PRACTICE EXAM 11: ASE T1 GASOLINE ENGINES SIMULATION

1. A scope captures the cranking compression waveform on cylinder 5 of a 7.3L Godzilla. The waveform shows compression peaks at 90 psi while the other seven cylinders peak at 165–175 psi. The MOST appropriate next step is to:

A. Replace the cylinder 5 spark plug as the most common cause of compression loss

B. Replace the cylinder 5 ignition coil as a preventive measure for the symptom

C. Perform a wet compression test on cylinder 5 to isolate ring versus valve leakage

D. Replace the engine controller since compression loss indicates PCM failure patterns

2. A heavy-duty gasoline truck has been brought in with a complaint of "engine cranks but won't start." The technician's structured diagnostic begins by verifying:

A. Whether fuel pressure, ignition spark, and engine compression are all present

B. The customer's interpretation of the symptom by performing a road test immediately

C. The engine controller status by replacing it as a preventive diagnostic measure

D. The catalytic converter condition by tapping it with a rubber mallet first

3. A vacuum gauge on a 6.0L Vortec at idle reads 19 in. Hg. The technician opens the throttle to 2,500 RPM and the gauge drops to 6 in. Hg. The needle then takes 8 seconds to recover to 19 in. Hg after the throttle is released. The MOST likely cause is:

A. Worn valve guides producing irregular sealing throughout the operating range

B. A worn camshaft causing valve timing variation under different load conditions

C. Normal engine response to throttle changes with healthy vacuum recovery

D. A plugged catalytic converter creating excessive backpressure under load

4. A LEAST-likely cause of an oil consumption complaint with no visible external leakage is:

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

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

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

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

5. A power balance test on a 6.4L HEMI shows cylinder 6 contributes 40 RPM less than the average of the other seven cylinders. Compression on cylinder 6 measures 165 psi, matching the other cylinders. The MOST likely cause is:

A. An ignition or fuel delivery issue specific to cylinder 6 location during operation

B. A failed compression ring on cylinder 6 requiring engine teardown for repair

C. A blown head gasket between cylinder 6 and an adjacent cylinder location

D. Mechanical wear that affects compression but not power production at cylinder 6

6. The customer reports a Class 5 truck "stalls at every traffic light when the engine is cold." The engine 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 many miles does the truck currently have on the odometer at this time?

C. Does the symptom occur in any specific operating condition such as cold weather?

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

7. A LEAST-likely cause of a knocking noise from the bottom of the engine is:

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

B. A failed downstream oxygen sensor providing incorrect feedback to the controller

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

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

8. The MOST appropriate response when a customer reports a "no-start" condition with no warning before the failure is to:

A. Quote the customer for a complete engine replacement before any diagnostic work

B. Replace the engine controller as the most common no-start cause on this platform

C. Immediately begin replacing components based on most common failure patterns

D. Verify the no-start condition exists and document any symptoms during cranking

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

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

B. A failed knock sensor producing false detection signals continuously

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

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

10. A vacuum gauge connected to a heavy-duty gasoline V8 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 during operation

11. A LEAST-likely cause of a coolant loss complaint with no visible external leak on a high-mileage gasoline truck 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 normal operation

C. An intake manifold gasket leak where coolant passages cross sealing surfaces

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

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

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

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

C. Tell the customer the repair is optional and can be deferred based on cost concerns

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

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

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

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

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

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

14. A LEAST-likely cause of a vacuum leak symptom on a heavy-duty gasoline V8 is:

A. A cracked intake manifold gasket or composite intake manifold body

B. A disconnected or cracked vacuum hose to a sensor or actuator

C. A clogged catalytic converter creating exhaust restriction during operation conditions

D. A failed PCV valve allowing excessive crankcase pressure to escape

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

A. 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 valve face to seat causing valve burning over time

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

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

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

17. Technician A says induction-hardened valve seats are part of the cylinder head material itself. Technician B says insert-style valve seats are separate hardened rings pressed into the head. 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 chain replacement on a 7.3L Godzilla is being verified after installation. The technician aligns crankshaft and camshaft marks at TDC compression cylinder 1. The cam mark appears to be one tooth retarded from the OEM reference. The MOST appropriate action is to:

A. Reposition the cam sprocket to align the mark exactly with the OEM reference position

B. Continue with reassembly since one tooth retard produces minimal performance change

C. Reassemble and verify operation by road test before making any further adjustments

D. Replace the timing chain since one tooth retard indicates chain stretch beyond service

19. A piston measurement at the skirt shows 4.001 inch. The cylinder bore measures 4.005 inch. OEM clearance specification is 0.0010 to 0.0030 inch. The clearance:

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

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

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

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

20. Plastigage on a connecting rod bearing produces a width corresponding to 0.0021 inch. OEM specification is 0.0010 to 0.0026 inch. The MOST appropriate action is:

A. Apply additional assembly lubricant during installation to compensate for clearance

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

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

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

21. A LEAST-likely cause of cylinder bore taper exceeding OEM specification on a high-mileage 6.0L Vortec is:

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

B. Normal long-term wear from ring travel against the cylinder wall over time

C. Operation with insufficient oil viscosity allowing accelerated wear patterns

D. Lack of proper engine maintenance allowing dirty oil to circulate over time

22. A crankshaft journal measurement shows 2.398 inch in one direction and 2.400 inch perpendicular to that. OEM specification limits journal out-of-round to 0.0005 inch. The crankshaft:

A. Is within specification and can be reused with new bearings during reassembly

B. Has been improperly machined and requires immediate replacement service

C. Has 0.002 inch out-of-round and must be reground or replaced before reuse

D. Is at the maximum specification limit but can be reused with care during operation

23. Oil pressure on a 6.4L HEMI measures 14 psi at hot idle and 38 psi at 2,000 RPM. OEM specification is 25–40 psi at idle and 50–65 psi at 2,000 RPM. The MOST likely cause is:

A. A pressure relief valve sticking closed at the maximum pressure setting continuously

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

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

D. A failed oil pump producing inadequate pressure under all 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. The cooling system will produce improved heat transfer due to chemistry blend

C. The coolant capacity will increase due to the chemistry mixture properties

D. A gel-like precipitate may form, clogging heater cores and radiator tubes

25. The MOST appropriate cooling system service after a head gasket replacement on a 7.3L Godzilla is to:

A. Refill the system, bleed all air pockets, and verify proper level after heat cycles

B. Refill the system and start the engine immediately to verify proper operation

C. Refill with fresh coolant and check the level after 24 hours of cool-down period

D. Refill the system with water only for the first 100 miles to verify no leaks present

26. A coil-on-plug ignition coil is being scope-tested. The primary winding signal shows the ground-side voltage rising to 200 V at the moment of field collapse. This signal pattern indicates:

A. The PCM is failing to ground the primary circuit during firing events

B. The coil primary winding has failed and requires immediate replacement service

C. Normal field collapse producing the expected high-voltage spike at coil shutoff

D. The coil secondary winding has failed and is producing back-EMF on the primary

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

A. Both Technician A and Technician B

B. Technician B only

C. Technician A only

D. Neither Technician A nor Technician B

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

A. A failed engine controller producing intermittent firing commands continuously

B. Hydraulic lifters that have bled down during the engine-off period

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

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

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

A. Pre-ignition damage requiring engine teardown for inspection of internal components

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

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

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

30. 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 coil-on-plug coils have all failed simultaneously requiring full replacement

C. The fuel pump has failed and is preventing engine startup despite spark capability

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

31. A LEAST-likely cause of misfires that set only on cold start and clear within 30 seconds of running is:

A. Hydraulic lifters bleeding down during the engine-off period of the engine

B. Fuel injectors with deposits that improve as injector body warms up over time

C. A failed crankshaft position sensor producing no signal during operation

D. Spark plug carbon tracking that conducts on cold porcelain only during operation

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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 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

36. A heavy-duty gasoline truck has a vacuum leak at the brake booster line. The fuel trim and operating symptoms include:

A. Positive long-term fuel trim, possible hissing sound when applying the brakes

B. Negative long-term fuel trim, no audible symptom from the brake booster line

C. No measurable fuel trim change because the vacuum is supplied by the manifold

D. Fuel trim values that vary randomly because the vacuum source is inconsistent

37. Technician A says a fuel pump that produces correct pressure but inadequate volume points to pump wear. Technician B says a fuel pump that produces inadequate pressure but correct volume points to a fuel pressure regulator failure. 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

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

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

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

39. 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 during operation

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

40. An EGR valve commanded 50% open by the scan tool produces no observable RPM change at idle. The MOST likely cause is:

A. The EGR valve is functioning correctly with normal idle response to commands

B. The EGR valve is mechanically stuck or the EGR passages are blocked with carbon

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

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

41. Technician A says installing an aftermarket "delete tune" that disables emissions monitors is illegal under the Clean Air Act. Technician B says replacing a failed catalytic converter with an OEM-equivalent unit is legal service work. 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

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. 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. Battery replacement requires PCM replacement on this generation of vehicles

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

D. The battery cable corrosion is affecting current flow to the engine controller

45. A J1939 SPN/FMI code shows SPN 105 (Intake Manifold Temperature) with FMI 3 (Voltage Above Normal). The MOST likely cause is:

A. The IAT sensor has an open circuit or short to power producing high voltage signal

B. The intake manifold temperature is above the normal operating range continuously

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

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

46. 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 module on the bus that has failed and is loading the network excessively

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

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

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

A. Connect a battery maintainer to ensure stable voltage throughout the entire procedure

B. Disconnect the battery during the reprogramming to prevent voltage spikes

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

D. Use a 12V test light to verify system voltage during the reprogramming session

49. After replacing a transmission, the customer returns with harsh shifts. The MOST likely cause is:

A. The new transmission has a defect requiring warranty replacement immediately

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

C. The transmission adapt reset procedure was not performed after installation

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

50. CAN High measures 5.0 V and CAN Low measures 0 V with the engine running. The vehicle has multiple U-codes and module communication failures. The MOST likely cause is:

A. CAN High is shorted to power and CAN Low is shorted to ground simultaneously

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

C. The bus is in the recessive idle state with normal voltage levels present

D. A short to ground on the CAN Low wire in the vehicle harness only

PRACTICE EXAM 11: ANSWER KEY AND EXPLANATIONS

1. C — When a single cylinder shows low compression compared to the others, a wet compression test isolates whether leakage is past the rings or past the valves. Adding oil temporarily seals the rings; if compression rises, the issue is rings. If it doesn't change, the issue is valves or head gasket. The wet test directs further diagnosis precisely.

2. A — A "cranks but won't start" condition requires verification of the three fundamentals: fuel pressure, ignition spark, and engine compression. Whichever element is missing identifies the diagnostic direction. Replacing components or running road tests without these basic verifications wastes time and parts.

3. D — A vacuum drop on snap-throttle that takes 8 seconds to recover indicates exhaust restriction. Healthy exhausts allow vacuum to recover within 1–2 seconds. The sustained recovery time confirms a converter or muffler restriction creating backpressure that must dissipate before vacuum can return to normal.

4. B — 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 — Operating-condition specifics (cold weather, hot operation, load conditions) are the most diagnostic interview information. Stalls only at traffic lights when the engine is cold suggest specific conditions — possibly idle air control, fuel system thermal effects, or other cold-condition issues. Vague questions about fuel grade, mileage, or parking rarely contribute.

7. B — 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.

8. D — Verifying the symptom and documenting cranking behavior is the proper first step for any no-start condition. Without verification, the technician cannot know what to fix. Component replacement without diagnosis wastes parts; engine replacement without diagnosis is fraud.

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

10. B — Rapid small-amplitude needle vibration at idle 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.

11. 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.

12. B — 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.

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

14. C — A clogged catalytic converter creates exhaust restriction, not a vacuum leak. Vacuum leaks are intake-side air leaks. The other listed causes — cracked manifold, disconnected hose, failed PCV valve — all admit unmetered air into the intake system, producing classic vacuum leak symptoms.

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

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

17. B — Both technicians are correct. Induction-hardened seats are part of the cylinder head material itself, surface-hardened by induction heating during manufacture. Insert-style seats are separate hardened rings (typically steel alloy) pressed into precision-machined bores in the head. Both types are common in heavy-duty truck applications.

18. A — Cam timing must be precisely aligned with the OEM reference position. One tooth retarded will alter valve events significantly, affecting power, idle quality, and emissions, with potential valve-to-piston contact in interference engines. The correct action is to reposition the cam sprocket to align exactly with the OEM reference.

19. D — Bore 4.005 minus piston 4.001 equals 0.004 inch clearance, which exceeds the 0.0030 inch maximum specification. Excessive clearance produces piston slap, ring sealing problems, and accelerated wear. The cylinder must be bored oversize and a corresponding piston installed.

20. C — 0.0021 inch falls within the 0.0010 to 0.0026 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. A — A failed MAF sensor affects fuel mixture and engine performance, not mechanical cylinder bore wear. Bore taper develops from ring travel against the cylinder wall over time, accelerated by dirty oil, wrong viscosity, or poor maintenance. The MAF is not mechanically connected to bore wear.

22. C — 2.400 minus 2.398 equals 0.002 inch out-of-round, well above the 0.0005 inch maximum specification. The crankshaft must be reground to the next undersize and matched with corresponding undersize bearings, or replaced. Reusing an out-of-round journal causes immediate uneven bearing loading.

23. B — 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. D — 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 — Cooling system service after head gasket replacement requires complete refilling, thorough air bleeding (through bleeder screws or by running the engine with the cap off), and verification of level after several heat cycles. Trapped air at the highest points produces overheating despite adequate coolant volume in the system.

26. C — A 200 V kickback voltage at the moment of field collapse on the primary winding is normal coil operation. The collapsing magnetic field induces this voltage spike on the primary side, which is then stepped up by the turns ratio to produce 5,000–35,000 V on the secondary. The pattern indicates healthy coil operation.

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

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

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

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

30. 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.

31. C — A failed CKP sensor producing no signal during operation prevents the engine from running at all — not just on cold start. The other listed causes (bled-down lifters, fuel injector deposits, plug carbon tracking on cold porcelain) all produce cold-start-only symptoms that clear with warmup. CKP failure produces continuous problems.

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

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

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

35. 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.

36. A — A vacuum leak at the brake booster line admits unmetered air, producing positive long-term fuel trim. The leak is often audible as a hissing sound, and the noise typically changes when the

brakes are applied because brake application changes the booster's vacuum demand. Both the trim change and the audible signature confirm the diagnosis.

37. C — 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.

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

39. A — A 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.

40. B — 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.

41. B — 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. 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. 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. C — 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. A — SPN 105 identifies intake manifold temperature; FMI 3 identifies "Voltage Above Normal." The combination indicates the IAT 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. D — A single failed sensor produces one DTC related to that sensor's circuit, not multiple unrelated U-codes across many modules. Multiple-module communication codes point to network or PCM ground/power issues that affect communication or operation across the entire vehicle system.

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

48. A — 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.

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

50. A — CAN High at 5.0 V and CAN Low at 0 V are not normal values; healthy CAN buses sit at approximately 2.5 V on both wires when idle and develop only small differential voltages during transmission. Extreme voltages on both wires indicate one is shorted to power and the other to ground, causing the communication failures.