

# PRACTICE EXAM 19: ASE T1

## GASOLINE ENGINES SIMULATION

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1. Two technicians discuss a heavy-duty gasoline truck with rough idle and lean fuel trim DTCs on both banks. Technician A says replacing the upstream oxygen sensors will resolve the symptom. Technician B says investigating common-cause issues like vacuum leaks or PCV contamination is the appropriate first step. Who is correct?

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

2. A vacuum gauge on a 6.0L Vortec at idle reads 17 in. Hg. The vehicle is operating at 2,000 feet elevation. The reading is:

- A. Above normal indicating possible improper sensor calibration during operation
- B. Within normal range when adjusted for altitude — typical operating values
- C. Indeterminate without specific OEM specifications for the engine and altitude
- D. Below normal indicating exhaust restriction requiring immediate investigation

3. Two technicians discuss diagnostic philosophy. Technician A says verifying the customer complaint is essential before diagnostic testing. Technician B says skipping verification because the symptom is "obvious" leads to comeback work. Who is correct?

- A. Both Technician A and Technician B
- B. Technician A only

C. Technician B only

D. Neither Technician A nor Technician B

4. A LEAST-likely cause of an oil consumption complaint on a heavy-duty gasoline truck with no visible external leak is:

A. Worn piston rings allowing oil past during cylinder pressurization events

B. Worn valve guides allowing oil to be drawn into the combustion chamber

C. A failed catalytic converter creating excessive backpressure under load conditions

D. Failed valve stem seals allowing oil to seep past during engine-off conditions

5. A power balance test on a heavy-duty gasoline V8 shows cylinder 5 produces 35 RPM less drop than the average. Compression on cylinder 5 is within OEM specification 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. Two technicians discuss noise diagnosis using a stethoscope. Technician A says noise loudest at the rocker arm assembly indicates valve train wear. Technician B says noise loudest at the bottom of the engine block indicates rotating assembly wear. 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

7. The customer reports a Class 4 truck "stalls when warm only" and restarts immediately after stalling. The MOST diagnostic interview question is:

- A. What grade of fuel does the customer typically purchase from the gas station?
- B. How long has the symptom been occurring and has it gotten worse over time?
- C. How many miles does the truck currently have on the odometer at this time?
- D. Where is the truck typically parked when not in active service operation today?

8. A LEAST-likely cause of a coolant loss complaint with no visible external leak on a high-mileage 7.3L Godzilla is:

- A. A head gasket failure allowing coolant into a combustion chamber during operation
- B. A cracked cylinder head allowing coolant into the cylinder during operation
- C. An intake manifold gasket leak where coolant passages cross sealing surfaces
- D. A failed mass airflow sensor providing incorrect signal data continuously

9. A vacuum gauge connected to a 6.4L HEMI produces a steady 19 in. Hg at idle. A snap-throttle test produces a brief drop to 5 in. Hg with immediate recovery. The pattern indicates:

- A. Normal engine response during throttle changes with healthy vacuum recovery
- B. An exhaust restriction creating excessive backpressure during all conditions
- C. Worn valve guides producing irregular sealing throughout the operating range
- D. A failed fuel pump unable to maintain pressure at higher engine demand

10. A heavy-duty gasoline truck has a "loss of power on grades when hot" complaint. Live data shows commanded ignition advance at 22° with knock retard at 10°. 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. Two technicians discuss a heavy-duty gasoline truck with sudden loss of power. Technician A says sudden loss of power points to specific component failures (clogged converter, failed turbo, MAF sensor failure). Technician B says sudden loss of power is the result of normal aging. Who is correct?

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

12. 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 failed fuel pump producing intermittent pressure drops affecting all conditions
- C. A vacuum leak or PCV system contamination affecting both banks symmetrically
- D. A failed catalytic converter creating excessive backpressure during all conditions

13. The MOST appropriate response to a customer who reports a fluid leak under a heavy-duty gasoline truck is to:

- A. Identify the fluid type and trace the leak to its source before any repair quote
- B. Replace the most commonly leaking component based on age of the vehicle
- C. Tell the customer to add fluid as needed and return when the truck is empty
- D. Quote the customer for a complete engine teardown to find the leak source

14. A heavy-duty gasoline truck has set DTC P0301 (Cylinder 1 Misfire). The technician swaps the cylinder 1 ignition coil with cylinder 8 and clears the codes. After driving, the new misfire code is P0308 (Cylinder 8 Misfire). The MOST likely conclusion is:

- A. Both cylinders had failing coils that produced misfire at different operating conditions
- B. The PCM has failed and is misreporting cylinder location randomly across the engine
- C. The original cylinder 1 spark plug is defective and requires immediate replacement
- D. The original cylinder 1 ignition coil is defective and produces misfire when relocated

15. Two technicians discuss cylinder head warpage measurement. Technician A says warpage exceeding spec in any direction requires resurfacing. Technician B says warpage measured by averaging multiple readings determines whether resurfacing is required. Who is correct?

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

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

- A. Improved cylinder sealing due to the reduced valve mass and faster closing speeds
- B. Inadequate heat transfer from valve face to seat causing valve burning over time
- C. Reduced valve life from sustained operation under heavy load conditions
- D. Possible valve failure during sustained operation under heavy load conditions

17. Two technicians discuss torque-to-yield (TTY) head bolt service. Technician A says TTY bolts can be reused if measured length is within specification. Technician B says TTY bolts must be replaced after every removal. Who is correct?

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

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. Apply assembly lubricant generously to compensate for the gap during operation
- D. Bore the cylinder oversize and install a corresponding oversize piston during repair

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. Reinstall the bearing as the clearance is acceptable for service operation conditions
- B. Verify the journal and bearing dimensions to identify the cause of tight clearance
- C. Apply additional assembly lubricant during installation to improve clearance margin
- 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. Must be replaced or reconditioned by a qualified machine shop facility
- B. Can be reused as-is since the engine has already been disassembled for inspection
- C. Requires only the rod bearing to be replaced before reassembly during repair
- D. Should be heated and bent back to the correct alignment in the shop equipment

23. Oil pressure on a 7.3L Godzilla measures 25 psi at hot idle and 50 psi at 2,000 RPM. OEM specification is 15–30 psi at idle and 40–60 psi at 2,000 RPM. The reading indicates:

- A. Worn engine bearings increasing the cumulative clearance volume the pump must fill
- B. A pressure relief valve sticking closed at the maximum pressure setting condition
- C. A failed oil pump producing inadequate pressure under operating temperature

D. The engine is operating within OEM specifications at both operating conditions

24. A heavy-duty gasoline truck has been topped off with the wrong coolant chemistry — IAT (green) added to a system originally filled with OAT (orange). The MOST likely consequence is:

A. The cooling system will operate normally with no measurable consequences

B. A gel-like precipitate may form, clogging heater cores, radiator tubes, and water jackets

C. The cooling system will produce improved heat transfer due to chemistry blend

D. The coolant will provide enhanced corrosion protection due to combined inhibitors

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. Install the OEM-specified oil and explain the consequences of incorrect oil to customer

B. Install whatever oil the customer requests since they are paying for the service performed

C. Install half OEM-specified and half generic oil as a compromise to satisfy the customer

D. Install the cheapest available oil since most modern oils provide similar protection

26. A coil-on-plug coil's primary winding measures 0.6 ohms. OEM specification is 0.4 to 0.8 ohms. The reading indicates:

A. The coil should be replaced as a preventive measure since reading is at maximum

B. The coil should be replaced because primary resistance cannot be reliably measured

C. The coil should be replaced along with all other coils as a maintenance procedure

D. The coil is within specification — no service is required at this time

27. A spark plug shows light tan deposits on the porcelain insulator with a small black ring at the base of the insulator near the threads. The MOST likely cause is:

- A. Normal combustion conditions with carbon accumulation from extended service
- B. Rich fuel mixture caused by a sticking fuel injector on that cylinder location
- C. Pre-ignition damage from incorrect heat range selection during recent service
- D. Oil entering the combustion chamber through worn rings or valve seals

28. Two technicians discuss DIS waste-spark ignition systems. Technician A says the waste-spark fires during the exhaust stroke of the paired cylinder. Technician B says the waste-spark requires almost no energy because cylinder pressure is low. 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

29. A heavy-duty gasoline truck has a no-spark condition with normal cranking. CKP signal is verified present. Power is verified at all eight ignition coils. The MOST likely cause is:

- A. The PCM is failing to ground the primary circuits of the ignition coils
- B. The crankshaft position sensor has failed even though signal appears present
- C. All eight ignition coils have failed simultaneously requiring full replacement
- D. The fuel pump has failed and is preventing engine startup despite spark capability

30. Two technicians discuss spark plug heat range. Technician A says hot plugs run at higher tip temperatures than cold plugs. Technician B says cold plugs are recommended for engines that operate under sustained heavy load. 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

31. A LEAST-likely cause of a misfire that occurs only at idle and disappears at higher engine speeds is:

- A. A vacuum leak that has greatest effect at idle when total airflow is low
- B. A spark plug with carbon tracking on the cool porcelain surface at idle conditions
- C. A failing ignition coil that produces weaker spark only during low-cylinder-pressure idle
- D. A clogged fuel injector that produces inadequate spray pattern during low fuel demand

32. Two technicians discuss fuel pump diagnosis. Technician A says a pump producing correct pressure but inadequate volume points to pump wear. Technician B says a pump producing inadequate pressure but correct volume points to a fuel pressure regulator failure. 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

33. A heavy-duty gasoline truck has fuel pressure of 28 psi at idle. OEM specification is 55 psi at idle on this returnless system. Volume delivery test shows 1/3 quart in 30 seconds when 1/2 quart is specified. The MOST likely cause is:

- A. The fuel pump has worn and lost both pressure and volume capacity over time
- B. The fuel filter has become clogged and is restricting flow to the entire system
- C. The fuel pressure regulator has failed at maximum pressure setting condition
- D. A leaking injector is dumping fuel into the combustion chamber at idle conditions

34. A LEAST-likely symptom of a vacuum leak at the intake manifold gasket is:

- A. Positive long-term fuel trim values that are most pronounced at idle conditions
- B. A hissing sound near the intake manifold that varies with engine speed during operation
- C. Improved engine performance under heavy load conditions due to better airflow
- D. Rough idle that smooths out at higher engine speeds with the vacuum leak present

35. A turbocharged Class 5 work truck has set DTC P0234 (Turbocharger Overboost Condition). Boost pressure tests at 18 psi when OEM specification is 12 psi maximum. The MOST likely cause is:

- A. A wastegate that is stuck closed and not opening at the commanded pressure
- B. A worn turbocharger compressor wheel reducing efficiency at high boost levels
- C. A clogged air filter restricting flow to the compressor inlet throughout operation
- D. A clogged intercooler restricting flow to the engine throughout operation

36. The MOST diagnostic single test for confirming a plugged catalytic converter is to:

- A. Visually inspect the converter substrate through the rear of the unit at the tailpipe
- B. Measure exhaust backpressure at the upstream oxygen sensor port location

- C. Tap the converter with a rubber mallet to listen for internal rattle in the unit
- D. Replace the converter as a preventive measure based on age and mileage of vehicle

37. A scan tool live data display shows the MAF sensor reading 2.5 g/sec at idle (specification 4.0–6.0 g/sec) and 65 g/sec at WOT (specification 95–115 g/sec). The customer complains of poor performance. The MOST likely cause is:

- A. The MAF sensor is contaminated, aged, or has a signal issue producing low readings
- B. The intake air filter is producing recognized airflow restriction continuously
- C. The PCM has failed and is misreading the MAF sensor signal at all engine speeds
- D. The MAF sensor is reading correctly with low airflow at all operating conditions

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

- A. A vacuum leak at the bank 1 intake manifold gasket sealing surface area
- B. A clogged fuel injector on bank 1 reducing fuel delivery to that bank only
- C. An exhaust leak ahead of the bank 1 upstream oxygen sensor location
- D. A leaking fuel pressure regulator dumping fuel into the manifold causing rich condition

39. A heavy-duty gasoline truck has set DTC P0442 (Small EVAP Leak Detected). A smoke test produces smoke escaping around the gas cap area. The MOST appropriate next step is to:

- A. Inspect and replace the fuel cap or its O-ring seal as the identified leak source
- B. Replace the EVAP canister as the most common cause of small EVAP leaks in trucks
- C. Replace the purge valve solenoid as the most common cause of small leaks
- D. Replace the entire fuel tank since smoke around the cap indicates tank failure

40. 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 mechanically stuck and not responding to controller commands
- B. The EGR passages are blocked with carbon preventing actual exhaust gas flow
- C. The EGR valve is functioning correctly with proper exhaust gas flow occurring
- D. The PCM is failing to send the bidirectional command signal correctly to the valve

41. Two technicians discuss federal emissions law. Technician A says the federal Clean Air Act prohibits installing "delete tunes" that disable emissions monitors. Technician B says replacing failed catalytic converters with OEM-equivalent units is legal service work. Who is correct?

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

42. A heavy-duty gasoline truck has set DTC P0420 (Catalyst Efficiency Below Threshold). The customer reports that the engine has been misfiring on cylinder 4 for the past month. The MOST likely cause of the converter failure is:

- A. The converter has reached the end of its normal service life from age alone
- B. The downstream oxygen sensor has failed and is incorrectly reporting converter status
- C. Sustained misfire has contaminated and overheated the catalyst substrate over time
- D. A failed mass airflow sensor producing incorrect fuel mixture across all conditions

43. A scan tool live data display shows fuel trim values: STFT +3%, LTFT +20%. Both banks. The MOST appropriate diagnostic direction is to:

- A. Investigate common-cause issues affecting both banks — vacuum leak, MAF, fuel pressure
- B. Investigate bank-specific causes since both banks show similar trim values to start
- C. Replace both upstream oxygen sensors based on the elevated fuel trim values present
- D. Replace the engine controller since fuel trim values exceed normal expected ranges

44. After a battery disconnect on a heavy-duty gasoline truck, the customer reports rough idle and harsh transmission shifts. The MOST likely cause is:

- A. The battery disconnect damaged the PCM during the procedure performed
- B. Adaptive learning values were reset and require a relearn drive cycle to relearn
- C. Battery replacement requires PCM replacement on this generation of vehicles
- D. The battery cable corrosion is affecting current flow to the engine controller

45. A J1939 SPN/FMI code shows SPN 110 (Engine Coolant Temperature) with FMI 3 (Voltage Above Normal). The MOST likely cause is:

- A. The engine coolant temperature is above the normal operating range continuously
- B. The PCM has failed and is misreading the ECT sensor signal during operation
- C. The ECT sensor has failed in the low-voltage state requiring sensor replacement
- D. The ECT sensor has an open circuit or short to power producing high voltage signal

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

- A. A single failed engine coolant temperature sensor on the engine module
- B. A network communication issue affecting bus traffic between modules
- C. A PCM power supply problem causing intermittent module operation
- D. A faulty PCM ground connection producing erratic module behavior

47. A scan tool live data display shows commanded throttle position at 30% and actual TPS feedback at 28%. Engine RPM responds correctly to the throttle command. The MOST likely interpretation is:

- A. The throttle motor has failed and cannot move the plate to the commanded position
- B. The TPS sensors have failed and are not reading the throttle plate position correctly
- C. The throttle is responding correctly within typical bidirectional control tolerance
- D. The PCM has failed and is sending incorrect commands to the throttle motor system

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

- A. The transmission adapt reset procedure was not performed after the replacement
- B. The new transmission has a defect and requires immediate warranty replacement
- C. The PCM has failed during the transmission replacement procedure performed
- D. The wrong transmission fluid was installed during the transmission replacement

49. A reprogramming session on a heavy-duty gasoline truck PCM is being prepared. The technician should:

- A. Disconnect the battery during reprogramming to prevent voltage spikes during procedure
- B. Connect a battery maintainer to ensure stable voltage throughout the entire session
- C. Allow the engine to run during reprogramming to maintain charging system output
- D. Use a 12V test light to monitor system voltage during the procedure for verification

50. CAN bus diagnosis with all modules powered down should show approximately 60 ohms of resistance across CAN High and CAN Low. This resistance comes from:

- A. Two 120-ohm terminating resistors at opposite ends of the bus in parallel
- B. The PCM's internal communication processor circuit on the bus line connection
- C. The instrument cluster's bus terminator at the dashboard location only
- D. The body control module's bus interface circuitry only on the network

# PRACTICE EXAM 19: ANSWER KEY AND EXPLANATIONS

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1. D — Technician B is correct; Technician A is wrong. Lean fuel trim DTCs on both banks point to a common-cause issue affecting fuel mixture across the entire engine. Investigating vacuum leaks, MAF accuracy, fuel pressure, or PCV contamination is the appropriate first step. Replacing oxygen sensors without identifying the underlying cause wastes parts.
2. B — A vacuum gauge reading loses approximately 1 in. Hg per 1,000 feet of elevation. At 2,000 feet, the normal 17–22 in. Hg range drops by about 2 in. Hg, making 17 in. Hg consistent with healthy operation at altitude. Always adjust expected vacuum readings for elevation before drawing conclusions.
3. A — Both technicians are correct. Verification is the foundation of effective diagnosis because it ensures the technician understands what the customer is experiencing. Skipping verification because the symptom seems obvious is a common cause of comeback work — confirmation bias leads to misdiagnosis even on apparently simple complaints.
4. C — A failed catalytic converter is an exhaust system component, not a source of internal oil consumption. Oil consumption with no external leakage traces to oil entering the combustion chamber — through worn rings, valve guides, or seals. The converter has no oil pathway to consume oil internally.
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 — Both technicians are correct. Stethoscope diagnosis relies on the principle that noise is loudest at its source. Valve train noise (worn rocker arms, lifters, pushrods) is loudest at the rocker arm assembly. Bottom-end mechanical noise (worn bearings, loose flywheel) is loudest at the block. Location-based diagnosis is foundational technique.
7. B — Symptom history (duration and progression) is the most diagnostic interview information. It reveals whether this is a developing failure, an intermittent issue, or chronic condition. Vague questions about fuel grade, mileage, or parking location rarely contribute meaningful diagnostic value.
8. D — A failed MAF sensor affects fuel mixture and engine performance, not coolant integrity. Internal coolant losses trace to head gaskets, cracked heads, intake manifold gaskets, or other

internal pathways that allow coolant to escape. The MAF sensor has no mechanical relationship to coolant containment.

9. A — A vacuum drop on snap-throttle that recovers immediately to baseline is normal engine response. The engine momentarily loses vacuum as the throttle opens fully, then recovers as airflow stabilizes. Healthy exhausts allow this rapid recovery; sustained low recovery would indicate restriction.
10. A — 10° of knock retard is significant and indicates the controller is responding to real, sustained detonation. Fuel quality should be verified, but the cause is likely elsewhere — carbon buildup raising effective compression, cooling system issues raising chamber temperature, or other detonation-promoting conditions. The knock sensor is doing its job; the underlying cause needs investigation.
11. A — Technician A is correct; Technician B is wrong. 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.
12. C — 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.
13. A — Fluid leaks must be identified by type and traced to source before any repair quote. The fluid color, viscosity, and odor identify the system; tracing the leak to its origin identifies the failed component. Quoting repairs without diagnosis is unprofessional; ignoring leaks risks engine or transmission damage.
14. D — When the misfire follows the swapped coil to its new location, the coil is the defective component. The original cylinder 1 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.
15. B — Technician A is correct; Technician B is wrong. Warpage exceeding spec in any direction requires resurfacing — averaging measurements is not how warpage is evaluated. Each measurement direction must be within tolerance independently. Averaging hides out-of-spec readings and produces premature gasket failure.
16. A — 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. C — 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. D — 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. B — 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. A — 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. D — Both readings (25 psi at hot idle, 50 psi at 2,000 RPM) fall within their respective OEM specifications. There is no service requirement for readings within specification. The engine is operating correctly across the measured range.
24. B — Mixing IAT (green) and OAT (orange/yellow) coolant chemistries produces a gel-like precipitate that clogs heater cores, radiator tubes, and water jackets. The chemistry incompatibility creates gelatinous deposits regardless of mixture ratio. Always identify and match the OEM-specified coolant before topping off.
25. A — Using OEM-specified oil and explaining the consequences of 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. D — A reading within the OEM specification range indicates the coil is functioning electrically as designed. There is no service requirement for measurements within specification. Replacement, particularly across all coils, based on within-spec readings is wasteful and unprofessional.
27. A — Light tan deposits with a small black ring near the threads at the porcelain base represents typical normal combustion conditions. The black ring is carbon accumulation in the cooler region near the threads, which is normal during extended service. The plug appearance does not indicate any abnormality requiring service.
28. C — Both technicians are correct. The waste-spark fires during the exhaust stroke of the paired cylinder, where it serves no useful purpose. The waste-spark requires almost no energy because cylinder pressure during exhaust is near atmospheric, so the coil's energy is delivered nearly entirely to the compression-stroke plug.
29. A — When CKP signal and coil power are both verified, the missing element in the firing sequence is the PCM grounding the primary circuits. The PCM is the switching device that grounds each coil to fire it. PCM failure (driver fault, software issue, internal damage) prevents this grounding, producing no spark despite all other inputs being present.
30. D — Both technicians are correct. Hot plugs run at higher tip temperatures than cold plugs because their longer insulator path slows heat transfer to the head. Cold plugs are recommended for sustained heavy-duty operation because their faster heat transfer prevents pre-ignition that would damage the engine.
31. B — A spark plug with carbon tracking on the porcelain typically conducts MORE readily when warm (not at idle when porcelain is cool). The other listed causes — vacuum leaks (greatest at idle), failing coils under low cylinder pressure, clogged injectors with low fuel demand — all produce idle-pronounced misfires. Carbon tracking conducts at all speeds.
32. D — Both technicians are correct. A pump producing correct pressure but inadequate volume points to internal pump wear — the pump can build pressure against a closed system but cannot maintain volume under flow. A pump producing inadequate pressure but correct volume indicates a regulator failure dumping fuel back to the tank.
33. A — Both pressure (28 psi) and volume (1/3 quart vs. 1/2 quart spec) below specification indicates pump wear has affected both metrics. A pump that produces correct pressure but inadequate volume points to wear. A pump that produces inadequate pressure and volume together indicates broader pump degradation.
34. C — A vacuum leak does not improve performance under heavy load. The leak admits unmetered air that the controller compensates for with positive fuel trim, which can degrade performance. The other listed symptoms (positive fuel trim at idle, hissing sounds, rough idle smoothing at higher RPM) are all classic vacuum leak indicators.

35. A — Boost pressure that overshoots specification indicates the wastegate is failing to open at the commanded pressure. The wastegate's job is to prevent boost from exceeding the commanded value. A stuck-closed wastegate (failed actuator, blocked control line, or failed control solenoid) keeps boost rising beyond specification.
36. B — Backpressure measurement at the upstream oxygen sensor port is the most diagnostic single test for converter restriction. Healthy backpressure stays low at idle and 2,500 RPM; restriction produces elevated readings that hold rather than dropping. Visual and rattle tests identify only certain failure modes.
37. A — A MAF sensor reading low at both idle and WOT indicates the sensor is contaminated, aged, or has a signal issue. The under-reading at all conditions is the diagnostic signature of a degraded sensing element. Other listed causes (correct readings, filter restriction, PCM failure) don't match the symmetric low readings.
38. D — 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.
39. A — Smoke escaping around the gas cap area during EVAP smoke testing identifies the fuel cap or its O-ring as the leak source. Replacing the cap or its sealing component is the appropriate repair. Replacing the canister, purge valve, or fuel tank without verification is wasteful and addresses the wrong components.
40. C — 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.
41. A — Both technicians are correct. Installing "delete tunes" that disable emissions monitors is illegal under the Clean Air Act with civil penalties exceeding \$4,500 per vehicle. Replacing failed catalytic converters with OEM-equivalent units is legal service work. Both statements accurately reflect federal emissions law.
42. C — Sustained misfire sends unburned fuel into the catalytic converter, where it ignites and overheats the substrate. The thermal damage destroys the catalyst's chemical activity and may melt the substrate. The customer's month-long misfire history is the direct cause of converter failure — fixing the converter without addressing the misfire produces immediate re-failure.
43. A — Identical positive long-term fuel trim on both banks (+20%) indicates a common-cause issue affecting the entire fuel system or air metering. Vacuum leaks, MAF/MAP accuracy issues, fuel pressure problems, and PCV system issues all affect both banks equally. Bank-specific causes would produce bank-specific imbalance.

44. B — Battery disconnect resets adaptive values that the controller has learned. Until these are relearned through driving, the engine and transmission may run roughly. The relearn period typically requires 50–100 miles of varied driving to restore normal operation. The disconnect itself does not damage the PCM.
45. D — SPN 110 identifies engine coolant temperature; FMI 3 identifies "Voltage Above Normal." The combination indicates the ECT sensor circuit is reading high voltage, typically caused by an open circuit in the sensor or wiring, or a short to reference voltage. The signal characteristic is the diagnostic information, not actual temperature.
46. A — 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.
47. C — A 2° difference between commanded (30°) and actual (28°) 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.
48. A — 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.
49. B — A dedicated battery maintainer ensures stable voltage throughout the entire reprogramming session. Battery disconnect is incorrect (the PCM needs power), running the engine introduces electrical noise, and a 12V test light cannot maintain battery voltage. The maintainer is the standard tool for this critical service.
50. A — CAN bus networks use two 120-ohm terminating resistors at opposite ends of the bus, wired in parallel. Two 120-ohm resistors in parallel produce 60 ohms of total resistance, which is the standard measurement value when checking termination integrity with all modules powered down.