

# PRACTICE EXAM 12: ASE T1

## GASOLINE ENGINES SIMULATION

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1. A fleet manager brings in a Class 6 work truck with a 6.0L Vortec for "loss of power complaint that started after a fuel filter replacement was performed last week." The MOST appropriate first diagnostic step is to:

- A. Replace the fuel filter again as the previous service was likely performed incorrectly
- B. Disassemble the entire fuel system to inspect for contamination throughout the system
- C. Replace the fuel pump as the most common cause of loss of power after fuel service
- D. Verify the symptom and inspect the fuel filter installation for proper orientation and fit

2. A 7.3L Godzilla has been running rough since a heavy rainstorm yesterday. The technician retrieves DTC P0301 (Cylinder 1 Misfire). The MOST likely cause is:

- A. The fuel pump has failed coincidentally with the recent weather event
- B. Moisture intrusion at the cylinder 1 ignition coil boot causing arc-over to ground
- C. The catalytic converter has been damaged by water ingestion during the rain
- D. The cylinder 1 spark plug has aged out coincidentally with the weather event

3. A vacuum gauge at idle reads 18 in. Hg with a steady needle. The vehicle elevation is 1,000 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

4. A LEAST-likely cause of an oil leak appearing at the bell housing area on a 7.3L Godzilla is:

- A. Valve cover gasket leak migrating down the rear of the engine assembly
- B. Oil pan rear gasket leak migrating to the bell housing area during operation
- C. A failed catalytic converter creating exhaust gas leakage at the joint area
- D. Intake manifold gasket leak migrating to the rear of the engine assembly

5. A power balance test on a 6.4L HEMI shows cylinder 8 contributes 35 RPM less than the average of the other seven cylinders. Compression on cylinder 8 measures 168 psi, matching the other cylinders. The MOST likely cause is:

- A. A blown head gasket between cylinder 8 and an adjacent cylinder location
- B. A failed compression ring on cylinder 8 requiring engine teardown for repair
- C. Mechanical wear that affects compression but not power production at cylinder 8
- D. An ignition or fuel delivery issue specific to cylinder 8 during operation

6. The customer reports a Class 4 truck "stalls 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

7. 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. A failed turbocharger on a turbocharged application reducing intake charge volume
- C. Normal aging of the engine producing gradually reduced power over time
- D. A failed mass airflow sensor reading low and reducing fuel delivery commands

8. A vacuum gauge connected to a 6.0L Vortec produces a steady 19 in. Hg at idle, but the needle vibrates rapidly with small amplitude movements at all engine speeds. The MOST likely cause is:

- A. A normal idle pattern requiring no further diagnostic procedures or tests
- B. Worn valve guides allowing irregular sealing on multiple cylinders during operation
- C. A clogged catalytic converter creating exhaust restriction during operation conditions
- D. A failed fuel pump unable to maintain pressure at idle conditions

9. A Class 6 work truck has been brought in with multiple complaints: rough idle, hesitation off-idle, and occasional stalling. Long-term fuel trim is at +22% 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 failed catalytic converter creating excessive backpressure during all conditions
- D. A vacuum leak or PCV system contamination affecting both banks symmetrically

10. The MOST appropriate response when a customer 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

11. The customer reports that her Class 5 truck "runs fine until it crosses railroad tracks, then it misfires for a few seconds and recovers." The MOST likely cause is:

- A. A loose electrical connection at a sensor or actuator that disconnects momentarily
- B. The fuel pump pickup is being uncovered during the bumps at the railroad crossing
- C. The catalytic converter has internal damage that produces noise during impacts
- D. The engine controller is sensitive to vibration and resets during the crossing event

12. A LEAST-likely diagnostic step in evaluating an intermittent misfire complaint is to:

- A. Use a scan tool with data logging to capture freeze frame and live data history
- B. Inspect the wiring harness for chafing, corrosion, or rodent damage at connectors
- C. Use a scope to capture sensor signals during operation that reproduces the symptom
- D. Replace the suspect components based on the most common failure patterns first

13. Two technicians discuss diagnostic methodology. Technician A says the customer interview captures information that DTCs alone cannot reveal. Technician B says verifying the symptom should occur before any tools come out of the toolbox. 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

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

- A. Explain the consequences of continued operation with a head gasket failure clearly
- B. Tell the customer the repair is optional and they can decide based on cost considerations
- C. Refuse to discuss the diagnosis with the customer until they pay for diagnostic time
- D. Tell the customer the repair must be done immediately or the truck will explode

15. A cylinder head warpage measurement reveals 0.005 inch in one direction and 0.004 inch in the perpendicular direction. OEM specification limits warpage to 0.003 inch in any direction. The MOST appropriate action is:

- A. Reuse the head as-is since the diagonal measurement is borderline acceptable
- B. Apply RTV silicone to the warped areas during reassembly to seal the surface
- C. Reuse the head with a thicker head gasket to compensate for the warpage
- D. Send the head out for resurfacing or replace it based on warpage exceeding spec

16. A LEAST-likely consequence of operating a heavy-duty gasoline engine with a worn camshaft lobe is:

- A. Reduced lift on the affected valve causing decreased airflow to that cylinder
- B. Lower compression on the affected cylinder during compression testing
- C. Weak cylinder contribution detected during a power balance test procedure
- D. Misfire DTCs that may set if the lift reduction is severe enough during operation

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

18. A timing chain replacement is being performed on a 7.3L Godzilla. After installation, the cam timing mark is one tooth advanced from the OEM reference position. The likely consequence of operating the engine in this condition is:

- A. Improved fuel economy due to advanced valve events at idle conditions
- B. Higher peak horsepower due to earlier valve opening under heavy load conditions
- C. Loss of power, rough running, and possible valve-to-piston contact during operation
- D. No noticeable change in performance with proper engine startup possible

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. Bore the cylinder oversize and install a corresponding oversize piston during repair
- B. Reuse the existing piston with the current cylinder bore as-is during reassembly
- C. Install a thicker connecting rod bearing to compensate for the clearance during operation
- 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. Reinstall the bearing as the clearance is acceptable for service operation
- B. Apply additional assembly lubricant during installation to improve clearance
- C. Tighten the connecting rod bolt beyond specification to widen the clearance
- D. Verify the journal and bearing dimensions to identify the cause of tight 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. Technician A says cylinder bore measurements should be taken at three depths. Technician B says cylinder bore measurements should include readings parallel to and perpendicular to the crankshaft. 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

23. Oil pressure on a 6.0L Vortec measures 8 psi at hot idle and 28 psi at 2,000 RPM. OEM specification is 15–30 psi at idle and 40–60 psi at 2,000 RPM. The MOST likely cause is:

- A. A blocked oil filter forcing oil through the bypass valve continuously during operation
- B. A pressure relief valve stuck open at the maximum pressure setting condition
- C. Wrong viscosity oil that is too thin for the operating temperature conditions
- D. Worn engine bearings increasing the cumulative clearance volume the pump must fill

24. A heavy-duty gasoline truck overheats only at idle and in slow traffic. Highway operation produces normal coolant temperatures. The MOST likely cause is:

- A. A water pump impeller that has eroded and reduced flow capacity overall

- B. A failed cooling fan clutch or electric fan not engaging at idle conditions
- C. An air pocket trapped at the highest point of the cooling system overflow
- D. A stuck-open thermostat preventing the engine from reaching operating temperature

25. The OEM specifies dexos1 Gen 3 5W-30 engine oil. A technician installs 10W-40 oil during a service. The MOST likely consequences include:

- A. Increased oil pressure, slower flow at startup, and possible emissions concerns
- B. Improved cold-start protection due to the higher viscosity in cold conditions
- C. Better fuel economy due to the thicker oil reducing component friction during operation
- D. No noticeable difference in performance or specifications regardless of viscosity

26. A coil-on-plug ignition coil's primary winding measures 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. The need to test the secondary winding before any replacement decision is made
- D. An open or high-resistance condition in the primary winding requiring replacement

27. Two technicians discuss spark plug heat range. Technician A says hot plugs have a longer insulator path to the shell. Technician B says cold plugs are recommended for engines that operate under sustained heavy load. 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

28. A LEAST-likely cause of a no-spark condition on a coil-on-plug equipped V8 is:

- A. A failed crankshaft position sensor producing no signal during cranking
- B. A failed PCM unable to send firing signals to any of the eight ignition coils
- C. A failed mass airflow sensor providing incorrect airflow data to the controller
- D. A failed ignition switch preventing power supply to the ignition system

29. A heavy-duty gasoline truck shows persistent knock retard of  $6^\circ$  during steady-state highway cruise. The fuel quality is verified as appropriate octane rating. The MOST likely cause is:

- A. Carbon buildup in the combustion chambers raising the effective compression ratio
- B. Normal operation that requires no further diagnostic procedures or tests
- C. A failed knock sensor producing false detection signals continuously during operation
- D. A failed downstream oxygen sensor causing improper fuel mixture under load

30. A spark plug shows oily black deposits on the electrodes and porcelain insulator. The MOST likely cause is:

- A. Pre-ignition damage from incorrect spark plug heat range selection during service
- B. A rich fuel mixture caused by a sticking fuel injector on that cylinder location
- C. Normal high-mileage wear that requires no immediate service action at this time
- D. Oil entering the combustion chamber through worn rings, guides, or valve seals

31. A 6.4L HEMI has misfires on cylinders 1, 3, 5, and 7. The HEMI uses a dual-plug-per-cylinder design with paired coils. The MOST likely cause is:

- A. All eight spark plugs on the dual-plug system have failed simultaneously together
- B. One coil from each pair is failing — the coil that fires the cylinders 1, 3, 5, 7 plugs

- C. The PCM has failed and is misreporting the cylinder location of the misfires
- D. The engine is mechanically failing on the entire bank with extensive damage

32. A heavy-duty gasoline truck has a fuel pump volume test showing 1/3 quart in 30 seconds when 1/2 quart is specified. Pressure is within specification. The MOST likely cause is:

- A. A failed fuel pressure regulator dumping fuel back to the fuel tank assembly
- B. A leaking fuel injector causing pressure drop during the volume test procedure
- C. A clogged fuel filter creating restriction throughout the entire fuel delivery system
- D. A worn fuel pump that produces correct pressure but inadequate volume capacity

33. A LEAST-likely symptom of a clogged catalytic converter is:

- A. Improved fuel economy and increased engine power under normal conditions
- B. A glowing-red exhaust manifold under load conditions during operation
- C. Loss of power and reduced throttle response under sustained load conditions
- D. Excessive exhaust backpressure measured at the upstream oxygen sensor location

34. An MAF sensor on a 6.0L Vortec produces these readings: 5.0 g/sec at idle (specification 4.0–6.0 g/sec) and 105 g/sec at WOT (specification 95–115 g/sec). The customer complains of poor fuel economy. The MOST likely cause is:

- A. The MAF sensor has failed with low readings at high airflow conditions
- B. The MAF sensor has failed with high readings at low airflow conditions
- C. The MAF sensor is reading correctly and the cause is elsewhere in the system
- D. The intake air filter is producing unrecognized airflow restriction continuously

35. A turbocharger on a Class 5 work truck has produced excessive shaft play during inspection. The technician notes oil residue at the compressor housing inlet. The MOST likely cause is:

- A. Internal turbocharger bearing failure allowing shaft movement and oil leakage
- B. A clogged air filter restricting flow to the compressor inlet at all times
- C. A failed wastegate actuator opening too early during heavy load conditions
- D. An intercooler restriction reducing charge cooling and effective output temperature

36. A vacuum leak at the intake manifold of a heavy-duty gasoline V8 produces:

- A. Higher fuel trim values that are most pronounced under heavy load conditions
- B. Lower fuel trim values across all operating conditions and engine speeds
- C. No measurable change in fuel trim values under any operating condition
- D. Higher fuel trim values that are most pronounced at idle conditions

37. The MOST diagnostic single test for a suspected restricted exhaust on a heavy-duty gasoline truck is to:

- A. Visual inspection of the catalytic converter substrate through the rear of the unit
- B. Measuring exhaust backpressure at the upstream oxygen sensor port location
- C. Tapping the catalytic converter with a rubber mallet to listen for internal rattle
- D. Visual inspection of the muffler for external corrosion or damage to the body

38. A heavy-duty gasoline truck has set DTC P0442 (Small EVAP Leak Detected). A smoke test produces smoke escaping from the underside of the fuel tank. The MOST likely cause is:

- A. A cracked or corroded fuel tank vent hose or seam allowing vapor escape
- B. The EVAP canister has failed and requires immediate replacement service

- C. The purge valve solenoid has failed and is allowing the leak to occur continuously
- D. The fuel cap has failed and requires immediate replacement to prevent leakage

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

- A. The EGR valve is functioning correctly with normal exhaust gas flow occurring
- B. The EGR valve is stuck partially open at all times causing rough idle conditions
- 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. A LEAST-likely consequence of a clogged catalytic converter is:

- A. Excessive exhaust backpressure causing engine performance loss during operation
- B. Possible thermal damage to the engine and exhaust components from heat buildup
- C. Improved emissions compliance due to longer residence time in the converter
- D. Fuel economy degradation due to reduced engine breathing efficiency

41. A wide-range air-fuel ratio sensor signal indicates lambda 0.85 (rich) during steady-state cruise. Fuel trim shows -22% long-term trim. The MOST likely cause is:

- A. The AFR sensor has failed and is producing incorrect rich readings to the controller
- B. The fuel pressure regulator has failed allowing high rail pressure delivery to injectors
- C. A real rich condition exists that the controller is compensating for at maximum trim
- D. The catalytic converter has failed and is affecting upstream sensor readings continuously

42. The federal emissions warranty for a major emissions component on a heavy-duty gasoline truck:

- A. Covers specific components for an extended period beyond the basic warranty
- B. Applies only to the catalytic converter and oxygen sensors regardless of mileage
- C. Expires when the basic vehicle warranty expires regardless of component type
- D. Does not exist for heavy-duty gasoline trucks under federal regulations

43. A scan tool reads the following data on a heavy-duty gasoline truck: ECT 195°F, IAT 75°F, MAP 12 in. Hg at idle, MAF 4.5 g/sec at idle, RPM 720, and TPS 0.8 V at idle. The MOST appropriate interpretation is:

- A. The ECT sensor is reading too high indicating thermostat failure during operation
- B. The IAT sensor reading is too low and requires immediate sensor replacement now
- C. The MAP sensor reading is too high indicating intake manifold restriction continuously
- D. All sensor readings are consistent with normal idle operating conditions on the engine

44. A Mode 06 test result shows the catalyst monitor passing with a value of 0.78 against a threshold of 0.50. This indicates:

- A. The converter is failing and requires immediate replacement before further driving
- B. The converter is performing well within the passing threshold for the monitor test
- C. The test value is too low and indicates a sensor calibration issue with the equipment
- D. The test result is invalid due to incomplete monitor execution during testing

45. A LEAST-likely cause of multiple unrelated U-codes (network communication codes) across several modules is:

- A. A wiring fault on the CAN High or CAN Low conductor in the harness

- B. Damage to one or both terminating resistors at the ends of the bus
- C. A single failed engine coolant temperature sensor on the engine module only
- D. A module on the bus that has failed and is loading the network excessively

46. A scan tool live data display shows the ECT sensor reading 195°F at idle, but the dashboard temperature gauge reads in the cold zone. The MOST likely cause is:

- A. A wiring fault between the PCM and instrument cluster affecting gauge signal
- B. The thermostat is stuck open preventing the engine from reaching operating temperature
- C. The radiator has lost cooling capacity and is overheating despite gauge reading
- D. Both gauges are correct and the engine is at normal operating temperature

47. Two technicians discuss CAN bus diagnostics. Technician A says CAN bus signaling uses differential voltage between CAN High and CAN Low. Technician B says CAN bus signaling provides good noise immunity due to the differential signaling scheme. 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

48. A heavy-duty gasoline truck has a P0128 DTC (Coolant Temperature Below Thermostat Regulating Temperature). The MOST likely cause is:

- A. A failed engine coolant temperature sensor providing incorrect signal data
- B. A clogged radiator preventing proper coolant flow through the cooling system
- C. A stuck-open thermostat preventing the engine from reaching regulating temperature
- D. A failed water pump impeller reducing flow capacity throughout the cooling system

49. A reprogramming session is being prepared on a heavy-duty gasoline truck PCM. 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. A bidirectional command from the scan tool causes the EGR valve to cycle audibly, but exhaust gas analysis shows no change in NOx levels. The MOST likely cause is:

- A. The EGR valve is opening but the EGR passages are blocked with carbon deposits
- B. The EGR valve is functioning correctly with normal NOx levels for the engine
- C. The scan tool is producing false bidirectional command signals to the valve
- D. The EGR valve position sensor has failed and is providing incorrect feedback

# PRACTICE EXAM 12: ANSWER KEY AND EXPLANATIONS

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1. D — Verifying the symptom and inspecting the recent service work is the proper diagnostic starting point. A fuel filter installed backward, with damaged sealing surfaces, or with the wrong part number is a common post-service issue. Replacing additional components without first checking the recent work wastes parts and ignores the most likely cause.
2. B — A misfire on a single cylinder after a heavy rainstorm strongly indicates moisture intrusion at the affected coil boot. Rain water can penetrate aging boots, providing a low-resistance path to ground that bleeds secondary voltage away from the spark plug. Drying the boot and inspecting for cracks typically resolves the issue.
3. A — A vacuum gauge reading loses approximately 1 in. Hg per 1,000 feet of elevation. At 1,000 feet, the normal 17–22 in. Hg range drops by about 1 in. Hg, making 18 in. Hg consistent with healthy operation at altitude. Always adjust expected vacuum readings for elevation before drawing diagnostic conclusions.
4. C — 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. D — 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. 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.
7. C — 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.
8. B — Rapid small-amplitude needle vibration at all engine speeds is the signature of worn valve guides or weak valve springs producing irregular sealing on multiple cylinders. The high-frequency fluctuation differs from the regular sharp drops of a single burned valve. The pattern is distinctive and well-documented.

9. D — Multiple driveability complaints with both-bank +22% 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 — 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.
11. A — Misfires correlated with railroad track crossings indicate vibration-sensitive electrical connections. A loose connector at a sensor, coil, or actuator disconnects momentarily during the impact, producing the misfire. Reproducing the symptom by tapping or wiggling connectors is the standard diagnostic technique for this pattern.
12. D — Replacing components based on common failure patterns without verification is not a diagnostic step — it is a guess. Proper intermittent misfire diagnosis requires data logging, scope captures, and physical inspection. Component replacement without verification wastes parts and rarely fixes intermittent issues.
13. C — Both technicians are correct. Customer interviews capture symptom history, operating conditions, and prior service that DTCs cannot reveal. Verifying the symptom before tools come out ensures everyone agrees on the problem and prevents wasted diagnostic effort on unverified complaints.
14. A — 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.
15. D — Warpage of 0.005 inch and 0.004 inch both exceed the 0.003 inch OEM specification. The head must be resurfaced or replaced. Reinstallation, RTV silicone, or thicker gaskets are all incorrect responses to out-of-spec warpage and produce premature gasket failure.
16. B — A worn cam lobe reduces valve LIFT, not compression. The valve still closes properly because the base circle is unchanged — the issue is reduced opening. Compression is determined by sealing during the closed phase, not by lift during the open phase. Reduced lift produces airflow loss and weak cylinder contribution.
17. A — Technician A is correct; Technician B 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. C — One tooth advanced from the OEM reference position alters valve events significantly. The engine experiences loss of power, rough running, and possible valve-to-piston contact in interference engines. The cam timing must be repositioned to the exact OEM reference before operation; any tooth-position error is unacceptable.
19. A — 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. D — 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 — Both technicians are correct. Cylinder bore measurements should be taken at three depths (top, middle, and bottom of ring travel) to identify wear patterns. They should also include readings parallel to and perpendicular to the crankshaft to identify out-of-round conditions. Both measurement approaches are required for complete bore evaluation.
23. D — 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 — Idle-only overheating with normal cooling during driving and a fan that doesn't engage points directly to the cooling fan or its control circuit. The system can move heat at speed (driven airflow) but not at idle when the fan must do the work. Fan failure or control circuit issues are the typical causes.
25. A — Wrong-viscosity oil (10W-40 instead of 5W-30) produces increased oil pressure and slower flow at startup. The thicker oil also affects emissions controls in some applications and may not provide proper protection at the OEM-engineered operating temperatures. Always match the OEM specification including viscosity grade and certification level.
26. D — 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. B — Both technicians are correct. Hot plugs have a longer insulator path from electrode to shell, slowing heat transfer and running hotter at the tip. Cold plugs are recommended for sustained

heavy-duty operation because their faster heat transfer prevents pre-ignition that would damage the engine.

28. C — 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.
29. A — When fuel quality is verified appropriate, sustained knock retard at cruise points to mechanical conditions raising effective compression — most commonly carbon buildup in the combustion chambers. Carbon takes up volume and increases compression ratio, promoting detonation despite proper fuel grade.
30. D — Wet, oily black deposits indicate oil entering the combustion chamber. The plug is fouled by oil from worn rings, valve seals, or guides. Rich fuel mixtures produce dry sooty deposits, not wet oily ones. The texture of the deposit is the key diagnostic distinction.
31. B — A 6.4L HEMI uses two plugs per cylinder fired by paired coils. Misfires on cylinders 1, 3, 5, 7 indicate one coil from each pair is failing, affecting only the plugs that one coil fires. The pattern matches the dual-plug architecture of the HEMI design.
32. D — A pump that produces correct pressure but inadequate volume is the textbook symptom of pump wear. The pump can build pressure against a closed system but cannot maintain volume under flow demand. Filter restriction would affect both pressure and volume; regulator issues would affect pressure, not volume.
33. A — A clogged catalytic converter degrades fuel economy and reduces engine power, not improves them. The other listed symptoms — glowing red manifold, loss of power, excessive backpressure — are all classic indicators of converter restriction. Improved performance is not associated with this failure mode.
34. C — Both MAF readings (5.0 g/sec at idle and 105 g/sec at WOT) fall within OEM specification at both extremes. The MAF is not the cause of the fuel economy complaint. The technician should investigate other causes — fuel injector flow, ignition timing, exhaust restriction, or driving habits.
35. A — Excessive turbocharger shaft play with oil residue at the compressor inlet indicates internal bearing failure. Worn center housing bearings allow shaft movement, and the seals fail in turn, leaking oil into the compressor housing. This is a primary turbocharger failure mode requiring complete turbo service.
36. D — A vacuum leak at the intake manifold admits unmetered air, producing positive long-term fuel trim. The lean condition is most pronounced at idle when leak airflow is large compared to total airflow, and diminishes at higher RPM when total airflow overwhelms the leak. The idle-pronounced pattern is the diagnostic signature.

37. B — Backpressure measurement at the upstream oxygen sensor port is the most diagnostic single test for exhaust restriction. Healthy exhaust produces minimal backpressure across the operating range; restriction produces elevated readings. Visual and rattle tests identify only certain failure modes.
38. A — Smoke escaping from the underside of the fuel tank during EVAP smoke testing indicates a tank-related leak — typically a cracked vent hose, corroded seam, or cracked fitting. The fuel cap, canister, and purge valve would produce smoke at their respective locations, not at the tank itself.
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 clogged catalytic converter creates exhaust restriction; it does not improve emissions compliance through "longer residence time." Restricted converters are typically thermally damaged and have lost catalyst activity, increasing emissions. The other listed consequences (backpressure, thermal damage, fuel economy loss) are all real.
41. C — A wide-range AFR sensor reporting lambda 0.85 with -22% LTFT means the controller is removing as much fuel as possible to compensate for a real rich condition. Two sensors agreeing is not a coincidence — when sensor data and trim values align, trust the data. Causes include high fuel pressure, leaking injectors, or contaminated fuel.
42. A — The federal emissions warranty covers specific major emissions components (catalytic converter, ECM, MIL system) for extended periods on certified vehicles, beyond the basic vehicle warranty period. Always check the OEM documentation before quoting an emissions repair, as the repair may be covered under the federal warranty.
43. D — All the listed sensor readings are consistent with normal idle operating conditions: ECT 195°F (operating temperature), IAT 75°F (ambient), MAP 12 in. Hg at idle (normal vacuum), MAF 4.5 g/sec at idle (normal airflow), 720 RPM (normal idle), TPS 0.8 V at closed throttle (normal closed position). Cross-sensor verification confirms healthy operation.
44. B — A test result of 0.78 against a passing threshold of 0.50 means the converter is performing well above the minimum requirement. The higher value indicates better catalyst function. Mode 06 values that exceed thresholds with margin indicate healthy systems.
45. C — A single failed ECT sensor produces a sensor-circuit DTC, not multiple unrelated U-codes across many modules. Network communication failures trace to bus wiring, terminating resistors, or modules loading the bus. Individual sensor failures don't propagate to network-level codes.
46. A — When scan tool data shows correct ECT temperature but the dashboard reads incorrectly, a wiring or signal issue exists between the PCM and the instrument cluster. The PCM is reading the sensor correctly; the cluster is not displaying the correct value. The fault is in the gauge signal path, not the temperature itself.

47. D — Both technicians are correct. CAN bus uses differential voltage between CAN High and CAN Low for signaling, and this differential approach provides excellent noise immunity because electrical interference affects both wires equally and cancels out in the differential measurement. These are foundational CAN principles.
48. C — P0128 is most often caused by a stuck-open thermostat preventing the engine from reaching regulating temperature. The DTC is frequently misdiagnosed as an ECT sensor fault, but the sensor is reading correctly — the engine is genuinely too cold. Verifying thermostat operation is the proper first step.
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 — 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.