improperly-timed shifts.

50. A — Both CAN High and CAN Low at 0 V with complete network failure indicates both wires are shorted to ground or the power supply to the bus is missing entirely. Healthy CAN buses sit at approximately 2.5 V on both wires when idle. Zero voltage on both wires is the textbook signature of a powered-down or grounded bus.