PRACTICE EXAM 13: ASE T1 GASOLINE ENGINES SIMULATION

1. A heavy-duty gasoline truck arrives with the customer reporting "loss of power and dark smoke from the exhaust under heavy load." The MOST appropriate first diagnostic step is to:

A. Replace the fuel injectors as the most common cause of dark smoke under load

B. Verify the symptom and retrieve any DTCs and freeze frame data from the controller

C. Replace the catalytic converter since dark smoke indicates converter damage

D. Replace the engine controller since power loss with smoke indicates PCM failure

2. A vacuum gauge connected to a 6.0L Vortec at idle shows a regular drop from 19 in. Hg to 13 in. Hg occurring approximately once per second. The drop is consistent and rhythmic. The MOST likely cause is:

A. A burned valve on a single cylinder failing to seat properly each cycle

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

C. A worn camshaft causing valve timing variation throughout operation

D. A failed fuel pressure regulator producing intermittent pressure changes

3. The customer reports a Class 6 work truck "starts hard in cold weather but starts normally when warm." 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. Where is the truck typically parked when not in active service operation today?

D. How long has the cold-start issue been occurring and has it gotten worse over time?

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

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

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

5. A heavy-duty gasoline truck has been brought in with a "knocking noise from the bottom of the engine that worsens with engine speed." A stethoscope confirms the noise originates from the rod bearing area. The MOST likely cause is:

A. Worn connecting rod bearings on one or more cylinders requiring inspection

B. Worn main bearings allowing crankshaft movement under operating conditions

C. A loose harmonic balancer producing rotational imbalance during operation

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

6. A vacuum gauge at idle shows 21 in. Hg with the needle steady. The vehicle is at sea level. The technician opens the throttle quickly to 2,500 RPM and the gauge drops to 5 in. Hg, then immediately recovers to 22 in. Hg before settling back to 21 in. Hg at idle. The pattern indicates:

A. A clogged catalytic converter creating excessive backpressure during operation conditions

B. Normal engine response during throttle changes with healthy vacuum recovery

C. Worn valve guides producing irregular sealing across multiple cylinders

D. A burned valve causing irregular vacuum readings during all operating conditions

7. A Class 4 truck has been brought in for "rough idle that started after a recent tune-up." The technician learns the prior shop replaced spark plugs, ignition coils, and fuel injectors. The MOST likely cause is:

A. The new ignition coils are defective and require replacement under warranty

B. The new spark plugs are gapped incorrectly for the application requirements

C. The new fuel injectors are defective and require replacement under warranty

D. Investigate which component or installation step from the recent tune-up caused the issue

8. A LEAST-likely diagnostic step in evaluating a "stalls when warm" complaint is to:

A. Replace the fuel pump as the most common cause of warm-stall complaints in trucks

B. Verify the symptom by allowing the engine to reach the conditions where stalling occurs

C. Capture live data with a scan tool during operation under conditions where stalling occurs

D. Review service history for recent repairs or related work that may indicate the cause

9. A heavy-duty gasoline truck has been brought in for a "loss of power on grades when hot." Live data captured during the symptom shows commanded ignition advance at 22° with knock retard at 9°. The MOST likely cause is:

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

B. Normal operation with appropriate timing retard for the operating conditions present

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

10. The customer reports a Class 5 truck "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 engine controller producing random hesitation events during acceleration

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

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 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. Two technicians discuss diagnostic methodology. Technician A says verifying the customer complaint is the foundation of effective diagnosis. Technician B says skipping verification because "the symptom is obvious" leads to comebacks. 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

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

A. The original cylinder 1 spark plug is defective and requires immediate replacement

B. The original cylinder 1 ignition coil is defective and produces misfire when relocated

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

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

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

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

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

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

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

16. Technician A says insert-style valve seats can be replaced when worn. Technician B says induction-hardened valve seats are part of the cylinder head material itself and cannot be replaced separately. 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

17. A LEAST-likely consequence of installing a too-hot heat range spark plug in a heavy-duty gasoline truck operating under sustained heavy load is:

A. Pre-ignition damage to the piston, valves, or other combustion chamber components

B. Reduced spark plug life from electrode burning and erosion under heavy load

C. Improved cold-start performance and reduced fouling in the affected cylinder

D. Possible burned electrodes or cracked insulator from excessive temperature

18. A timing chain replacement is being verified after installation on a 6.4L HEMI. The technician aligns crankshaft and camshaft marks at TDC compression cylinder 1. The cam mark appears to be one tooth advanced from the OEM reference. The MOST appropriate action is:

A. Continue with reassembly since one tooth advance produces minimal performance change

B. Replace the timing chain since one tooth advance indicates chain stretch beyond service

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

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

19. A piston pin clearance measurement shows 0.0010 inch in the rod and 0.0008 inch in the piston. OEM specification is 0.0005 to 0.0015 inch in the rod and 0.0005 to 0.0010 inch in the piston. The MOST appropriate action is:

A. Replace the rod and piston as both are at the maximum specification limit

B. Reuse both the rod and piston as both are within OEM specifications

C. Reuse both the rod and piston since both are at the maximum specification

D. Apply additional assembly lubricant to compensate for the borderline measurements

20. Plastigage on a connecting rod bearing produces a width corresponding to 0.0023 inch. OEM specification is 0.0010 to 0.0026 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. Tighten the cap beyond specification to compress the clearance further

D. Apply additional assembly lubricant during installation to compensate fully

21. A LEAST-likely cause of cylinder block deck warpage is:

A. Sustained operation with a failed head gasket allowing combustion gases to attack deck

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

C. Severe overheating that distorts the block during cooling after thermal stress

D. Improper cylinder head installation with inadequate or improper torque sequence

22. A crankshaft journal measurement after a regrind shows 2.378 inch on a journal that was originally 2.398 inch. OEM undersizes are 0.010, 0.020, and 0.030 inch under standard. The technician needs:

A. A 0.020 inch undersize bearing because the journal has been ground 0.020 inch

B. A 0.030 inch undersize bearing because the journal is now 0.020 inch undersize

C. A 0.010 inch undersize bearing because the journal has been ground 0.010 inch

D. A standard size bearing because the regrind size has not changed the bearing size

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

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

B. A pressure relief valve sticking closed at the maximum pressure setting condition

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

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

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

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

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

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

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

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

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

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

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

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

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 LEAST-likely cause of carbon tracking on a coil-on-plug coil boot is:

A. Moisture intrusion into the spark plug well during heavy rainstorm conditions

B. Normal high-mileage operation with no underlying cause requiring investigation

C. A cracked or aged coil boot allowing arc-over to ground during operation

D. Carbon buildup from secondary voltage finding low-resistance path to ground

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

A. Technician A only

B. Technician B only

C. Both Technician A and Technician B

D. Neither Technician A nor Technician B

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

A. The 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

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

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

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

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

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

31. A spark plug shows white deposits with normal electrode wear and proper gap. The MOST likely cause is:

A. Oil consumption with additive deposits, or a fuel-related ash issue from the fuel quality

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

C. Pre-ignition damage from incorrect spark plug heat range selection during service

D. Severe engine damage requiring immediate teardown for inspection of internals

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 with a vacuum leak at the regulator producing constant pressure

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

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

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

A. A wastegate that is stuck closed and not opening at the commanded pressure

B. A clogged air filter restricting flow to the compressor inlet throughout operation

C. A clogged intercooler restricting flow to the engine throughout operation

D. A worn turbocharger compressor wheel reducing efficiency at high boost levels

34. 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. 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 mixture

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

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

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

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

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

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

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

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

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

37. A heavy-duty gasoline truck has a hesitation off-idle that has gradually worsened over six months. Throttle body inspection reveals significant carbon accumulation. The MOST likely cause is:

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

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

C. PCV system contamination depositing oil mist on the throttle body components

D. Normal wear of the throttle body components that requires no service action

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

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

B. Replace the EVAP canister based on the gross leak code presence

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

B. Investigate bank-specific causes since both banks show similar trim values to start

C. Replace both upstream oxygen sensors based on the elevated fuel trim values present

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

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

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

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

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

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 4 (Voltage Below Normal). The MOST likely cause is:

A. The engine coolant temperature is above the normal operating range continuously

B. The PCM has failed and is misreading the ECT sensor signal during operation

C. The ECT sensor has failed in the high-voltage state requiring sensor replacement

D. The ECT sensor has an open circuit short to ground or sensor failure producing low voltage

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

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

B. A network communication issue affecting bus traffic between modules

C. A PCM power supply problem causing intermittent module operation

D. A faulty PCM ground connection producing erratic module behavior

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

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

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

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

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

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

49. 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

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. The instrument cluster's bus terminator at the dashboard location only

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

D. The body control module's bus interface circuitry only on the network

PRACTICE EXAM 13: ANSWER KEY AND EXPLANATIONS

1. B — Verifying the symptom and retrieving DTCs is the proper diagnostic foundation for any complaint. DTCs and freeze frame data identify what the controller has detected and the conditions present at the time. Component replacement without verification wastes parts and rarely addresses the actual cause of the complaint.

2. A — A regular vacuum drop occurring once per second at idle is the signature of a single burned valve failing to seat each time it closes on its compression stroke. The frequency corresponds to one valve event per cylinder per cycle. The pattern distinguishes this from random noise or load-related fluctuations.

3. D — Symptom history (duration and progression) is the most diagnostic interview information. It reveals whether this is a developing failure, an intermittent issue, or chronic condition. Vague questions about fuel grade, mileage, or parking location rarely contribute meaningful diagnostic value.

4. C — A failed catalytic converter is an exhaust system component, not a source of internal oil consumption. Oil consumption with no external leakage traces to oil entering the combustion chamber — through worn rings, valve guides, or seals. The converter has no oil pathway to consume oil internally.

5. A — Knocking noise from the bottom of the engine that worsens with engine speed and originates from the rod bearing area on stethoscope inspection is the classic signature of worn rod bearings. The noise location and behavior pattern are characteristic. Inspection requires bearing measurement after disassembly.

6. B — A vacuum drop on snap-throttle that immediately recovers — even briefly overshooting normal idle vacuum before settling — is normal engine response. The momentary overshoot reflects the engine's response to closed-throttle deceleration. Healthy exhausts and engines produce this rapid recovery pattern.

7. D — Multiple components were replaced during the recent tune-up — any one of them, or the installation procedure, could be the cause. Investigating which specific component or step is responsible is the proper diagnostic approach. Random replacement assumptions waste parts and may not address the actual cause.

8. A — Replacing the fuel pump as the most common cause of warm-stall is not a diagnostic step — it is a guess. Proper diagnosis requires verification, live data capture, and review of service history.

Component replacement without verification wastes parts and may not address the actual cause of the symptom.

9. C — 9° 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. 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.

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. 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. A — Both technicians are correct. Verification is the foundation of effective diagnosis because it ensures the technician understands what the customer is experiencing. Skipping verification because the symptom seems obvious is a common cause of comeback work — confirmation bias leads to misdiagnosis even on apparently simple complaints.

14. B — When the misfire follows the swapped coil to its new location, the coil is the defective component. The original cylinder 1 coil now in the cylinder 8 position is causing the cylinder 8 misfire. The swap-and-watch technique definitively confirms the coil as the cause, justifying its replacement.

15. D — 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. A — Both technicians are correct. Insert-style valve seats are separate hardened rings pressed into precision-machined bores in the head and can be replaced when worn. Induction-hardened seats are part of the cylinder head material itself, surface-hardened during manufacture, and cannot be replaced separately — only the entire head can be replaced.

17. C — A too-hot heat range plug under sustained heavy load does not improve cold-start performance — that is a benefit of hot plugs in light-duty short-trip applications. Under heavy

load, a too-hot plug glows red and pre-ignites the mixture, causing piston damage, valve damage, and burned electrodes.

18. D — Cam timing must be precisely aligned with the OEM reference position. One tooth advanced 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. B — Both measurements (rod 0.0010, piston 0.0008) fall within their respective OEM specifications. There is no service requirement for measurements within specification. Replacing components or applying excess lubricant for in-spec readings is wasteful and incorrect.

20. A — 0.0023 inch falls within the 0.0010 to 0.0026 inch specification range. There is no service requirement for clearance values within specification. Replacement, over-torquing, or excess lubricant are all incorrect responses to in-spec readings — accept the measurement and continue assembly.

21. B — A failed MAF sensor affects fuel mixture and engine performance, not block deck warpage. Block deck warpage develops from severe overheating, sustained head gasket failure attacking the deck, or improper head installation. The MAF is not mechanically connected to deck integrity.

22. A — The journal has been ground from 2.398 inch to 2.378 inch, a reduction of 0.020 inch. The matching bearing must be a 0.020 inch undersize bearing to provide proper clearance with the reground journal. Each bearing undersize matches its corresponding journal regrind.

23. D — Both readings (25 psi at hot idle, 50 psi at 2,000 RPM) fall within their respective OEM specifications. There is no service requirement for readings within specification. The engine is operating correctly across the measured range.

24. A — 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. C — 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. 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. B — Carbon tracking on a coil boot always has an underlying cause. Moisture intrusion, cracked or aged boots, and accumulated arc-over damage are all common causes. "No underlying cause" is not a valid diagnostic conclusion — carbon tracking only develops when secondary voltage finds an arc-over path due to specific failures.

28. C — Both technicians are correct. The waste-spark fires during the exhaust stroke of the paired cylinder, where it serves no useful purpose. The waste-spark requires almost no energy because cylinder pressure during exhaust is near atmospheric, so the coil's energy is delivered nearly entirely to the compression-stroke plug.

29. 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 — 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.

31. A — White ash deposits with normal electrode wear indicate oil consumption with additive deposits, or fuel-quality-related ash. Oil additives or fuel contaminants form ash when burned in the combustion chamber. The ash signature differs from white blistering of pre-ignition (which damages electrodes).

32. C — 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. A — Boost pressure that overshoots specification indicates the wastegate is failing to open at the commanded pressure. The wastegate's job is to prevent boost from exceeding the commanded value. A stuck-closed wastegate (failed actuator, blocked control line, or failed control solenoid) keeps boost rising beyond specification.

34. 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.

35. B — 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.

36. A — 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.

37. C — Significant carbon accumulation on a throttle body that has gradually worsened over six months is most often caused by PCV system contamination. Oil mist routed through the PCV system deposits on the throttle plate and bore over time. Cleaning the throttle body is the immediate fix; addressing the PCV contamination prevents recurrence.

38. A — 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. D — 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. D — 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. B — 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. D — SPN 110 identifies engine coolant temperature; FMI 4 identifies "Voltage Below Normal." The combination indicates the ECT sensor circuit is reading low voltage, typically caused by a short to ground in the wiring or a sensor failure pulling the signal low. The signal characteristic is the diagnostic information, not actual coolant temperature.

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

47. 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. D — 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. 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.

50. C — 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.