PRACTICE EXAM 18: ASE T1 GASOLINE ENGINES SIMULATION

1. A heavy-duty gasoline truck has been brought in with a complaint of "rough idle and hesitation that started two weeks ago." The technician retrieves DTCs P0300 (random misfire) and P0171 (lean bank 1). The MOST appropriate diagnostic direction is to:

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

B. Replace all eight ignition coils as a preventive measure for the misfire DTC

C. Replace the bank 1 upstream oxygen sensor based on the lean fuel trim DTC presence

D. Replace the engine controller since multiple DTCs indicate PCM degradation patterns

2. A vacuum gauge connected to a 6.4L HEMI at idle shows a regular drop from 19 in. Hg to 14 in. Hg occurring approximately every 3 seconds. The variation has no apparent relationship to engine speed. The MOST likely cause is:

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

B. A worn camshaft producing irregular valve events during idle conditions

C. Normal engine response to AC compressor cycling on and off during idle operation

D. A failed fuel pressure regulator producing intermittent pressure changes

3. The customer reports a Class 5 truck "hesitates briefly when first accelerating from a stop, then accelerates normally." The MOST diagnostic interview question is:

A. What grade of fuel does the customer typically purchase from the gas station weekly?

B. How long has the symptom been occurring and is it getting worse over time?

C. How many miles does the truck currently have on the odometer at this time?

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

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

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

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

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

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

5. A power balance test on a 7.3L Godzilla shows cylinder 6 contributes 35 RPM less than the average of the other seven cylinders. Compression on cylinder 6 measures 165 psi, matching the other cylinders. The MOST likely cause is:

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

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

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

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

6. A heavy-duty gasoline truck has been brought in with a "ticking noise from the valve cover area that worsens with engine speed." A stethoscope confirms the noise is loudest at the rocker arm assembly. The MOST likely cause is:

A. Worn rocker arms, lifters, or pushrods producing camshaft-speed noise

B. A failed crankshaft main bearing producing crankshaft-speed noise at idle

C. A failing harmonic balancer producing rotational imbalance under all loads

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

7. A vacuum gauge connected to a heavy-duty gasoline V8 produces a steady 19 in. Hg reading at idle, but drops to 12 in. Hg under steady cruise at 2,000 RPM and remains there. The MOST likely cause is:

A. Worn valve guides producing irregular sealing under load conditions during operation

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

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

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

8. A LEAST-likely diagnostic step in evaluating a coolant loss complaint with no visible external leak is:

A. Replacing the radiator cap as the most likely cause without further testing

B. Pressure-testing the cooling system at the radiator filler neck location for leaks

C. Performing a combustion gas leak test using chemical indicator fluid testing

D. Inspecting the engine oil for milky appearance indicating coolant intrusion in the oil

9. The customer reports a 6.4L HEMI "stalls when coming to a stop, then restarts immediately and runs fine." The MOST diagnostic interview question is:

A. What grade of fuel does the customer typically purchase from the gas station?

B. Does the symptom occur in any specific operating condition such as hot or cold?

C. How many miles does the truck have on the odometer at the current time?

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

10. A heavy-duty gasoline truck with a Class 4 GVWR has a complaint of "rough idle that has gradually worsened over six months." Long-term fuel trim shows +18% on both banks. The MOST likely cause is:

A. A failed downstream oxygen sensor providing incorrect feedback continuously

B. A failed engine controller misinterpreting sensor data across all operating conditions

C. A failed catalytic converter producing exhaust restriction during all operating conditions

D. PCV system contamination or vacuum leak producing gradual lean condition

11. The technician notices significant carbon buildup at the intake valves of a GDI engine during disassembly. The MOST likely root cause is:

A. A failed PCV valve allowing excessive oil mist into the intake throughout operation

B. Operation with low-quality fuel that has produced excessive deposits over time

C. The absence of fuel washing the back of the intake valves on GDI systems

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

12. A LEAST-likely interpretation of fluid identified at a leak point under a heavy-duty gasoline truck is:

A. Clear fluid with a strong fuel odor indicates engine coolant leakage from the system

B. Red-brown fluid with sweet smell indicates automatic transmission fluid leakage

C. Amber to dark brown slick fluid indicates engine oil leakage from a seal or gasket

D. Green or orange fluid with a sweet smell indicates engine coolant leakage from system

13. Two technicians discuss the use of TSBs in diagnosis. Technician A says TSBs document known failure patterns and corrective procedures from the manufacturer. Technician B says TSBs should be reviewed before performing diagnostic testing on a vehicle. 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

14. A heavy-duty gasoline truck has a no-start with cranking present, fuel pressure verified, and spark confirmed at all cylinders. The technician notes the engine has thrown a P0335 (Crankshaft Position Sensor Circuit) DTC. The MOST appropriate next step is to:

A. Verify the CKP sensor signal and circuit before any component replacement

B. Replace all eight ignition coils as a preventive measure during diagnosis procedure

C. Replace the fuel pump to ensure adequate volume during cranking attempts

D. Replace the engine controller to address the no-start symptom directly during diagnosis

15. A cylinder head has been resurfaced. The required surface finish for an MLS gasket on an aluminum head is:

A. 100–150 microinches Ra finish required for proper sealing performance

B. 30–60 microinches Ra finish required for proper MLS gasket sealing performance

C. 80–120 microinches Ra finish required for proper sealing under all conditions

D. 60–110 microinches Ra finish required for proper composite gasket sealing

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. Both Technician A and Technician B

B. Technician A only

C. Technician B only

D. Neither Technician A nor Technician B

17. A LEAST-likely consequence of operating a heavy-duty gasoline engine with a worn camshaft lobe is:

A. Reduced lift on the affected valve causing decreased airflow to that cylinder

B. Weak cylinder contribution detected during a power balance test procedure

C. Misfire DTCs that may set if the lift reduction is severe enough during operation

D. Lower compression on the affected cylinder during compression testing

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 30 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 timing belt is installed off by multiple teeth, causing valve-to-piston damage

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

19. A connecting rod big end bore measures 2.250 inch in one direction and 2.252 inch perpendicular to that. OEM specification limits big end bore out-of-round to 0.0005 inch. The rod:

A. Has 0.002 inch of out-of-round and must be reconditioned or replaced

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

C. Has been improperly machined and requires immediate replacement service

D. Has been overheated during operation and cannot be reused under any circumstances

20. Plastigage on a connecting rod bearing produces a width corresponding to 0.0020 inch. OEM specification is 0.0010 to 0.0026 inch. The technician should:

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

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

C. Replace the bearing since the value is approaching the maximum specification limit

D. Tighten the rod cap beyond specification to reduce the clearance further

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

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

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

C. Operation with insufficient oil viscosity allowing accelerated wear conditions

D. Lack of proper engine maintenance allowing dirty oil to circulate 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 standard size bearing because the regrind size has not changed the bearing size

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

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

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

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

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

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

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

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

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

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

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 should be replaced along with all other coils as a maintenance procedure

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

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

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

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

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

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

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

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. Both Technician A and Technician B

C. Technician B only

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. Improved fuel economy and engine performance under all operating conditions

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

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 PCM is failing to send the bidirectional command signal correctly to the valve

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

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

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. Both Technician A and Technician B

B. Technician A only

C. Technician B only

D. Neither Technician A nor 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 bank 1-specific causes since trim is slightly higher on that side of the engine

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

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

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 been left in a partially-programmed state requiring recovery procedures

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

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

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. Both sensors have failed simultaneously requiring immediate replacement

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

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

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

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 control module

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

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

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

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 18: ANSWER KEY AND EXPLANATIONS

1. A — A misfire DTC combined with a lean fuel trim DTC on the affected bank points to a common-cause issue affecting fuel mixture. Vacuum leaks, MAF sensor accuracy, fuel pressure, or PCV contamination all produce this pattern. Replacing components without identifying the underlying lean cause wastes parts and rarely resolves the issue.

2. C — A regular vacuum variation occurring approximately every 3 seconds with no relationship to engine speed 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 — 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. A — A failed catalytic converter is an exhaust system component, not a source of engine oil leakage. Oil migrating to the bell housing originates from oil-bearing engine components — valve covers, intake manifolds, oil pans. The catalytic converter has no oil pathway to leak.

5. D — 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 — Ticking noise loudest at the rocker arm assembly with stethoscope confirmation is camshaft-speed valve train noise. Worn rocker arms, lifters, or pushrods produce this signature pattern. The location at the rocker assembly directly identifies the failure area.

7. C — A vacuum reading that drops under sustained higher RPM and stays low indicates exhaust restriction. As exhaust gas volume increases, backpressure builds and reduces effective intake vacuum. Healthy exhausts maintain vacuum across the operating range without sustained drops.

8. A — Replacing the radiator cap without further testing is not a diagnostic step — it is a guess. Proper diagnosis includes pressure-testing, combustion gas leak testing, and inspecting oil for coolant contamination. Component replacement without verification wastes parts and rarely resolves the actual issue.

9. B — Operating-condition specifics (hot, cold, load conditions) are the most diagnostic interview information. Stalls only when coming to a stop suggest specific operating conditions — possibly idle air control, fuel system thermal effects, or transmission torque converter issues. Vague questions about fuel grade, mileage, or parking rarely contribute.

10. D — Gradual worsening over six months with positive both-bank fuel trim is characteristic of PCV system contamination or developing vacuum leaks. Both conditions produce slow-onset lean trims that worsen over time. Single-failure causes (oxygen sensor, controller, converter) typically don't produce gradual symmetric symptoms.

11. C — GDI engines have no fuel washing the back of the intake valves because fuel is injected directly into the cylinder, bypassing the intake port. Carbon deposits accumulate on the intake valves over time, and this is a documented characteristic GDI service issue requiring periodic cleaning.

12. A — Engine coolant has a sweet smell and is colored (green, orange, yellow, etc.) — never clear with a fuel odor. Clear fluid with strong fuel odor is gasoline. The other listed identifications (red-brown ATF, amber engine oil, colored sweet coolant) are all accurate fluid identifications.

13. D — Both technicians are correct. TSBs document the manufacturer's known failure patterns and corrective procedures for specific symptoms and platforms. Reviewing TSBs early in the diagnostic process identifies known issues and prevents reinventing diagnostic procedures the manufacturer has already published.

14. A — A P0335 DTC indicates a CKP sensor circuit fault. With the no-start condition combined with this code, verifying the CKP signal and circuit is the appropriate next step. Replacing components without verification wastes parts and may not address the actual issue causing both the no-start and the DTC.

15. B — MLS (multi-layer steel) head gaskets on aluminum heads require an extremely smooth surface finish of 30–60 microinches Ra. The smoother surface is required because MLS gaskets seal through metal-to-metal contact rather than gasket material compression. Composite gaskets allow rougher surfaces.

16. A — 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. D — A worn cam lobe reduces valve LIFT, not compression. The valve still closes properly because the base circle is unchanged — the issue is reduced opening. Compression is determined by sealing during the closed phase, not by lift during the open phase. Reduced lift produces airflow loss and weak cylinder contribution.

18. C — All cylinders showing 30 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 — 2.252 minus 2.250 equals 0.002 inch out-of-round, which exceeds the 0.0005 inch maximum specification. The rod must be reconditioned (machined cap, big end resized) by a qualified machine shop, or replaced. Reusing an out-of-round rod produces accelerated bearing wear.

20. B — 0.0020 inch falls within the 0.0010 to 0.0026 inch specification range. There is no service requirement for clearance values within specification. Replacement, additional lubricant compensation, or over-torquing are all incorrect responses to in-spec readings.

21. A — A failed 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. D — 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. C — 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. A — 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. B — 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. D — 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. A — 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. B — 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. 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. A — 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. B — 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. C — 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. D — 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. A — 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. C — 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. A — 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. D — 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. 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 — 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.