PRACTICE EXAM 8: ASE T1 GASOLINE ENGINES SIMULATION

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1. A customer brings a Class 5 work truck in with a complaint of "engine running rough at idle." The technician retrieves DTCs and finds P0300 (random misfire), P0171 (lean bank 1), and P0174 (lean bank 2). The MOST appropriate diagnostic direction is to:

A. Replace all eight ignition coils as a preventive measure for the misfire codes

B. Replace both upstream oxygen sensors based on the lean fuel trim DTCs presence

C. Investigate causes of lean fuel trim that could produce both DTC categories

D. Investigate causes of lean fuel trim that could produce both DTC categories present

2. A heavy-duty gasoline truck has been brought in with a complaint of "loss of power on grades." The technician verifies the symptom during a road test. Live data shows knock retard at 12° during the loss-of-power event. 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 during road testing

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

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

3. A LEAST-likely cause of a coolant loss complaint with no visible external leak on a high-mileage 6.0L Vortec is:

A. Head gasket failure allowing coolant into a combustion chamber during operation

B. Cracked cylinder head allowing coolant into the cylinder during normal operation

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

D. Intake manifold gasket leak where coolant passages cross the head sealing surface

4. The customer reports that her Class 6 truck "runs rough only when the air conditioning is engaged." Removing the AC compressor from operation immediately smooths the idle. The MOST likely cause is:

A. The air conditioning compressor has failed and is creating excessive parasitic load

B. The PCM is failing to compensate for the AC load with throttle plate adjustment

C. The serpentine belt is slipping when the AC compressor engages during operation

D. The AC compressor clutch is binding and not engaging properly during operation

5. A vacuum gauge at idle reads 17 in. Hg. The vehicle elevation is sea level and the engine is at operating temperature. A snap-throttle test produces a brief drop to 4 in. Hg with immediate recovery to 19 in. Hg before settling at 17 in. Hg. The reading and pattern indicate:

A. Normal engine operation with healthy vacuum response across the conditions

B. An exhaust restriction creating excessive backpressure during cruise conditions

C. A weak fuel pump unable to maintain rail pressure under load conditions

D. A worn timing chain producing valve timing variation at all engine speeds

6. A LEAST-likely cause of a P0420 (Catalyst Efficiency Below Threshold) DTC is:

A. Sustained engine misfire contaminating and overheating the catalyst substrate

B. A failed catalytic converter that has lost oxygen storage capacity over time

C. A failing downstream oxygen sensor producing incorrect feedback to the controller

D. A failed crankshaft position sensor producing intermittent signals during operation

7. A heavy-duty gasoline truck has been brought in with a "leaking fluid" complaint. Inspection identifies amber to dark brown slick fluid pooled at the bell housing area. The MOST likely fluid is:

A. Automatic transmission fluid leaking from a cooler line connection in the area

B. Engine coolant leaking from a hose or gasket at the rear of the engine assembly

C. Engine oil leaking from the rear main seal or oil pan rear gasket area

D. Power steering fluid leaking from the steering system pressure or return lines

8. A customer reports a Class 4 truck has "overheated three times in the past month, but only when towing a trailer up grades on hot days." Cooling system pressure tests within specification. Thermostat tests open at the correct temperature. Fan operation is verified normal. The MOST likely cause is:

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

B. The cooling system is operating at its design limit for the demanding duty cycle

C. A clogged radiator core requiring complete radiator replacement before service

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

9. The MOST appropriate response to a customer who insists on installing aftermarket "performance tunes" that delete emissions monitors is to:

A. Install the tune as the customer is paying for the service and accepts liability

B. Install the tune but document the customer's request in writing for the records

C. Refer the customer to a tuning shop that specializes in heavy-duty applications

D. Decline the work, explain federal law, and document the request in writing professionally

10. A heavy-duty gasoline truck has set DTC P0300 (Random Misfire). The technician notes long-term fuel trim at +18% on bank 1 and -2% on bank 2. The MOST likely diagnostic direction is:

A. Investigate bank-specific causes of lean fuel trim on bank 1 only — not random

B. Replace all spark plugs as a preventive measure for the random misfire DTC

C. Replace the engine controller since random misfires often indicate PCM failure

D. Replace the catalytic converter since random misfires indicate exhaust system issues

11. A LEAST-likely cause of a sudden loss of power complaint on a heavy-duty gasoline truck is:

A. A clogged catalytic converter producing severe exhaust restriction during operation

B. Normal aging of the engine producing gradually reduced power over time

C. A failed turbocharger on a turbocharged application reducing intake charge volume

D. A failed mass airflow sensor reading low and reducing fuel delivery commands

12. A Class 6 work truck has set DTC P0128 (Coolant Temperature Below Thermostat Regulating Temperature). The MOST likely cause is:

A. A failed engine coolant temperature sensor providing incorrect signal data

B. A clogged radiator preventing proper coolant circulation through the system

C. A failed water pump impeller reducing flow capacity throughout the cooling system

D. A stuck-open thermostat preventing the engine from reaching regulating temperature

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

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

B. The oil filter was over-tightened during the recent service procedure

C. The drain plug was not properly torqued during the oil change service

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

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

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

B. Capturing live data with a scan tool during operation under conditions where stalling occurs

C. Replacing the fuel pump as the most common cause of warm-stall complaints in trucks

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

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

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

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

16. Technician A says torque-to-yield head bolts can be reused if measured length is within specification. Technician B says torque-to-yield head bolts must be replaced after every removal. Who is correct?

A. Technician A only

B. Both Technician A and Technician B

C. Neither Technician A nor Technician B

D. Technician B only

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

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

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

18. A timing chain replacement on a 6.4L HEMI 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 advanced from the OEM reference. The MOST appropriate action is:

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

B. Continue with reassembly since one tooth advance 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 advance indicates chain stretch beyond service

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

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

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

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

20. Plastigage on a connecting rod bearing produces a width corresponding to 0.0015 inch. The OEM specification is 0.0010 to 0.0026 inch. The MOST appropriate action is:

A. Apply additional assembly lubricant during installation to ensure proper protection

B. Replace the bearing since 0.0015 is too close to the maximum specification

C. Tighten the rod cap beyond specification to compress the clearance further

D. Accept the in-spec reading and continue with normal assembly procedures

21. A LEAST-likely cause of cylinder bore taper exceeding OEM specification on a heavy-duty gasoline V8 is:

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

B. Operation with insufficient oil viscosity allowing accelerated wear conditions

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

D. A failed fuel pressure regulator dumping fuel into the intake during idle

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 7.3L Godzilla measures 4 psi at hot idle. OEM specification is 15–30 psi at idle. The dashboard warning lamp has illuminated. The customer has continued driving for 20 minutes. The MOST appropriate response is:

A. Continue normal operation to the customer's destination since the engine is still running

B. Shut down the engine immediately to prevent bearing damage from oil starvation

C. Add additional oil to the engine and continue operation to assess if pressure improves

D. Drive the truck to the shop for diagnosis without further consideration of the warning

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 thermostat has failed open and is preventing engine warmup completely

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

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

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

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

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

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

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

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 should be replaced as a preventive measure since reading is at maximum

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

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

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

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

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

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

B. Normal combustion conditions with carbon accumulation from extended service

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 variable-amplitude signals that decrease at high 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. An ignition coil failing under the higher cylinder pressures during acceleration

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

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

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

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 vacuum line missing or disconnected from the fuel pressure regulator port

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

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

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

33. A heavy-duty gasoline truck has set DTC P0102 (MAF Sensor Circuit Low). A scan tool reads 0.1 V at idle and 0.1 V at WOT. The MOST likely cause is:

A. The MAF sensor is reading correctly with low airflow at all conditions detected

B. The MAF sensor has failed at low airflow conditions but reads correctly at WOT

C. The MAF sensor or its wiring has an open or short to ground producing low voltage

D. The PCM has failed and is misreading the MAF sensor signal at all engine speeds

34. A turbocharged Class 5 work truck has a complaint of "white smoke from the exhaust under heavy load." Boost pressure tests within OEM specification. The MOST likely cause is:

A. A clogged air filter restricting flow to the compressor inlet at all engine speeds

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

C. A failed fuel pressure regulator allowing excessive fuel under high load conditions

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

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

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

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

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

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

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

A. Higher fuel trim values that are most pronounced at idle conditions

B. Lower fuel trim values across all operating conditions of the engine

C. No measurable change in fuel trim values under any operating conditions

D. Fuel trim values that vary randomly because the leak is intermittent in nature

37. Technician A says GDI systems require pressure relief before service work begins. Technician B says GDI fuel rail pressures can exceed 2,000 psi during normal operation. Who is correct?

A. Technician A only

B. Technician B only

C. Both Technician A and Technician B

D. Neither Technician A nor Technician B

38. A LEAST-likely consequence of removing the catalytic converter from a heavy-duty gasoline truck is:

A. Civil penalties under the Clean Air Act for the vehicle owner and shop

B. Failure to pass any state-required emissions inspection program testing

C. Increased emissions of HC, CO, and NOx into the atmosphere

D. Improved fuel economy and engine performance under all operating conditions

39. A heavy-duty gasoline truck has set DTC P0455 (Gross EVAP Leak Detected). A smoke test produces no visible smoke leakage anywhere on the vehicle. The MOST likely cause is:

A. The fuel cap was missing, loose, or improperly seated when the DTC was set

B. The EVAP canister has failed and the smoke test is unable to detect the leak

C. The purge valve solenoid has failed and is allowing the leak to occur internally

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

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 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 relatively flat signal due to oxygen storage capacity buffering exhaust composition

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

42. Technician A says PCV system contamination can produce gradual carbon buildup at the throttle body and intake valves. Technician B says PCV system contamination can produce gradual oil consumption increase as the engine ages. 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

43. A scan tool live data display shows fuel trim values: STFT +2%, LTFT +20% on bank 1; STFT +1%, LTFT +18% on bank 2. The MOST appropriate diagnostic direction is:

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

B. Investigate bank 1-specific causes since trim is slightly higher on that side of the engine

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

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

44. A reprogramming session on a heavy-duty gasoline truck PCM is interrupted by a power outage in the shop. The PCM does not respond to the scan tool after restoration. The MOST likely cause is:

A. The PCM has failed coincidentally with the power outage at the wrong time

B. The scan tool has failed during the reprogramming session and requires replacement

C. The PCM has been left in a partially-programmed state requiring recovery procedures

D. The reprogramming software has corrupted the calibration file requiring redownload

45. A scan tool live data display shows TPS-1 reading 0.8 V at idle and 4.2 V at WOT. TPS-2 reads 4.3 V at idle and 0.7 V at WOT. The MOST likely interpretation is:

A. Normal complementary operation — the sensors track inversely as designed

B. Both sensors have failed simultaneously requiring immediate replacement

C. TPS-1 has failed in the high voltage state requiring replacement

D. TPS-2 has failed in the low voltage state requiring replacement

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

A. A network communication issue affecting bus traffic between modules at all times

B. A PCM power supply problem causing intermittent module operation across systems

C. A faulty PCM ground connection producing erratic module behavior across systems

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

47. A J1939 SPN/FMI code shows SPN 100 (Engine Oil Pressure) with FMI 1 (Data Valid But Below Normal Operating Range). The MOST likely cause is:

A. The oil pressure sensor has failed and is providing incorrect signal data to the controller

B. Real low oil pressure exists — investigate worn bearings, low oil level, or pump issues

C. The oil pressure sensor wiring has an open circuit producing low voltage signal

D. The PCM has failed and is misreading the oil pressure sensor signal during operation

48. A bidirectional command from the scan tool causes the cooling fan to cycle from off to high speed. The fan motor responds normally to the command. This test confirms:

A. The fan control circuit between the PCM and the fan motor is functional

B. The cooling system has adequate coolant level for proper operation under load

C. The thermostat is operating correctly within OEM specification ranges

D. The water pump is delivering adequate coolant flow throughout the system

49. After a throttle body cleaning on an electronic throttle control system, the customer returns with rough idle. The MOST likely cause is:

A. The throttle position sensor has failed and requires immediate replacement service

B. The PCM has failed during the throttle body cleaning service procedure performed

C. The throttle relearn procedure was not performed after the cleaning service

D. The throttle body has been reinstalled incorrectly during the cleaning service

50. A CAN bus voltage measurement during normal operation shows CAN High and CAN Low both sitting at 2.5 V at idle (between transmissions). The MOST likely interpretation is:

A. The bus is in the recessive (idle) state — normal between message transmissions

B. The bus is shorted to ground and requires immediate diagnostic action

C. The bus is shorted to power and requires immediate attention from the technician

D. The bus has lost communication and the modules are not transmitting any messages

PRACTICE EXAM 8: ANSWER KEY AND EXPLANATIONS

1. D — A misfire DTC combined with both-bank lean fuel trim DTCs points to a common-cause issue affecting fuel mixture across the entire engine. Vacuum leaks, MAF/MAP sensor accuracy, fuel pressure, or PCV contamination all produce this pattern. Replacing coils or oxygen sensors without identifying the underlying cause wastes parts and rarely resolves the issue.

2. A — 12° 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. The knock sensor is doing its job.

3. C — 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.

4. B — When idle smooths immediately upon AC compressor disengagement, the engine itself is healthy — the controller is failing to compensate for the AC parasitic load. Modern PCMs should adjust throttle position to maintain idle when accessory loads engage. Failure to compensate produces idle drop or rough running specifically when AC engages.

5. A — All readings and patterns described indicate normal engine operation: 17 in. Hg at sea level idle is normal, the snap-throttle drop and recovery is healthy, and brief overshoot before settling is the typical pattern of a healthy engine. There is no fault to diagnose — the engine is operating correctly.

6. D — A failed CKP sensor produces no-start conditions, stalling, or system-wide synchronization issues — not a P0420 catalyst efficiency code. P0420 is set by the OBD-II catalyst monitor based on downstream oxygen sensor data. The other listed causes (sustained misfire, failed converter, failed downstream sensor) all directly relate to the catalyst monitoring system.

7. C — Amber to dark brown slick fluid is the signature of engine oil. The bell housing location indicates the rear main seal or oil pan rear gasket as the source. ATF is red-brown, coolant is colored (green/orange/yellow) with sweet smell, and power steering fluid has a distinctive petroleum smell.

8. B — When all individual cooling components test within specification but overheating occurs only during the most demanding duty cycle (towing up grades on hot days), the cooling system is at its

design limit for that duty cycle. Severe-duty cooling packages or load-appropriate vehicle selection address this; replacing in-spec components doesn't.

9. D — Federal law prohibits the installation of tunes that delete emissions monitors, with civil penalties exceeding $4,500 per vehicle. The technician's professional and legal responsibility is to decline tampering work, explain the legal issue, and document the request in writing. Customer payment does not transfer legal liability away from the shop and technician.

10. A — Lean fuel trim on bank 1 only (+18%) with normal trim on bank 2 (-2%) indicates a bank-specific issue, not a random cause. Investigating bank 1-specific causes — vacuum leak at bank 1 manifold, bank 1 injector issue, exhaust leak ahead of bank 1 upstream sensor — is the correct diagnostic direction. The misfire DTC is downstream of the lean condition.

11. B — Sudden loss of power is, by definition, a sudden event — not the gradual decline of normal aging. Sudden symptoms trace to specific component failures: clogged converter, failed turbocharger, or MAF sensor failure that occurs at a specific moment. Gradual aging produces gradual power loss, not sudden complaints.

12. D — 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.

13. A — The wrong oil viscosity used during a recent oil change is a common cause of post-service ticking noises. Wrong-weight oil produces inadequate film thickness or restricted flow at startup, allowing valve train components to make noise. Verifying the oil viscosity matches OEM specification is the proper first step.

14. C — 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.

15. A — 0.001 inch warpage 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 — Technician B is correct; Technician A is wrong. TTY bolts stretch into the elastic-plastic transition zone during installation and cannot be reused regardless of length measurement. Once stretched, the bolt's clamping characteristics are altered. Reusing TTY bolts is a common cause of premature head gasket failure.

17. B — 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.

18. A — 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. C — 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. D — 0.0015 inch falls within the 0.0010 to 0.0026 inch specification range. There is no service requirement for clearance values within specification. Additional lubricant compensation, replacement, or over-torquing are all incorrect responses to in-spec readings.

21. D — A failed fuel pressure regulator affects fuel mixture and combustion, 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 fuel pressure regulator 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. B — 4 psi is below the minimum lubrication pressure for protecting bearings, and the warning lamp threshold (typically 5 psi) has been crossed. Continued operation produces immediate bearing damage. Shutting down the engine immediately is the correct response — adding oil or driving to the shop while pressure is critically low compounds the damage.

24. D — 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. A — Using OEM-specified oil and explaining the consequences of incorrect oil is the proper professional response. Wrong-specification oil can damage emissions controls, accelerate bearing wear, and void warranty coverage. The cost of correct oil is far less than the cost of damage from incorrect oil.

26. C — 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. A — 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. B — Light tan deposits on the porcelain with a small black ring at the base near the threads represents typical normal combustion conditions over time. 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 specific abnormality requiring service.

30. C — Neither technician is correct. Magnetic CKP sensors generate their own signal and require NO external power. Hall-effect sensors produce constant-amplitude digital signals at any RPM (not variable amplitude). Both technician statements contain factual errors about sensor technology.

31. D — 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, not affecting acceleration ignition.

32. A — 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. C — Constant 0.1 V output regardless of engine condition indicates an open or short-to-ground circuit fault in the MAF sensor or its wiring. A healthy MAF produces a voltage that varies with airflow. The constant minimum voltage means no current is flowing through the sensing element correctly.

34. B — White smoke under heavy load with normal boost pressure is the signature pattern for internal turbocharger seal failure. Worn center housing seals leak oil into the intake stream, where it burns and produces white smoke. The boost remains normal because the compressor wheel is still functional; the seals around it are not.

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

36. A — A vacuum leak at the intake manifold admits unmetered air, producing positive long-term fuel trim. The lean condition is most pronounced at idle when leak airflow is large compared to total airflow, and diminishes at higher RPM when total airflow overwhelms the leak. The idle-pronounced pattern is the diagnostic signature.

37. C — Both technicians are correct. GDI systems require pressure relief through OEM-specified procedures before service to prevent injury from injected fuel. GDI fuel rail pressures can exceed 2,000 psi during normal operation, dramatically higher than port injection systems (35–60 psi). Both statements reflect critical GDI service safety considerations.

38. D — Removing or hollowing out a catalytic converter does not improve fuel economy or engine performance on a properly-engineered modern engine. The other listed consequences — civil penalties under federal law, emissions inspection failures, increased pollution — are all real consequences of converter tampering. Tampering provides no legitimate benefit.

39. A — A gross EVAP leak (P0455) with no smoke leakage detectable during testing strongly indicates the cap was missing, loose, or improperly seated when the DTC was set. The customer may have tightened or replaced the cap before the smoke test, eliminating the leak. The intermittent nature points to a temporary cap issue.

40. B — A commanded EGR valve that produces no observable engine response indicates the valve is not actually opening or no exhaust gas is flowing. The valve pintle is mechanically stuck or the EGR passages are fully blocked with carbon. The lack of idle change confirms no exhaust dilution despite the command being sent.

41. B — 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. Mirroring of upstream switching indicates loss of storage capacity (failed converter).

42. D — Both technicians are correct. PCV system contamination produces multiple consequences: gradual carbon buildup at the throttle body and intake valves (from oil mist routed through the PCV system), and gradual oil consumption increase as the contamination worsens. Both effects develop slowly over time and reflect underlying PCV system issues.

43. A — Identical positive long-term fuel trim on both banks (+20% and +18%) 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 — A reprogramming session interrupted by a power outage typically leaves the PCM in a partially-programmed state. The controller cannot complete the calibration installation, and the existing memory may not have been preserved correctly. Recovery procedures (or replacement) are typically required to restore PCM function.

45. A — Dual TPS sensors are designed to track inversely — as one rises, the other falls. TPS-1 at 0.8 V at idle and 4.2 V at WOT, with TPS-2 at 4.3 V at idle and 0.7 V at WOT, is the textbook complementary signal pattern. The PCM uses this inverse relationship to detect single-sensor failures.

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

47. B — SPN 100 identifies engine oil pressure; FMI 1 identifies "Data Valid But Below Normal Operating Range." This means the sensor is reading correctly but the actual oil pressure is below normal. Real oil pressure problems (worn bearings, low oil level, pump failure) must be investigated. Sensor or wiring failures would produce different FMI values.

48. A — Successful bidirectional control of the cooling fan confirms the control circuit between the PCM and the fan motor is functional. The test does not verify coolant level, thermostat operation, or water pump function — those are independent system checks. The bidirectional test verifies only the control path.

49. C — Most ETC systems require a throttle relearn procedure after the throttle body is cleaned, allowing the controller to relearn the precise plate position required for various idle conditions. Skipping this step produces rough idle and stalling complaints after otherwise correct service work. The relearn is the missing step.

50. A — When the CAN bus is idle (between message transmissions), both wires sit at approximately 2.5 V — the recessive state. Differential voltage develops only during active message transmission when CAN High rises and CAN Low falls. The 2.5 V reading on both wires confirms normal recessive-state operation.