PRACTICE EXAM 15: ASE T1 GASOLINE ENGINES SIMULATION

1. A heavy-duty gasoline truck has been brought in with a complaint of "engine cranks but won't start." The technician verifies fuel pressure at 56 psi (specification 56 psi) and spark at all cylinders. The MOST appropriate next diagnostic step is to:

A. Verify engine compression to confirm the third element of the combustion fundamentals

B. Replace the engine controller as a no-start condition with fuel and spark indicates PCM failure

C. Replace the catalytic converter as a no-start condition often indicates exhaust restriction

D. Replace all eight ignition coils as a preventive measure during no-start diagnosis

2. A vacuum gauge connected to a 6.4L HEMI at idle shows the needle dropping from 19 in. Hg to 5 in. Hg approximately every 30 seconds, then recovering. The MOST likely cause is:

A. Worn valve guides producing irregular sealing across multiple cylinders during operation

B. A failed fuel pressure regulator producing intermittent pressure changes during operation

C. A worn camshaft causing valve timing variation throughout the engine speed range

D. AC compressor cycling on and off during normal idle operation conditions

3. The customer reports a Class 5 truck "lost power suddenly while driving on the highway and now won't accelerate above 30 mph." The MOST likely cause to investigate first is:

A. The engine controller has failed coincidentally during the highway operation

B. A failed turbocharger, clogged catalytic converter, or major mechanical failure

C. The spark plugs have all failed simultaneously requiring complete replacement

D. The fuel filter is clogged due to fuel contamination from recent fueling

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

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

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

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

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

5. A power balance test on a 6.0L Vortec shows cylinder 7 contributes 35 RPM less than the average of the other seven cylinders. Compression on cylinder 7 measures 165 psi, matching the other cylinders. The MOST likely cause is:

A. A blown head gasket between cylinder 7 and an adjacent cylinder location

B. A failed compression ring on cylinder 7 requiring engine teardown for repair

C. An ignition or fuel delivery issue specific to cylinder 7 location during operation

D. Mechanical wear that affects compression but not power production at cylinder 7

6. A heavy-duty gasoline truck has been brought in with a "knocking noise from the bottom of the engine that occurs only at cold start and goes away within 60 seconds." The MOST likely cause is:

A. Piston slap from worn piston-to-cylinder wall clearance that quiets when warm

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

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

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

7. A vacuum gauge at idle shows 19 in. Hg with a steady needle. The technician opens the throttle quickly to 2,500 RPM and observes the gauge drops to 5 in. Hg, then immediately recovers to 22 in. Hg before settling back to 19 in. Hg at idle. The pattern indicates:

A. A clogged catalytic converter creating excessive backpressure during operation

B. A worn camshaft causing valve timing issues throughout the operating range

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

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

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

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

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

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 "loss of power on grades when hot only." Live data captured during the symptom shows commanded ignition advance at 22° with knock retard at 9°. The MOST likely cause is:

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

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

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

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

10. The customer reports a Class 4 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 42 psi momentarily. The MOST likely cause is:

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

B. A failed catalytic converter creating excessive exhaust restriction continuously

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

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 failed mass airflow sensor providing incorrect signal data to the controller

C. A cracked cylinder head allowing coolant into the cylinder during normal operation

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

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

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

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

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

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

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. Technician A only

B. Technician B only

C. Both Technician A and Technician B

D. Neither Technician A nor Technician B

14. A heavy-duty gasoline truck arrives with the customer reporting "engine ran fine yesterday but won't start today after a heavy rainstorm." Cranking is normal. The MOST likely cause to investigate first is:

A. The fuel pump has failed coincidentally with the weather change overnight

B. The engine controller has failed and requires immediate replacement service

C. The catalytic converter has been damaged by water ingestion during the rain

D. Moisture intrusion into ignition components or wiring connectors causing failure

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

A. Send the head out for resurfacing or replace it based on warpage exceeding spec

B. Reuse the head as-is since the diagonal measurement is borderline acceptable

C. Apply RTV silicone to the warped areas during reassembly to seal the surface

D. Reuse the head with a thicker head gasket to compensate for the warpage

16. 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 B only

B. Technician A only

C. Both Technician A and Technician B

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

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

D. Possible burned electrodes or cracked insulator from excessive temperature

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-to-cylinder wall clearance measurement produces 0.0040 inch. OEM specification is 0.0010 to 0.0030 inch. The MOST appropriate action is:

A. Bore the cylinder oversize and install a corresponding oversize piston during repair

B. Reuse the existing piston with the current cylinder bore as-is during reassembly

C. Install a thicker connecting rod bearing to compensate for the clearance during operation

D. Apply assembly lubricant generously to compensate for the gap during operation

20. Plastigage on a connecting rod bearing produces a width corresponding to 0.0023 inch. OEM specification is 0.0010 to 0.0026 inch. The MOST appropriate action is:

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

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

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

D. Apply additional assembly lubricant during installation to compensate fully

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

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

B. Operation with insufficient oil viscosity allowing accelerated wear patterns

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

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

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 0.010 inch undersize bearing because the journal has been ground 0.010 inch

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

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

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

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

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

B. A pressure relief valve stuck open at the maximum pressure setting condition

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

D. A clogged oil filter forcing oil through the bypass valve continuously

24. A heavy-duty gasoline truck overheats only when the air conditioning is operating at idle. The cooling fan does not engage during the overheat event. The MOST likely cause is:

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

B. The cooling fan or its control circuit has failed at the AC operating condition

C. The water pump impeller has eroded and is not delivering adequate flow capacity

D. The thermostat has failed open and is preventing engine warmup completely

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 with water only for the first 100 miles to verify no leaks present

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

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

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

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

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

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

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

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

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

28. A heavy-duty gasoline truck has been brought in for a no-spark condition. CKP signal is present, fuel pressure is verified, and battery voltage is at all eight ignition coils. The MOST likely cause is:

A. The crankshaft position sensor has failed even though signal appears present

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

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

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

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

A. Normal combustion conditions with carbon accumulation from extended service

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

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

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

30. Two technicians discuss CKP sensor diagnosis. Technician A says magnetic CKP sensors require external power for operation. Technician B says Hall-effect CKP sensors produce constant-amplitude digital signals at any RPM. Who is correct?

A. Technician A only

B. Technician B only

C. Neither Technician A nor Technician B

D. Both Technician A and Technician B

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

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

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

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

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

32. A heavy-duty gasoline truck has fuel pressure of 60 psi at idle and 60 psi at WOT on a return-style fuel system. OEM specification is 56 psi vacuum-applied and 65 psi vacuum-disconnected. The MOST likely cause is:

A. A failed fuel pump producing constant maximum pressure under all conditions

B. The fuel pressure regulator vacuum line is missing or has fallen off the regulator

C. A clogged fuel return line preventing pressure modulation across operating conditions

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

33. A turbocharged Class 5 work truck has a "boost leak" symptom — boost pressure that rises briefly then drops as load increases. Charge piping is verified sealed. The MOST likely cause is:

A. A turbocharger compressor wheel that has separated from the turbine shaft entirely

B. An intercooler core that is cracked or has internal leaks under boost pressure

C. Normal turbocharger operation requiring no service or further diagnostic procedures

D. A failed wastegate actuator opening too early under heavy boost load conditions

34. The MOST diagnostic single test for a stuck-open EGR valve is to:

A. Disconnect the EGR valve electrical connector and observe whether idle improves

B. Replace the EGR valve based on the suspected stuck-open condition observation

C. Apply vacuum to the EGR valve manually and observe the engine's response

D. Cycle the EGR valve through bidirectional control and observe RPM changes

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 at idle

D. A damaged exhaust pipe upstream of the bank 1 oxygen sensor location

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

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

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

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

37. Technician A says a vacuum leak at the brake booster line will produce lean fuel trim. Technician B says a vacuum leak at the brake booster line will produce a hissing sound that may be noticeable when applying the brakes. 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

38. An EVAP system smoke test reveals smoke escaping from the purge valve while the valve is commanded closed. The MOST likely cause is:

A. The purge valve is stuck open and allowing vapor flow when it should be closed

B. The EVAP canister has failed and is leaking smoke from the canister body

C. The fuel cap has failed and is allowing smoke to escape from the filler neck

D. The fuel tank pressure sensor has failed and is producing false leak readings

39. A LEAST-likely symptom of a stuck-closed EGR valve is:

A. A NOx emissions failure on a state inspection program test

B. Spark knock or detonation under sustained load conditions on grades

C. A subtle reduction in fuel economy without obvious driveability complaints

D. Rough idle and stalling at low engine speeds with vacuum-leak-like behavior

40. A heavy-duty gasoline truck has set DTC P0420 (Catalyst Efficiency Below Threshold). Inlet temperature measures 720°F and outlet temperature measures 760°F. The MOST likely conclusion is:

A. The converter has lost catalytic activity with insufficient temperature rise across it

B. The converter is performing normally with appropriate temperature differential

C. The catalyst is poisoned but still producing some catalytic activity inside the unit

D. The downstream sensor has failed and the converter is functioning correctly

41. The federal Clean Air Act prohibits which of the following?

A. Replacing a failed catalytic converter with an OEM-equivalent unit during service

B. Replacing an oxygen sensor that has failed with an OEM-equivalent replacement

C. Disabling, removing, or rendering inoperative emissions controls on a road vehicle

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

42. After a PCM replacement on a heavy-duty gasoline truck, the customer returns with various rough idle and shifting complaints. The MOST likely cause is:

A. The PCM was not programmed with VIN-specific calibration matching the truck

B. The new PCM has failed within days of installation requiring immediate replacement

C. The fuel injectors have failed coincidentally with the PCM replacement service

D. The transmission has failed coincidentally with the PCM replacement service

43. A scan tool live data display shows fuel trim values: STFT +5%, LTFT +18%. Both banks. The MOST appropriate interpretation is:

A. The controller is removing fuel from a rich condition that is moderate at idle

B. The controller is adding fuel to compensate for a lean condition affecting both banks

C. Normal fuel trim values that require no further investigation or diagnostic action

D. The controller is producing random fuel trim values due to PCM signal interference

44. A bidirectional command from the scan tool causes the fuel pump to activate. After a few seconds, fuel rail pressure rises to 58 psi (specification 55–60 psi). This test confirms:

A. The fuel injectors are functioning correctly across all eight cylinders simultaneously

B. The fuel pump is functioning correctly but the regulator status cannot be determined

C. The fuel filter is not clogged and is allowing proper fuel flow through the system

D. The fuel pump and pressure regulator are functioning correctly per OEM specification

45. A LEAST-likely diagnostic step in the verification of network communication failures across multiple control modules is to:

A. Replace each module on the bus individually until the network communication issue clears

B. Verify CAN bus voltage levels with a multimeter across CAN High and CAN Low

C. Verify CAN bus terminating resistance is approximately 60 ohms with all modules off

D. Use a scope to inspect bus traffic for clean differential signaling without ringing

46. A heavy-duty gasoline truck has a P0128 (Coolant Temperature Below Thermostat Regulating Temperature) DTC. The technician should FIRST:

A. Replace the thermostat as the most common cause without testing the sensor

B. Replace the engine coolant temperature sensor as the most common cause

C. Verify thermostat operation by removing and testing it in heated water

D. Replace the entire cooling system since the DTC indicates major coolant issues

47. After a battery replacement, the customer returns complaining the cooling fan runs constantly with the engine off. The MOST likely cause is:

A. The cooling fan relay is energizing due to adaptive value reset and is not yet relearned

B. The battery replacement caused damage to the cooling fan motor or controller

C. The thermostat has failed during the battery replacement service unrelated to it

D. The water pump has failed during the battery replacement service procedure

48. A reprogramming session on a heavy-duty gasoline truck PCM displays "Calibration Mismatch" before installation. The MOST likely cause is:

A. The PCM has failed before the reprogramming session could begin properly

B. The selected calibration file does not match the vehicle's VIN-specific configuration

C. The scan tool is incompatible with this generation of vehicle architecture used

D. The battery voltage is too low to allow the reprogramming session to begin

49. 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 engine controller is failing to read the ECT sensor signal correctly through software

C. The ECT sensor is producing low voltage, possibly from a short to ground or sensor failure

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

50. A bidirectional throttle command from the scan tool moves the throttle plate from 0° to 30° as commanded. The actual TPS feedback shows the plate moved from 0° to 28°. The MOST likely interpretation is:

A. The throttle plate is responding correctly within typical bidirectional control tolerance

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

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

PRACTICE EXAM 15: ANSWER KEY AND EXPLANATIONS

1. A — When fuel pressure and spark are both verified, the missing element in the combustion fundamentals is compression. A no-start condition with two of three fundamentals confirmed requires verification of the third before pursuing component replacement. Engine compression failures (timing chain skip, severely worn rings, valve damage) prevent starting even with proper fuel and spark.

2. D — A vacuum drop occurring approximately every 30 seconds with recovery is the signature pattern of AC compressor cycling. The compressor engages and disengages on a thermostatic cycle, momentarily loading the engine each time. This is normal operation and not a fault to diagnose.

3. B — A sudden complete loss of acceleration capability points to a major airflow or exhaust restriction — failed turbocharger, clogged catalytic converter, or major mechanical failure. These produce immediate, dramatic power loss that prevents normal operation. Coincidental controller failure, simultaneous spark plug failure, or fuel filter clogging rarely produce sudden complete power loss.

4. A — 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. 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.

6. A — Cold-start knocking that quiets within 60 seconds of warmup is the classic signature of piston slap from worn piston-to-cylinder wall clearance. Cold pistons have looser fit; as the piston warms and expands, the clearance decreases and the noise diminishes. Bearing-related knocks would persist regardless of temperature.

7. D — 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.

8. B — 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. A — 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. C — 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. B — 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. A — Fluid leaks must be identified by type and traced to source before any repair quote. The fluid color, viscosity, and odor identify the system; tracing the leak to its origin identifies the failed component. Quoting repairs without diagnosis is unprofessional; ignoring leaks risks engine or transmission damage.

13. C — 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. D — Moisture intrusion into ignition components or wiring is the classic post-rainstorm no-start cause. Rain water can penetrate aging boots, connectors, or distributor caps, providing low-resistance paths to ground that prevent normal spark delivery. Drying the components and inspecting connectors typically resolves the issue.

15. A — Warpage of 0.005 inch and 0.004 inch both exceed the 0.003 inch OEM specification. The head must be resurfaced or replaced. Reinstallation, RTV silicone, or thicker gaskets are all incorrect responses to out-of-spec warpage and produce premature gasket failure.

16. C — 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.

17. B — 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 — 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. A — 0.0040 inch clearance exceeds the 0.0030 inch maximum specification. The cylinder must be bored oversize and a corresponding oversize piston installed to restore proper clearance. Reusing the existing piston, installing wrong components, or applying excess lubricant are all incorrect responses.

20. C — 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. D — 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 — 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. A — Low oil pressure at hot idle on an engine, with normal pressure not reached at higher RPM, points to worn engine bearings increasing the cumulative clearance volume. The pump cannot fill the increased clearance fast enough at low pump speeds. This is the classic high-mileage wear pattern.

24. B — Overheating only when the AC operates at idle, with the cooling fan failing to engage, points to the fan or its control circuit as the cause. AC operation increases cooling demand at idle (condenser heat plus engine heat), and the fan must engage to handle this load. Fan failure or AC-related fan command failure is the typical cause.

25. D — 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 within the OEM specification range indicates the coil is functioning electrically as designed. There is no service requirement for measurements within specification. Replacement, particularly across all coils, based on within-spec readings is wasteful and unprofessional.

27. D — 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 — When CKP signal, fuel pressure, and ignition coil power are all 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.

29. A — Light tan deposits with a small black ring near the threads at the porcelain base represents typical normal combustion conditions. The black ring is carbon accumulation in the cooler region near the threads, which is normal during extended service. The plug appearance does not indicate any abnormality requiring service.

30. B — Technician B is correct; Technician A is wrong. Magnetic CKP sensors generate their own signal and require NO external power. Hall-effect sensors produce constant-amplitude digital signals at any RPM regardless of speed. Magnetic sensors produce variable-amplitude signals that vary with speed.

31. A — 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 — Constant high pressure (60 psi) regardless of operating conditions on a return-style system indicates the pressure regulator is not receiving its vacuum reference signal. Without vacuum modulation, the regulator holds maximum pressure across all conditions. A disconnected or fallen-off vacuum line is the typical cause.

33. D — Boost that rises briefly then drops as load increases, with charge piping verified sealed, indicates the wastegate is opening too early. As cylinder pressure builds, the wastegate releases boost prematurely, preventing peak boost from being maintained. A failed actuator or weakened spring is typical.

34. A — Disconnecting the EGR valve electrical connector forces the valve fully closed (in most designs). If idle quality improves after disconnection, the valve was stuck open. This is a quick mechanical confirmation of the diagnosis without requiring valve removal.

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 the lean condition characteristic of a P0171 DTC.

36. A — 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.

37. B — Both technicians are correct. A vacuum leak at the brake booster line admits unmetered air into the intake, producing lean 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.

38. A — Smoke escaping from the purge valve while it's commanded closed indicates the valve is stuck open. The valve should hold pressure when closed; smoke flow through it confirms it cannot seal. This is the definitive diagnostic for a stuck-open purge valve.

39. D — A stuck-CLOSED EGR valve does not produce rough idle or stalling. It produces NOx emissions failures (since EGR cannot reduce NOx), spark knock under load (since reduced peak temperatures aren't being achieved), and subtle fuel economy changes. Rough idle is characteristic of a stuck-OPEN valve, not stuck-closed.

40. A — A converter producing only 40°F temperature rise (720°F to 760°F) indicates insufficient catalytic activity. A healthy converter produces approximately 100°F or more rise because the chemical reactions inside are exothermic. The low temperature differential confirms reduced conversion efficiency.

41. C — The Clean Air Act prohibits disabling, removing, or rendering inoperative emissions controls on road vehicles. Replacing failed components with OEM-equivalent parts and installing aftermarket air filters that meet OEM filtration standards are all legal service operations. Tampering with active emissions equipment is the legal violation.

42. A — A new PCM must be programmed with VIN-specific calibration matching the vehicle's engine, transmission, and equipment. Without this programming, the PCM may operate generically but produces driveability and shift complaints because the calibration doesn't match the actual vehicle configuration.

43. B — Positive fuel trim (STFT +5%, LTFT +18%) means the controller is adding fuel to compensate for a lean condition. Both banks affected indicates a common-cause issue — vacuum leak, MAF/MAP accuracy issue, fuel pressure problem, or PCV system issue. The values indicate active compensation, not random behavior.

44. D — Successful pump activation through bidirectional control producing pressure within OEM specification confirms both the pump and the regulator are functioning correctly. The pump

delivers volume; the regulator maintains specified pressure. The test does not validate injector or filter status — those require separate verification.

45. A — Replacing each module individually until the issue clears is not a diagnostic step — it is a wasteful guess-and-check approach that ignores systematic diagnosis. Proper network diagnosis uses voltage measurement, terminating resistance verification, and scope inspection of bus traffic before any component replacement.

46. C — P0128 is most often caused by a stuck-open thermostat preventing the engine from reaching regulating temperature. The DTC is frequently misdiagnosed as an ECT sensor fault, but the sensor is reading correctly — the engine is genuinely too cold. Verifying thermostat operation is the proper first step.

47. A — Battery replacement resets adaptive values that the controller has learned, including some accessory control parameters. The cooling fan circuit may be operating in a default state until the controller relearns its learned values through normal operation. Allowing the controller to relearn through driving typically resolves this.

48. B — "Calibration Mismatch" indicates the selected calibration file doesn't match the vehicle's VIN-specific configuration. The technician must verify the correct calibration is selected before proceeding. PCM failure, scan tool incompatibility, and battery voltage produce different error messages — this is a calibration-selection issue.

49. C — 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 SPN/FMI format directly identifies parameter and fault type.

50. A — A 2° difference between commanded (30°) and actual (28°) throttle position is within typical bidirectional control tolerance and indicates normal throttle response. Modern ETC systems do not require perfect agreement — small variations are expected and accepted. Larger discrepancies would indicate motor or sensor problems.