PRACTICE EXAM 10: ASE T1 GASOLINE ENGINES SIMULATION

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1. A heavy-duty gasoline truck arrives with a complaint of "rough idle." The technician retrieves DTC P0301 (Cylinder 1 Misfire). The MOST appropriate diagnostic next step is to:

A. Replace the cylinder 1 ignition coil based on the misfire DTC presence alone

B. Test compression, ignition, and fuel delivery on cylinder 1 to identify the cause

C. Replace the cylinder 1 spark plug as the most common cause of cylinder misfires

D. Replace the cylinder 1 fuel injector as injectors are common misfire causes

2. A vacuum gauge at idle shows 16 in. Hg with the needle steady. The vehicle is at sea level. The MOST likely cause is:

A. Normal engine operation requiring no further diagnostic procedures or tests

B. Worn valve guides producing irregular sealing across multiple cylinders

C. A burned valve on a single cylinder failing to seat properly during operation

D. An exhaust restriction or significant intake manifold air leak in the system

3. The customer reports that her Class 6 work truck "stalls intermittently when stopped at a traffic light." The MOST diagnostic interview question is:

A. Has the symptom been getting worse, better, or staying the same over time?

B. Where does the customer typically purchase fuel for the vehicle weekly?

C. What is the average daily mileage that the truck accumulates over time?

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

4. A power balance test on a 7.3L Godzilla shows cylinder 4 produces 35 RPM less drop than the average of the other seven cylinders. Compression on cylinder 4 measures 168 psi, matching the other cylinders. The MOST likely cause is:

A. A blown head gasket between cylinder 4 and an adjacent cylinder location

B. A failed compression ring on cylinder 4 requiring engine teardown for repair

C. An ignition or fuel delivery issue specific to cylinder 4 location

D. Mechanical wear that affects compression but not power production at cylinder 4

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

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

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

C. An intake manifold gasket leak migrating to the rear of the engine area

D. An oil pan rear gasket leak migrating to the bell housing area

6. A heavy-duty gasoline truck has been brought in with a "ticking noise that started after a recent oil change." The customer reports the prior service was performed at a quick-lube shop. The MOST likely cause is:

A. The oil pump has failed coincidentally with the recent oil change service

B. The oil filter was cross-threaded during the oil change service procedure

C. The drain plug was over-tightened during the oil change service procedure

D. The wrong oil viscosity was used and is producing inadequate lubrication noise

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. Worn valve guides producing irregular sealing under load conditions

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

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

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

8. A LEAST-likely cause of blue smoke during cold start that clears within 30 seconds is:

A. Worn valve seals allowing oil to seep into combustion overnight during shutdown

B. PCV valve sticking allowing oil mist to enter the intake during overnight shutdown

C. A clogged catalytic converter creating excessive exhaust system backpressure

D. Worn valve guides allowing oil into combustion overnight from above the valves

9. The customer reports a 6.4L HEMI "occasionally hesitates during acceleration but otherwise runs fine." Live data captured during a hesitation event shows fuel rail pressure dropping from 58 psi to 45 psi momentarily. The MOST likely cause is:

A. A weakening fuel pump that cannot maintain pressure under heavy demand

B. A failed catalytic converter creating excessive exhaust restriction continuously

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

D. A failed engine controller producing random hesitation events during acceleration

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 knock retard at 8°. The MOST likely cause is:

A. A failed knock sensor producing false detection signals continuously

B. Normal operation under heavy load with appropriate timing retard for conditions

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

D. A failed engine controller commanding excessive timing retard at the wrong moment

11. A vacuum gauge reading at idle shows 21 in. Hg. The vehicle elevation is 3,000 feet above sea level. The reading is:

A. Above normal — investigate exhaust restriction or other significant cause

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

C. Below normal regardless of altitude and indicates a serious problem

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

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

A. Quote the customer for a complete engine teardown to find the leak source

B. Replace the most commonly leaking component based on age of the vehicle

C. Identify the fluid type and trace the leak to its source before any repair quote

D. Tell the customer to add fluid as needed and return when the truck is empty

13. A LEAST-likely cause of a "stalls when warm" complaint on a heavy-duty gasoline truck is:

A. A weakening fuel pump that loses pressure at operating temperature conditions

B. A failed catalytic converter creating excessive exhaust restriction continuously

C. A failing crankshaft position sensor that fails specifically when warm

D. A vacuum leak that becomes more pronounced at operating temperature levels

14. Two technicians discuss the diagnostic process. 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. Neither Technician A nor Technician B

D. Both Technician A and Technician B

15. A cylinder head warpage measurement reveals 0.002 inch in all measured directions. OEM specification limits warpage to 0.003 inch per 6 inches of length. The technician should:

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

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

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

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

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

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

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

C. Improved cylinder sealing due to the reduced valve mass during operation

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

17. Technician A says a worn camshaft lobe produces reduced lift on the affected valve. Technician B says a worn camshaft lobe produces reduced compression on the affected cylinder. 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 25 psi. The MOST likely cause is:

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

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

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

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

19. A piston measurement at the skirt shows 4.000 inch. The cylinder bore measures 4.003 inch. OEM clearance specification is 0.0010 to 0.0030 inch. The clearance:

A. Exceeds the maximum specification — corrective action required for repair

B. Is within OEM specification and requires no service action at this time

C. Is below the minimum specification — assembly lubricant should be applied

D. Cannot be calculated without additional measurement at multiple piston positions

20. Plastigage on a main bearing produces a width corresponding to 0.0018 inch clearance. OEM specification is 0.0010 to 0.0030 inch. The MOST appropriate action is:

A. Accept the in-spec reading and continue with normal assembly procedure

B. Replace the bearing because the value is too close to the maximum specification

C. Apply additional assembly lubricant during installation to compensate fully

D. Tighten the cap beyond specification to compress the clearance further

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

B. Worn main bearings allowing crankshaft movement under heavy load

C. A loose flywheel that has lost retention bolt torque specification

D. A failing oxygen sensor providing incorrect feedback to the controller

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

B. Can be reused as-is since the engine has already been disassembled

C. Requires only the rod bearing to be replaced before reassembly

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

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

D. A failed oil pump producing inadequate pressure under operating temperature

24. A heavy-duty gasoline truck overheats only at idle in hot weather. Cooling fan, water pump, and thermostat all test within OEM specifications during testing. The MOST likely cause is:

A. A water pump impeller that has eroded and is reducing flow capacity at idle

B. The cooling fan or its control circuit is not engaging at idle conditions

C. An air pocket trapped at the highest point of the cooling system overflow

D. A clogged radiator core requiring complete radiator replacement before operation

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

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

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

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

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

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

A. The coil is at the lower limit of specification — within range but borderline

B. The coil should be replaced as a preventive measure since reading is at minimum

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

D. The coil is below specification — replacement is required immediately for safety

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. Rich fuel mixture caused by a sticking fuel injector on that cylinder location

B. Pre-ignition damage from incorrect heat range selection during recent service

C. Normal combustion conditions with carbon accumulation from extended service

D. Oil entering the combustion chamber through worn rings or valve seals

28. A LEAST-likely cause of a misfire on a single cylinder is:

A. A failed coil on that specific cylinder producing weak or no spark output

B. A failed crankshaft position sensor producing intermittent signal during operation

C. A failed spark plug on that cylinder with widened gap or fouling issues

D. A failed fuel injector on that cylinder producing inadequate fuel delivery

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 crankshaft position sensor has failed even though signal appears present

B. The fuel pump has failed and is preventing engine startup despite all conditions

C. All eight ignition coils have failed simultaneously requiring full replacement

D. The PCM is failing to ground the primary circuits of the ignition coils

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. Both Technician A and Technician B

B. Technician A only

C. Technician B only

D. Neither Technician A nor Technician B

31. A LEAST-likely cause of an ignition system misfire that occurs only under heavy acceleration is:

A. An ignition coil failing under the higher cylinder pressures during acceleration

B. A worn spark plug with a widened gap requiring excessive firing voltage

C. A failed downstream oxygen sensor providing incorrect feedback at all conditions

D. A spark plug wire with deteriorating insulation arcing under heavy load

32. A heavy-duty gasoline truck has fuel pressure of 56 psi at idle and 56 psi at WOT on a returnless fuel system. OEM specification is 56 psi at all conditions. The system is:

A. Operating with a stuck-closed pressure regulator requiring replacement

B. Operating within OEM specification — no service required at this time

C. Operating with a vacuum leak at the regulator producing constant pressure

D. Operating with a failed fuel pump unable to vary pressure as commanded

33. The MOST diagnostic single test for a fuel pump volume capacity issue is to:

A. Measure fuel pressure at idle and at WOT under various load conditions

B. Measure fuel pump current draw with a multimeter during operation

C. Measure fuel rail pressure with the engine running at multiple speeds

D. Measure fuel pump volumetric output in a graduated container over fixed time

34. A turbocharged Class 5 work truck has white smoke from the exhaust along with low boost. The MOST likely cause is:

A. Internal turbocharger seal failure allowing oil into the intake stream during operation

B. A clogged air filter restricting flow to the compressor inlet at all times

C. A wastegate that is opening too early at all engine speeds and loads

D. Normal turbocharger operation requiring no service or further investigation

35. 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

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

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

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 plugged catalytic converter creating excessive exhaust system backpressure

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

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

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

37. Technician A says GDI systems require pressure relief before service work begins. Technician B says GDI fuel rail pressures can exceed 2,000 psi during normal operation. 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 30% open by the scan tool produces no observable change in idle quality or engine vacuum. The MOST likely cause is:

A. Normal EGR valve operation since the valve does not affect idle conditions

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

C. The EGR valve is stuck closed or its passages are fully blocked with carbon

D. The EGR position sensor is providing false position feedback to the PCM controller

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

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

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

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

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

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

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

D. Installing an aftermarket air filter that meets the original OEM filtration standards

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. A failed mass airflow sensor producing incorrect fuel mixture across all conditions

D. Sustained misfire has contaminated and overheated the catalyst substrate over time

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. Replace both upstream oxygen sensors based on the elevated long-term fuel trim values

B. Investigate common-cause issues affecting both banks — vacuum leak, MAF, fuel pressure

C. Replace the engine controller since fuel trim values exceed normal expected ranges

D. Investigate bank-specific causes since both banks show similar trim values

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. Adaptive learning values were reset and require a relearn drive cycle to relearn

B. The battery disconnect damaged the PCM during the procedure performed

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 an open circuit or short to power producing high voltage signal

D. The ECT sensor has failed in the low-voltage state requiring sensor replacement

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

A. A network communication issue affecting bus traffic between modules

B. A PCM power supply problem causing intermittent module operation

C. A faulty PCM ground connection producing erratic module behavior

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

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 throttle is responding correctly within typical bidirectional control tolerance

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

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. Allow the engine to idle during reprogramming to maintain voltage from charging

C. Use a 12V test light to monitor system voltage during the reprogramming session

D. Connect a battery maintainer to ensure stable voltage throughout the entire session

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. The PCM's internal communication processor circuit on the bus line connection

B. Two 120-ohm terminating resistors at opposite ends of the bus in parallel

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 10: ANSWER KEY AND EXPLANATIONS

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

2. D — A vacuum reading at 16 in. Hg with a steady needle at sea level is below the healthy 17–22 in. Hg range. Steady but low readings indicate either exhaust restriction (limiting cylinder scavenging) or a major intake manifold air leak (preventing proper vacuum development). The low-but-stable pattern is the diagnostic signature.

3. A — Symptom history (worsening, improving, or stable over time) is the most diagnostic interview information. It reveals whether the issue is a developing failure, an intermittent fault, or a chronic condition. Vague questions about fuel purchase location, mileage, or parking rarely contribute meaningful diagnostic value.

4. C — 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.

5. A — 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.

6. D — Wrong oil viscosity used during a recent oil change is a common cause of post-service ticking. Wrong-weight oil produces inadequate film thickness or restricted flow at startup, allowing valve train components to make noise. The temporal correlation between the service and the symptom is the diagnostic clue.

7. B — 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. C — A clogged catalytic converter does not produce blue smoke during cold start. Cold-start blue smoke that clears within 30 seconds is the signature of valve seal seepage or PCV-related oil contamination. Catalytic converter issues produce power loss and excessive backpressure, not oil-burning symptoms.

9. A — Fuel rail pressure dropping during hesitation events points to a weakening fuel pump that cannot maintain pressure under heavy demand. The pump can hold pressure during normal operation but fails under acceleration loads. The temporal correlation between pressure drop and symptom is the diagnostic clue.

10. C — 8° 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. B — A vacuum gauge reading loses approximately 1 in. Hg per 1,000 feet of elevation. At 3,000 feet, the normal 17–22 in. Hg range drops by about 3 in. Hg, making 21 in. Hg above the expected range when adjusted for altitude. Always adjust expected vacuum readings for elevation before drawing conclusions.

12. C — 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.

13. B — A clogged catalytic converter creates continuous backpressure that affects all operating conditions, not just hot-only stalls. The other listed causes — fuel pump losing pressure when hot, CKP sensor failing when warm, vacuum leaks worsening at temperature — all produce symptoms specifically related to thermal effects.

14. D — 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.

15. A — 0.002 inch is 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. C — 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. A — Technician A is correct; Technician B is wrong. A worn cam lobe reduces valve LIFT, not compression. The valve still closes properly because the base circle is unchanged. Compression is determined by sealing during the closed phase, not by lift during the open phase.

18. D — All cylinders showing 25 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. B — Bore 4.003 minus piston 4.000 equals 0.003 inch clearance, exactly at the 0.0030 inch maximum specification. The clearance is within OEM tolerance. There is no service requirement for measurements within specification — accept the reading and continue assembly.

20. A — 0.0018 inch falls within the 0.0010 to 0.0030 inch specification range. There is no service requirement for clearance values within specification. Replacement, additional lubricant compensation, or over-torquing are all incorrect responses to in-spec readings.

21. D — 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. C — 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 — Idle-only overheating in hot weather with all components testing within specification points to the cooling fan or its control circuit not engaging properly at idle. The system can move heat at speed (driven airflow) but not at idle when the fan must do the work. Fan or fan-control failure is the typical cause.

25. D — 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. A — A reading of 0.4 ohms exactly meets the lower limit of the 0.4–0.8 ohm specification. The coil is at the borderline of acceptable but technically within range. There is no service requirement for measurements that meet specification, even if borderline. Document the reading and continue diagnosis if the symptom persists.

27. C — 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. B — A failed CKP sensor produces no-start conditions or stalling, not a single-cylinder misfire. Single-cylinder misfires trace to components specific to that cylinder — coil, plug, injector. CKP failure is a system-level fault that affects all cylinders or prevents the engine from running at all.

29. D — 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. A — 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. C — A failed downstream oxygen sensor affects catalyst efficiency monitoring, not ignition system performance during heavy acceleration. Misfires only under acceleration trace to ignition components stressed by higher cylinder pressures (failing coils, worn plugs, deteriorating wires). The downstream sensor's role is in monitoring the converter.

32. B — A returnless system holds rail pressure constant regardless of operating conditions because the regulator is in the tank. 56 psi at idle and 56 psi at WOT exactly matches the OEM constant-pressure specification. The system is operating correctly.

33. D — Volume capacity is best measured directly by collecting fuel pump output in a graduated container over a fixed time interval. Pressure measurement alone tells whether the pump can build pressure but not whether it can sustain volume. The volumetric flow test is the definitive measurement for volume capacity.

34. A — White smoke combined with low boost on a turbocharged application points to internal turbocharger seal failure. The compressor or turbine seals leak oil into the intake or exhaust stream, producing white smoke and reducing boost capability. This is a classic turbo failure pattern requiring turbocharger service.

35. C — 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. A — 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 systems require pressure relief through OEM-specified procedures before service to prevent injury from injected fuel. GDI fuel rail pressures can exceed

2,000 psi during normal operation, dramatically higher than port injection systems (35–60 psi). 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. C — A commanded EGR valve that produces no observable engine response indicates the valve is not actually opening. The pintle is stuck closed or the EGR passages are fully blocked with carbon. The lack of idle change confirms no exhaust gas is flowing into the intake despite the command.

40. A — 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. A — 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. D — 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. B — 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. A — 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. C — 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 coolant temperature.

46. 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.

47. B — 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. D — 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. B — 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.