

PRACTICE EXAM 19: ASE A1 ENGINE REPAIR SIMULATION (50 QUESTIONS)

1. A technician is diagnosing a V6 engine with a customer complaint of gradual power loss over 20,000 miles. Compression readings are uniformly low at 118 to 126 PSI on all six cylinders (specification 145 to 170). A wet test improves all cylinders by only 8 to 12 PSI. A timing chain measurement shows the camshaft is retarded 6 degrees from specification. The vacuum gauge reads a steady 13 in. Hg at idle. Which of the following BEST explains why the wet test improvement was smaller than expected if the timing chain retardation is the primary cause?

- A. The oil used in the wet test was too thin to seal the ring gaps effectively on this particular engine
- B. The rings are also severely worn and the timing chain retardation is only a secondary contributing factor
- C. The wet test always produces small improvements on six-cylinder engines compared to four-cylinder engines
- D. The wet test improves ring seal only — if the primary compression loss is from late intake valve closing due to the retarded cam timing, oil cannot seal a valve timing problem and the improvement is minimal

2. A rebuilt engine has been running for 8,000 miles with excellent performance. During a routine oil change, the technician notices the oil has a very faint milky discoloration at the bottom of the drain pan — the last pint drained has a slightly different appearance than the rest of the oil. The bulk of the oil appears normal dark brown. The coolant level is full. No white smoke is visible. A block test is negative. Which of the following is the MOST likely cause?

- A. A head gasket failure that is allowing coolant into the oil in such small quantities that only the settled portion shows contamination
- B. Water contamination from condensation that accumulated in the bottom of the oil pan from frequent short-trip driving in humid conditions
- C. Normal moisture condensation that settles to the bottom of the pan during cool-down periods — a common finding on vehicles driven primarily on short trips where the oil never reaches full operating temperature

D. A cracked engine block between a coolant passage and the oil pan that is allowing a slow coolant seep

3. A four-cylinder engine exhibits a single-cylinder misfire (P0301) at idle that disappears above 1,200 RPM. The spark plug, coil, and injector have been swapped with cylinder 2 — the misfire stays on cylinder 1. Compression on cylinder 1 is 136 PSI (specification minimum 140). All other cylinders are 150 to 158 PSI. A wet test raises cylinder 1 to 140 PSI. A leak-down test shows 16% leakage with air at both the oil filler cap (faint) and the tailpipe (faint). Which of the following is the MOST appropriate recommendation?

A. The cylinder has both minor ring wear and a marginally leaking exhaust valve — while neither alone would cause a misfire, the combination drops cylinder 1 below the threshold for reliable idle combustion, and the head should be removed for valve service and the bore assessed for ring replacement

B. Replace only the exhaust valve because the leak-down air at the tailpipe confirms the valve is the sole cause

C. Replace only the piston rings because the wet test improvement confirms rings are the sole compression loss source

D. No mechanical repair is needed — adjust the idle speed upward by 100 RPM to mask the marginal cylinder

4. A technician is performing a cooling system pressure test on an engine with an intermittent overheating complaint. The system holds 16 PSI with no drop for 30 minutes at cold. The technician then starts the engine, drives the vehicle for 20 minutes in traffic, parks, and shuts it off. Before the engine cools, the technician connects the pressure tester. The gauge reads 19 PSI and is slowly climbing. The radiator cap is rated at 16 PSI. Which of the following is the MOST likely cause of the above-specification pressure?

A. The radiator cap's pressure relief valve has failed and is not venting at its rated 16 PSI during operation

B. Combustion gas is entering the cooling system through a head gasket breach and pressurizing the system beyond the cap's ability to vent

C. The water pump is generating excessive pressure at the higher RPM of driving conditions

D. The coolant boiling point has been exceeded and steam pressure is building inside the system

5. A customer brings in a vehicle with a turbocharged engine reporting that the engine produces heavy blue smoke only during the first 5 seconds of startup after the vehicle has sat for more than 4 hours. The smoke does not appear during driving at any condition — idle, cruise, acceleration, or deceleration. Oil consumption is approximately one quart every 3,000 miles. Compression is within specification. The turbocharger shaft has no measurable play. Which of the following is the MOST likely cause?

A. Worn piston rings that only leak oil when the engine is cold and the ring-to-bore clearances are widest

B. A turbocharger turbine seal that leaks oil into the exhaust housing during sitting periods when oil pressure is absent

C. A PCV valve stuck in the open position that draws excessive crankcase oil into the intake during the cold-start enrichment period

D. Worn valve stem seals that allow oil to pool on the valve faces during extended sitting periods and burn on the first few seconds of startup

6. Technician A says that an engine with a steady vacuum reading of 21 in. Hg at idle at sea level indicates excellent cylinder sealing and no significant vacuum leaks. Technician B says that the same 21 in. Hg reading at 5,000 feet elevation would be abnormally high and likely indicates a gauge error. 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

7. A rebuilt engine develops a persistent oil seep at the front timing cover gasket within the first 2,000 miles. The technician who built the engine used RTV sealant per the manufacturer's instructions. Upon removing the timing cover, the technician discovers that the RTV bead was applied correctly on the cover surface, but the block mating surface has a thin film of residual old gasket material that was not fully removed during block preparation. Which of the following explains how this residual material caused the leak?

A. The old gasket material reacted chemically with the new RTV and prevented it from curing properly

- B. The residual material created a coolant passage blockage that increased pressure behind the timing cover seal
- C. The residual material prevented the new RTV from making direct contact with the clean metal block surface, creating voids in the seal where oil can seep through the unbonded areas
- D. The old material absorbed oil from the engine's internal passages and transmitted it through to the external surface by capillary action

8. A V8 engine with 210,000 miles exhibits oil pressure of 10 PSI at hot idle (specification minimum 10 PSI) and 34 PSI at 2,500 RPM (specification 40 to 65 PSI). The engine has a faint rod knock at idle on cylinder 3 that diminishes when the cylinder 3 injector is disabled. The customer asks whether replacing only the cylinder 3 rod bearing would be an effective repair. Which of the following is the correct response?

- A. Replacing only the cylinder 3 rod bearing is the recommended repair because the other bearings are not producing noise
- B. Replacing only the number 3 rod bearing will address the knock temporarily, but the below-specification oil pressure at speed indicates all bearings are worn — the remaining bearings will likely fail in sequence, making a single-bearing repair a short-term fix rather than a lasting solution
- C. The oil pressure is within specification at idle, so replacing the number 3 bearing is all that is needed
- D. The knock is not from the rod bearing — it is from the wrist pin, and bearing replacement will not help

9. A technician is inspecting a set of used pushrods removed from an OHV engine during a rebuild. The technician rolls each pushrod on a flat surface plate to check for straightness. Twelve of the sixteen pushrods roll perfectly true. Four pushrods have a visible wobble as they roll — indicating a slight bend. Which of the following is the correct action?

- A. Replace only the four bent pushrods with new ones of the correct specification and reuse the twelve straight pushrods
- B. Replace all sixteen pushrods as a set because the bent ones indicate the entire engine experienced conditions that may have weakened all pushrods
- C. The bent pushrods can be straightened using a press and reused if they roll true after straightening
- D. The slight bend is within the normal tolerance for used pushrods and all sixteen can be reinstalled

10. A rebuilt engine exhibits a condition where the crankcase pressure is noticeably higher than specification — the PCV system is functional and the valve is the correct application. All compression readings are within specification. The oil filler cap hisses when cracked open. The engine has 500 miles since the rebuild. Which of the following is the MOST likely explanation for the elevated crankcase pressure on a rebuilt engine with good compression?

- A. The oil pump is generating excessive pressure that is being transmitted through the bearings to the crankcase
- B. The PCV valve is the wrong application despite appearing correct — the flow rate is too low for this engine
- C. The catalytic converter is creating excessive exhaust back-pressure that forces gas backward through the exhaust valve guides
- D. The piston rings have not yet fully seated during break-in and are allowing more blowby than a fully seated ring set would produce, temporarily elevating crankcase pressure above the specification designed for a broken-in engine

11. A customer reports that the engine developed a sudden loss of power and a loud rattling noise from the timing chain area while driving at highway speed. The engine continues to run but misfires badly. A scan tool shows misfire codes on all four cylinders. A compression test shows: Cyl 1 = 50, Cyl 2 = 110, Cyl 3 = 45, Cyl 4 = 115 PSI. The specification is 145 to 160 PSI. Cylinders 1 and 3 are dramatically lower than 2 and 4. Which of the following BEST explains why two specific cylinders are affected more severely than the other two?

- A. The timing chain stretched unevenly and affected the cam timing on cylinders 1 and 3 more than 2 and 4
- B. When the timing chain jumped teeth on this interference engine, the valves on cylinders 1 and 3 were in the most vulnerable position in their timing cycle and suffered more severe valve damage than cylinders 2 and 4
- C. Cylinders 1 and 3 share a common exhaust manifold runner that collapsed and is restricting their exhaust flow
- D. The head gasket failed between cylinders 1 and 3 simultaneously with the timing chain failure

12. A technician is performing a cylinder head inspection after removal from an overheated engine. The deck surface appears flat to visual inspection. However, when the technician places a precision straightedge diagonally across the deck and uses a feeler gauge, the center area of the head shows 0.005 inches of warpage while the edges measure flat. The maximum warpage specification is 0.003 inches.

The head has never been resurfaced. Maximum allowable resurfacing is 0.008 inches. Which of the following is the correct repair?

- A. Resurface the head to remove the 0.005-inch warpage — the full amount must be removed from the center, which leaves 0.003 inches of remaining allowable resurfacing depth for future service
- B. Replace the head because removing 0.005 inches from the center requires removing material from the entire surface, and the amount needed exceeds the maximum allowable resurfacing
- C. Install the head with a thicker composite gasket that can conform to the 0.005-inch warpage
- D. Resurface only the high spots at the edges and leave the center untouched to preserve material

13. A rebuilt V6 engine has been running for 15,000 miles. The customer reports that the oil pressure gauge has been gradually declining. Current readings: hot idle = 16 PSI (specification minimum 15), hot 2,500 RPM = 38 PSI (specification 40 to 65). The 500-mile readings were 28 PSI idle and 55 PSI at speed. No knocking is present. Oil level and viscosity are correct. Which of the following is the correct assessment?

- A. The oil pump should be replaced immediately because the speed pressure has dropped below specification
- B. The idle pressure is still above minimum but the speed pressure below specification indicates the bearing wear has exceeded normal break-in levels — the engine should be investigated for assembly errors or premature wear
- C. All readings are within specification and the decline is normal post-break-in bearing wear
- D. The pressure decline indicates the bearing clearances were assembled too tight and are now wearing to their correct dimensions

14. A technician is diagnosing a V8 engine where the customer reports an occasional brief hesitation during light-throttle acceleration between 30 and 40 mph. The hesitation occurs approximately once per 15-minute drive. No codes are stored. Compression is within specification on all cylinders. Fuel pressure is correct. A scan tool shows no abnormal sensor readings during normal driving. The technician has been unable to reproduce the hesitation during a 30-minute test drive. Which of the following is the MOST appropriate next diagnostic step?

- A. Replace the spark plugs as a maintenance item because marginal plugs can produce intermittent hesitation

B. Perform an injector balance test to identify any injector with a slightly different flow rate than the others

C. Install a continuous data logger to record all sensor data, fuel trim, ignition timing, and misfire counts over several days of the customer's normal driving pattern to capture the conditions at the next occurrence

D. Replace the fuel filter because a partially restricted filter can produce intermittent fuel delivery hesitation

15. A four-cylinder engine has been diagnosed with a worn exhaust camshaft lobe on cylinder 2 of a DOHC engine. The lobe has lost 0.025 inches of lift compared to specification. All other lobes are within 0.002 inches of specification. The customer asks if the worn lobe can be repaired without replacing the entire camshaft. Which of the following is the correct response?

A. Individual cam lobes cannot be reliably repaired on a production camshaft — the entire exhaust camshaft must be replaced along with all exhaust cam followers that ride on the camshaft

B. The worn lobe can be built up with weld and reground to the correct profile for a fraction of replacement cost

C. A thicker shim can be installed at the number 2 exhaust position to compensate for the lost lift dimension

D. The worn lobe only affects one cylinder's exhaust and the engine will function adequately without repair

16. A customer brings in a vehicle stating that the engine runs normally except during a very specific condition: when the vehicle is driven at exactly 55 mph on cruise control for more than 15 minutes, the engine develops a slight but noticeable vibration. The vibration is not present at 50 or 60 mph, and is not present at 55 mph without cruise control. Compression and all mechanical tests are normal. Which of the following is the MOST likely cause?

A. A worn engine mount that resonates at the specific RPM corresponding to 55 mph in the transmission gear selected by cruise control

B. A specific drivetrain resonance created by the combination of engine RPM, transmission gear ratio, converter lockup status, and driveshaft speed that occurs only under the precise steady-state conditions of cruise control at 55 mph

C. The fuel injectors produce a harmonic vibration at the specific pulse width commanded during 55 mph cruise

D. The exhaust system has a resonance frequency that is excited at the specific exhaust flow rate of 55 mph cruise operation

17. A technician is performing a block test on a vehicle with a suspected head gasket failure. The test is performed with the engine at operating temperature idling. The radiator cap is removed and the test fluid container is placed over the filler neck. Within the first 10 seconds, the test fluid violently bubbles and changes color from blue to bright yellow. Which of the following does the speed and intensity of this reaction indicate?

A. The block test chemicals have expired and are reacting to the heat of the coolant rather than combustion gas

B. The test fluid container was contaminated with exhaust residue from a previous test and produced a false positive

C. A large coolant leak has diluted the test fluid with excess coolant volume and produced a false color change

D. The head gasket has a large breach that is allowing a high volume of combustion gas into the coolant — the violent reaction indicates a severe failure rather than a minor seep

18. A rebuilt engine has been running for 1,000 miles. The technician performs the second oil pressure check: hot idle = 24 PSI (was 30 at 500 miles), hot 2,500 RPM = 50 PSI (was 55 at 500 miles). The specification is 20 minimum at idle and 40 to 65 at speed. All readings are within specification. Which of the following BEST characterizes this pressure trend?

A. The 6 PSI idle drop and 5 PSI speed drop from 500 to 1,000 miles is within the expected range of normal post-break-in bearing wear-in and the rate of decrease will continue to decelerate

B. The pressure drop is excessive for only 500 miles of additional driving and suggests premature bearing wear

C. The speed pressure should have increased as the rings seated, not decreased alongside the idle pressure

D. The pressure drop indicates the oil viscosity has changed from the break-in oil to the regular oil used at the first change

19. A customer reports that the engine temperature gauge rises above normal when climbing steep mountain grades with a full load but returns to normal on flat highway driving. The cooling fan activates

and runs continuously during the climbing episodes. The coolant level is correct. The system holds pressure. A block test is negative. The thermostat opens at the correct temperature. Which of the following is the MOST likely cause?

- A. A failing water pump that cannot circulate adequate coolant volume under maximum thermal load conditions
- B. An air pocket in the cooling system that expands during the high heat output of loaded mountain climbing
- C. The cooling system's maximum heat rejection capacity is being exceeded by the extreme thermal output of sustained loaded climbing — the system is functioning correctly but the operating condition exceeds the system's design cooling capacity, which may indicate a partial radiator restriction
- D. The thermostat is opening too late under the rapid temperature rise of loaded climbing conditions

20. Technician A says that when installing a new rear main seal on an engine with a one-piece seal design, the seal should be pre-lubricated with clean engine oil on the lip before installation. Technician B says that some rear main seal manufacturers specify a specific lubricant (not engine oil) for the seal lip and using the wrong lubricant can cause premature seal failure. 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

21. A technician discovers during an engine rebuild that the number 2 cylinder bore has a small area of pitting — approximately 5 mm in diameter — located at the midpoint of the bore on the thrust side. The pitting is shallow (less than 0.001 inches deep) and covers a localized area. All other surfaces of the bore are smooth. Which of the following is the MOST likely cause of this localized pitting?

- A. A foreign particle that was trapped between the piston ring and the bore wall and vibrated against the surface
- B. Detonation damage that focused pressure waves at a specific point on the thrust side bore wall
- C. Electrolysis corrosion from a stray electrical ground path through the engine block that concentrated at the bore-to-coolant interface, with the pit appearing on the bore side of a thin wall section

D. A casting porosity defect that was exposed as the bore surface wore during normal engine operation

22. A customer reports that the engine oil pressure warning light illuminates briefly when the vehicle makes sharp right turns at speed but immediately goes off when the vehicle straightens. Oil level is at the full mark. The oil pan is a rear-sump design. The vehicle is a rear-wheel-drive with the engine mounted longitudinally. Which of the following is the MOST likely cause?

A. A worn oil pump that cannot maintain minimum pressure under the momentary flow disruption of cornering

B. The oil pressure sending unit has a loose wire that momentarily disconnects during the G-force of turning

C. Excessive main bearing clearance that allows oil to drain from the gallery faster than normal during the momentary flow disruption

D. During right turns, the oil sloshes to the left side of the rear-sump pan, momentarily uncovering the pickup screen and causing the pump to draw air, which drops pressure below the warning light threshold

23. A rebuilt engine develops a ticking noise at the number 5 exhaust rocker arm at 3,000 miles. The engine is OHV with hydraulic lifters. Oil pressure is 25 PSI at idle — within specification. The technician removes the valve cover and manually depresses the number 5 exhaust lifter plunger with a pushrod while the engine is off. The plunger moves freely downward but returns very slowly compared to the other lifters when pressure is released. Which of the following does this bench test reveal?

A. The lifter has a weak internal spring or a leaking check valve that is allowing oil to escape from the high-pressure chamber faster than it can refill — confirming the lifter is the source of the tick and must be replaced

B. The lifter is functioning normally — slow return is expected on a used lifter that has been operating for 3,000 miles

C. The lifter bore in the block is worn and allowing the lifter body to tilt, which is causing the slow return

D. The camshaft lobe for number 5 exhaust has worn flat and the lifter is compensating by extending further

24. A four-cylinder engine with 180,000 miles exhibits a vacuum gauge reading that drops approximately 2 in. Hg every time the air conditioning compressor clutch cycles on. The drop recovers

within 3 seconds. When the A/C is turned off, the vacuum is a steady 17 in. Hg. With the A/C on, the vacuum dips rhythmically as the compressor cycles. The idle speed remains stable during the cycling. Which of the following is the correct interpretation?

- A. The compressor clutch cycling is placing excessive load on the engine because the A/C system has a problem
- B. The momentary vacuum dip when the compressor engages is normal — the sudden parasitic load temporarily reduces engine power output, dropping vacuum briefly until the idle speed control compensates
- C. The 2 in. Hg drop indicates a vacuum leak in the A/C system's vacuum-operated controls that opens when the compressor engages
- D. The compressor is mechanically seizing intermittently and placing an abnormal drag on the crankshaft

25. A technician is inspecting a cylinder head that was removed from an engine with a known coolant consumption problem. The head passes a pressure test at 40 PSI. Dye penetrant inspection of the deck surface reveals no cracks. However, the technician notices that one of the exhaust valve seats appears to have a greenish discoloration in the seat contact area that the other seats do not have. Which of the following does this discoloration MOST likely indicate?

- A. The valve seat was contaminated with a copper-based anti-seize compound during a previous valve job
- B. The green discoloration is normal oxidation of the hardened steel valve seat insert in the aluminum head
- C. The valve seat has been exposed to exhaust gas containing coolant vapor from a gasket breach that has since been sealed by carbon deposits
- D. A crack exists between the coolant passage and the exhaust seat area that allows coolant to seep to the seat surface — the green color is from coolant additive residue deposited on the seat during engine operation

26. A rebuilt engine produces normal oil pressure at all conditions. However, the technician notices during a pre-delivery inspection that the oil filter housing appears to have a very thin film of oil on its external surface — not a drip, just a sheen. The filter was hand-tightened plus three-quarters turn per the manufacturer's specification. The filter base gasket appears evenly compressed. Which of the following should the technician check FIRST?

- A. Whether the old oil filter gasket stuck to the engine and a double-gasket condition exists beneath the new filter
- B. Whether the oil filter is the wrong application with a gasket that does not match the housing surface
- C. Whether the filter housing surface on the engine has a nick or scratch that prevents a complete seal
- D. Whether excessive oil pressure is blowing oil past the filter gasket under high-RPM conditions

27. A customer reports that the engine has gradually become noisier over the past 50,000 miles. The noise is a general increase in mechanical sound from the entire engine — not isolated to any single component. Oil level is correct. Oil pressure is within specification but at the lower end of the range. Compression is uniformly below specification by approximately 15% on all cylinders. The engine has 230,000 miles. Which of the following BEST describes this condition?

- A. The engine is experiencing generalized wear across all systems — rings, bearings, valvetrain, and timing components — the cumulative loosening of clearances throughout the engine produces the overall increase in mechanical noise
- B. The increased noise is from a single component — the timing chain — that affects the entire engine's sound signature
- C. The noise increase is from worn engine mounts that allow more vibration to transfer to the vehicle body
- D. The oil viscosity should be increased to dampen the noise from the worn bearings and valvetrain

28. A technician is rebuilding an engine and must verify that the new main bearing shells are the correct application before installation. The technician measures the bearing shell wall thickness with a micrometer. The shells measure 0.0785 inches thick. The manufacturer's specification calls for 0.0780-inch wall thickness with a tolerance of plus or minus 0.0005 inches. Which of the following is the correct assessment?

- A. The shells are 0.0005 inches too thick and will produce bearing clearances that are too tight
- B. The shells are outside the tolerance range and must be returned for the correct specification
- C. The shells at 0.0785 inches fall within the plus or minus 0.0005-inch tolerance range (0.0775 to 0.0785) and are acceptable for installation
- D. The shell thickness cannot be reliably measured with a standard micrometer and the measurement is meaningless

29. A customer brings in a vehicle reporting that the engine stalls only when the transmission is shifted from Neutral to Drive while the A/C compressor is running and the brake pedal is pressed. The engine restarts immediately. The stall does not occur without the A/C on, without the brake pressed, or when shifting to Reverse. Compression is within specification. Which of the following is the MOST likely cause?

- A. A torque converter that is locking up prematurely when Drive is selected and overloading the engine at idle
- B. The combined simultaneous loads of the A/C compressor, the torque converter engagement in Drive, and the brake booster vacuum demand exceed the engine's idle capacity — the idle control cannot increase airflow fast enough to prevent the RPM from dropping below the combustion threshold
- C. The transmission has an internal hydraulic problem that creates excessive resistance when shifted to Drive
- D. The brake booster has a ruptured diaphragm that creates a massive vacuum leak only when the brake is pressed

30. A technician discovers that during an engine rebuild, the block deck surface has a shallow gouge — approximately 2 inches long, 1/8 inch wide, and 0.003 inches deep — that was caused by a pry bar during the previous head removal. The gouge runs perpendicular to the gasket's fire ring for cylinder 3. The rest of the deck surface is flat within 0.001 inches. Which of the following is the correct repair?

- A. The block deck must be resurfaced to a depth that removes the full 0.003-inch gouge and restores a uniform flat surface across the entire deck
- B. Fill the gouge with metallic epoxy, sand it flat, and install the head gasket over the repaired area
- C. Install the head gasket as-is because the MLS gasket's multiple layers can conform to a 0.003-inch gouge
- D. The gouge only needs repair if it intersects a coolant or oil passage — a gouge crossing the fire ring area is non-critical

31. A V8 engine with 195,000 miles develops a new symptom: when the engine is shut off after a 30-minute highway drive, a quiet but distinct gurgling sound is audible from the engine compartment for approximately 20 seconds. The sound was not present six months ago. The coolant level has been dropping slowly. No external leaks are found. The engine oil is clean. Which of the following is the MOST likely source of the gurgling?

- A. The water pump impeller is continuing to spin briefly after shutdown and producing the gurgling from residual flow
- B. Normal coolant circulation sounds that are more noticeable on a quiet engine after shutdown and are not related to the coolant loss
- C. A radiator with developing internal restrictions that traps air pockets that gurgle as they redistribute after shutdown
- D. Combustion gas that has been forced into the cooling system through a developing head gasket breach is rising through the coolant as bubbles after the engine stops — the bubbles produce the gurgling as they reach the top of the system

32. A technician performs a relative compression test using a starter current clamp on a V6 engine. Five cylinders produce uniform current spikes. Cylinder 4 produces a spike approximately 30% higher than the others. A standard compression test shows all six cylinders between 148 and 155 PSI — all within specification. Which of the following could cause a HIGHER-than-normal current spike on one cylinder?

- A. A burned valve on cylinder 4 that reduces compression and requires less starter effort to compress the reduced charge
- B. Low compression on cylinder 4 that produces the higher spike because the starter works harder to compress a cylinder that leaks
- C. A hydrostatic condition — liquid (fuel or coolant) accumulated above the piston on cylinder 4 that the starter must compress, requiring significantly more current than compressing gas alone
- D. A fuel injector that is leaking fuel into cylinder 4 and the extra fuel volume increases the work the starter must perform to compress the charge

33. A customer's vehicle has been diagnosed with a head gasket failure. During the repair, the technician discovers that the head bolt holes in the block are filled with coolant to a depth of approximately 1/2 inch. The technician removes the coolant from all bolt holes before installing the new head bolts. Which of the following explains why it is critical to remove this coolant before installing the head bolts?

- A. Coolant in the bolt holes will corrode the new bolt threads and cause them to seize during future removal
- B. Liquid in the bottom of a bolt hole is incompressible — as the bolt is torqued, it compresses the trapped liquid, which can produce a false torque reading (the wrench clicks at the specified value while

the bolt has not achieved the designed clamping force) or crack the block casting from hydraulic pressure

- C. The coolant will contaminate the head gasket sealing surface and prevent proper gasket adhesion
- D. Coolant in the bolt holes indicates the block is cracked at those locations and the block must be replaced

34. A technician is evaluating a used engine for a customer considering a swap. The engine has unknown history. A quick diagnostic reveals: compression 140 to 148 PSI on all six cylinders (specification 145 to 170), oil pressure 20 PSI at hot idle (specification minimum 15), oil pressure 42 PSI at 2,500 RPM (specification 40 to 65), no knocking, clean oil, and no visible leaks. Which of the following is the MOST accurate assessment?

- A. The engine shows moderate wear — two of six cylinders are marginally below the compression minimum and oil pressure is in the lower third of the specification range — the engine is functional but has limited remaining service life before parameters drop below specification
- B. The engine is in excellent condition because all parameters are above minimum specification
- C. The engine should not be purchased because two cylinders below the compression minimum indicate valve problems
- D. The oil pressure readings indicate the engine has been rebuilt with incorrect bearing clearances

35. A rebuilt engine is being broken in. The technician monitors oil pressure at regular intervals: at 100 miles, hot idle = 32 PSI; at 500 miles, hot idle = 28 PSI; at 1,000 miles, hot idle = 26 PSI; at 2,500 miles, hot idle = 25 PSI; at 5,000 miles, hot idle = 24 PSI. The specification minimum is 20 PSI. Which of the following BEST describes what this trend indicates?

- A. The pressure is declining too rapidly and the bearings were assembled with excessive clearance
- B. The oil pump relief valve spring is weakening and should be replaced before the pressure drops further
- C. The pressure trend is abnormal because it should have stabilized by 1,000 miles rather than continuing to drop
- D. The rate of pressure decrease is decelerating (6 PSI drop in the first 500 miles, then 2 PSI per 500-mile interval, then 1 PSI per 2,500-mile interval) — indicating normal bearing break-in that is approaching its equilibrium, with all readings well above the minimum specification

36. Technician A says that when performing a wet compression test, too much oil (more than 2 tablespoons) squirted into the cylinder can produce a falsely high compression reading by hydro-locking the small remaining combustion chamber volume above the piston. Technician B says that the wet test should be performed immediately after the dry test on the same cylinder to get the most accurate comparison. 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

37. A vehicle owner reports that the engine oil level reads one quart above the full mark on the dipstick despite no oil being added. The oil has a faint fuel odor. The engine has no misfires, no codes, and runs normally. The customer drives 5 miles to work in cold weather each morning and 5 miles home each evening. The vehicle sits in an unheated garage overnight. Which of the following is the MOST likely cause of the rising oil level?

- A. A leaking fuel pressure regulator diaphragm that allows fuel to enter the intake manifold at all operating conditions
- B. Fuel dilution from the rich cold-start fuel mixture — on short cold-weather trips, unburned fuel washes past the piston rings into the crankcase and the oil never reaches operating temperature to evaporate the accumulated fuel through the PCV system
- C. A stuck-open fuel injector that drips fuel into one cylinder overnight and the fuel drains past the rings into the crankcase
- D. The dipstick is reading incorrectly because cold oil adheres to the dipstick tube walls and produces a false high reading

38. A rebuilt engine is being pre-primed with a drill-driven priming tool. The technician observes that oil pressure builds to 35 PSI on the gauge. However, oil is not flowing from two of the eight rocker arm assemblies under the valve cover despite three minutes of continuous priming. Oil flows normally from the other six positions. Which of the following is the MOST likely cause?

- A. The two non-flowing positions have lifters with defective check valves that are blocking oil passage
- B. The rocker arm pivots at those two positions have blocked oil passages from manufacturing defects

C. The two positions are fed from a different oil gallery branch that has not yet been reached by the pump

D. The oil gallery passages feeding those two specific lifter bores are blocked with assembly debris, dried sealant, or contaminants that were not removed during block cleaning

39. A customer brings in a vehicle where the engine has been consuming coolant for three months. All standard tests have been performed: pressure test (holds), block test at idle (negative), block test at 2,500 RPM (negative), UV dye test after 300 miles (no external fluorescence found), oil analysis (no glycol detected), and exhaust condensate analysis (no glycol detected). The coolant loss is approximately one pint every three weeks. The customer is frustrated. Which of the following diagnostic approach should the technician try NEXT?

A. Perform an extended overnight pressure test with a precision digital gauge that can detect pressure drops as small as 0.1 PSI over 12 hours

B. Replace the head gaskets preemptively because the consumption must be from an internal breach too small for any available test to detect

C. Perform a leak-down test on each cylinder individually while monitoring the coolant level or pressurized cooling system gauge for any correlation between cylinder pressure and coolant system response

D. Inform the customer that the loss of one pint every three weeks is within normal evaporative loss for most cooling systems and no repair is needed

40. A technician is diagnosing an engine that has a P0171 (system too lean, bank 1) code. Long-term fuel trim on bank 1 is plus 20%. Bank 2 fuel trim is plus 3%. Compression is within specification on all cylinders. The intake manifold gasket was replaced three weeks ago at another shop. A smoke test shows no visible smoke from any gasket surface, vacuum hose, or port. Which of the following should the technician investigate despite the negative smoke test?

A. The bank 1 oxygen sensor for a contamination-related false lean reading that occurred during the manifold service

B. The intake manifold gasket installation for a possible error — some gaskets can pass a smoke test if the leak is at a location where positive smoke pressure pushes the gasket closed, but manifold vacuum during running pulls the gasket open and creates the leak

C. The fuel injectors on bank 1 for clogging that occurred during the manifold removal and reinstallation process

D. The catalytic converter on bank 1 for a restriction that is creating false lean readings on the upstream oxygen sensor

41. A rebuilt engine develops a persistent misfire on cylinder 2 within the first 500 miles. The technician swaps the plug, coil, and injector — the misfire stays on cylinder 2. A compression test shows cylinder 2 at 160 PSI — within specification and the highest reading in the engine. A leak-down test shows only 4% leakage. The misfire is present at all conditions. Which of the following should the technician investigate?

A. The valve timing on cylinder 2 specifically — a cam lobe ground to an incorrect profile or an incorrectly installed cam follower could produce a misfire despite normal cranking compression and leak-down by altering the dynamic valve events during running

B. The connecting rod bearing on cylinder 2 for excessive clearance that produces an RPM-dependent vibration

C. The piston on cylinder 2 for a crown defect that disrupts the combustion flame pattern in the chamber

D. The cylinder 2 bore for a surface finish defect that causes the rings to chatter and leak intermittently

42. A customer reports that the engine produces a brief whiff of blue smoke from the exhaust only when decelerating from highway speed on a long downhill grade. The smoke appears after approximately 10 seconds of sustained closed-throttle deceleration and disappears when the throttle is opened. Oil consumption is one quart every 5,000 miles. Compression is within specification. Which of the following is the MOST likely cause?

A. Worn piston rings that allow oil to be pulled upward past the rings by the extreme high vacuum of sustained deceleration

B. A PCV valve that opens fully during the high vacuum of deceleration and draws crankcase oil into the intake

C. Worn turbocharger seals that leak oil during the low-boost conditions of deceleration

D. Worn valve stem seals that allow oil past the seals under the extremely high intake manifold vacuum of sustained closed-throttle deceleration — the high vacuum pulls oil past the worn seals and into the combustion chamber

43. A technician is measuring the bore diameter on a recently bored and honed cylinder. The specification for the 0.020-inch oversize bore is 3.8200 inches plus or minus 0.0005 inches. The

technician's measurements at six points (top, middle, bottom in two perpendicular directions) all fall between 3.8197 and 3.8203 inches. Taper is 0.0004 inches. Out-of-round is 0.0003 inches. Which of the following is the correct assessment?

- A. The bore is within specification on all measurements and is ready for piston and ring installation
- B. The bore measurements below 3.8200 indicate the bore was not bored to a full 0.020-inch oversize
- C. All measurements fall within the plus or minus 0.0005-inch tolerance (3.8195 to 3.8205), taper and out-of-round are minimal, and the bore is properly machined and ready for assembly
- D. The 0.0006-inch spread between the lowest and highest readings exceeds acceptable bore uniformity

44. A technician is investigating an oil consumption complaint on an engine with 90,000 miles. There are no external leaks. The PCV system is functional. Compression is within specification on all cylinders. The exhaust shows no visible smoke at any condition. The customer insists the engine consumes one quart every 1,500 miles. The manufacturer states that oil consumption of up to one quart per 1,000 miles is within normal parameters. Which of the following is the correct conclusion?

- A. The engine has a defect because 90,000 miles is too early for any measurable oil consumption to occur
- B. The oil consumption rate of one quart per 1,500 miles falls within the manufacturer's published normal range and all diagnostic tests confirm no defect — the engine is operating within its design parameters
- C. The converter must be tested because it may be masking a smoke condition from a head gasket breach
- D. The valve stem seals should be replaced preemptively because they are the most likely cause at this mileage

45. A rebuilt engine exhibits a condition where the oil pressure is normal at all RPMs when the engine is cold, but at full operating temperature, the idle pressure drops to 18 PSI (specification minimum 20 PSI) while the speed pressure remains within specification at 44 PSI. The bearing clearances were verified with Plastigage during assembly and all were in the middle of the specification range. Which of the following is the MOST likely cause of the below-specification hot idle pressure?

- A. The oil pump pickup tube O-ring has a marginal seal that allows air ingestion at hot idle when the thinner oil reduces the pump's suction seal capability — the air reduces pump efficiency at the low-demand idle condition but is overwhelmed by the higher flow demand at speed
- B. The main bearing clearances have already worn beyond specification after only a few thousand miles
- C. The oil filter is restricting flow at hot idle but the higher pump output at speed overcomes the restriction
- D. The crankshaft end play has increased and is allowing oil to escape laterally from the thrust bearing

46. A customer reports that the engine developed a sudden loud metallic knocking two days ago. The knock is present at all RPMs and is loudest at 2,000 RPM under light load. Oil level is correct. Oil pressure is 15 PSI at idle (specification minimum 10) and 30 PSI at 2,500 RPM (specification 40 to 65). Disabling the cylinder 6 injector reduces the knock significantly. Which of the following BEST describes the severity and recommended action?

- A. The knock is likely from a worn wrist pin that can be repaired by replacing only the pin and bushing
- B. The cylinder 6 rod bearing has failed and the below-specification speed pressure confirms the bearing clearance is excessive — the engine requires removal for rod bearing replacement on cylinder 6 at minimum, with inspection of all other bearings and the crankshaft journal
- C. The knock is from a loose piston that can be corrected by installing oversize rings on cylinder 6
- D. The knock is from a worn rod bearing on cylinder 6 but the idle pressure above specification means only the single bearing needs replacement without further engine disassembly

47. A technician is performing the final quality check on a rebuilt engine before customer delivery. The engine has been through three heat cycles with no leaks. Compression is within specification. Oil pressure is within specification. A block test is negative. The technician performs one additional check — placing a hand near each exhaust port at the manifold while the engine is idling. Three of the four ports produce strong, even exhaust pulses. The number 3 port produces noticeably weaker pulses than the others. Which of the following should the technician do?

- A. Deliver the vehicle because the difference in pulse strength is within normal variation between cylinders
- B. Check the exhaust manifold for a restriction at the number 3 runner that may be dampening the pulse

C. Investigate cylinder 3 for a problem — weak exhaust pulses indicate that cylinder is not producing the same combustion force as the others, despite passing the standard compression test, and could indicate an assembly error or component defect

D. Replace the exhaust manifold gasket because a leak at the number 3 port is dissipating the pulse energy

48. A rebuilt engine has been running for 10,000 miles. The customer brings the vehicle in reporting a new symptom: the oil pressure gauge drops approximately 5 PSI when the engine transitions from cold to hot during the warm-up period. The hot idle pressure is 22 PSI (specification minimum 20). The customer is concerned because the drop was only 3 PSI at the 5,000-mile service. Which of the following is the MOST appropriate response?

A. The increasing cold-to-hot pressure differential indicates the bearings are wearing faster than expected

B. The increasing differential is within the normal progression of post-break-in bearing clearance stabilization — as clearances increase slightly from break-in wear, the viscosity-related pressure difference between cold and hot oil becomes more pronounced, but the critical measure is the hot idle reading, which at 22 PSI still exceeds the 20 PSI minimum

C. The oil pump should be replaced because it is losing efficiency as the engine warms

D. The increasing differential indicates the wrong oil viscosity is being used and a heavier weight should be installed

49. A customer brings in a vehicle stating that the engine runs perfectly in every way except for one complaint: the engine takes approximately 4 seconds of cranking to start every morning. Once started, the engine runs flawlessly. All restarts during the day are immediate. Fuel pressure at key-on reads 30 PSI — below the 55 PSI specification. After the fuel pump runs for 3 seconds, pressure reaches 55 PSI and the engine starts normally. Which of the following is the MOST likely cause?

A. A fuel system component — either the fuel pump check valve or a leaking fuel injector — is allowing fuel pressure to bleed down to 30 PSI overnight, requiring extended cranking to repressurize the rail before adequate fuel delivery can occur

B. The fuel pump is failing and takes 4 seconds to reach full speed and pressure on cold mornings

C. The fuel filter is partially restricted and delays fuel delivery to the rail during the initial cranking period

D. The PCM is commanding a delayed injector pulse during cold start as part of its emissions reduction strategy

50. A technician has completed all 1,000 practice questions in this study guide. The technician's average score across all 20 practice exams has been 82%. The technician's weakest domain has consistently been Domain C (Engine Block and Rotating Assembly) at an average of 68%. All other domains average above 80%. The ASE A1 exam is scheduled for next week. Which of the following is the MOST effective final preparation strategy?

A. Take two additional full-length practice exams to build confidence and maintain momentum

B. Review all 1,000 questions and explanations from the beginning to refresh every topic equally

C. Focus intensive study on a completely new reference source to gain a fresh perspective on all five domains

D. Dedicate the remaining study time primarily to reviewing Domain C content — the engine block and rotating assembly chapter, all Domain C questions missed across the 20 exams, and the explanations for those questions — because raising a 68% domain to 75% or higher produces a larger score gain than further improving domains already above 80%

Practice Exam 19: Answer Key and Full Explanations

Domain Key: Each question's domain is noted in brackets for score tracking.

[A] = General Engine Diagnosis | [B] = Cylinder Head and Valve Train | [C] = Engine Block | [D] = Lubrication and Cooling Systems | [E] = Fuel, Electrical, Ignition, and Exhaust Systems

1. D — The wet test improves ring seal only — it squirts oil into the ring-to-bore gap to temporarily seal worn rings. [A] If the primary cause of low compression is late intake valve closing from 6 degrees of camshaft retardation (the chain stretch), the charge escapes back through the still-open intake valve before compression builds — and no amount of oil at the ring-to-bore interface can seal a valve timing problem. The small 8 to 12 PSI improvement represents the minor ring wear contribution, while the majority of the compression loss is from the retarded valve timing.

2. C — A faint milky discoloration in the last pint of drained oil — with the bulk of the oil appearing normal, full coolant level, no white smoke, and a negative block test — is consistent with moisture

condensation that has settled to the bottom of the pan. [D] During short-trip driving in humid conditions, the engine never reaches full operating temperature long enough to evaporate the moisture that accumulates in the crankcase from combustion blowby and atmospheric humidity. The water settles to the lowest point of the pan and emulsifies with the oil, producing the milky appearance in the last portion drained.

3. A — Cylinder 1 has two simultaneous mechanical deficiencies: minor ring wear (faint air at oil filler, wet test improvement from 136 to 140) and a marginally leaking exhaust valve (faint air at tailpipe). [A] Neither deficiency alone would cause a misfire — 136 PSI with only ring wear would idle fine, and a minor exhaust valve leak alone would idle fine. But the combination drops cylinder 1's effective compression below the threshold for reliable idle combustion. The head must be removed for valve service, and the bore condition assessed to determine whether ring replacement or boring is also needed.

4. B — Combustion gas entering the cooling system through a head gasket breach adds gas pressure on top of the normal thermal expansion pressure. [D] The system held at 16 PSI when cold because there was no combustion to drive gas through the breach. During driving, each power stroke forces high-pressure combustion gas into the coolant, progressively building pressure beyond the cap's 16 PSI rating. The cap's pressure relief valve opens but cannot keep up with the continuous influx of gas, and the pressure climbs above specification.

5. D — Heavy blue smoke only during the first 5 seconds after startup following 4+ hours of sitting — with no smoke during any driving condition — is the classic presentation of worn valve stem seals. [A] During extended sitting, oil from the valve cover area and cam journals seeps past the worn seals and pools on the closed valve faces. On the first start, this accumulated pool of oil is drawn into the combustion chambers and burned, producing the visible blue smoke. Once the pool is consumed within the first few seconds, the dynamic seal during running is adequate to prevent further visible smoke.

6. A — Technician A only is correct: a steady 21 in. Hg at sea level indicates excellent cylinder sealing and no vacuum leaks. [A] Technician B is incorrect because at 5,000 feet elevation, atmospheric pressure is approximately 12% lower than sea level, and normal vacuum readings are proportionally lower — typically 15 to 18 in. Hg for a healthy engine. A reading of 21 in. Hg at 5,000 feet would indeed be unusual and worthy of investigation, but not because of "gauge error" — it could indicate a gauge calibration issue or an unusual atmospheric condition. Technician B's reasoning is flawed.

7. C — The extreme dust load from 10 miles of construction zone driving exceeded the air filter's capacity, allowing fine abrasive particles to bypass the filter element and enter the engine through the intake tract. [A] These particles contaminated the intake charge and were drawn into the combustion chambers, where they contacted the cylinder walls, piston rings, and valve faces. The contaminated oil

(confirmed by elevated silicon in the analysis) then circulated through the entire lubrication system, causing accelerated wear on the valvetrain components — hydraulic lifters, cam followers, and cam lobes — producing the persistent ticking noise.

8. B — A piston wrist pin bore that is intentionally offset 0.040 inches from center is a designed feature found on many production engines. [C] The offset controls which direction the piston tilts at the crossover points of each stroke — TDC and BDC — where the connecting rod changes its angular direction and the piston reverses its thrust side loading. By positioning the pin offset toward the major thrust side, the piston's rocking motion is directed in a controlled manner that reduces the audible piston slap noise that would otherwise occur at the crossover points.

9. A — Replace only the four bent pushrods with new ones of the correct specification. [B] A pushrod with any visible bend — regardless of how slight — has been permanently deformed and will not maintain correct valvetrain geometry. The twelve straight pushrods that roll true on the surface plate are dimensionally correct and can be safely reused. Replacing all sixteen as a set is unnecessary when twelve are verified as straight. Attempting to straighten a bent pushrod in a press is unreliable and risks hidden metallurgical weakening.

10. D — A rebuilt engine with good compression readings but elevated crankcase pressure at 500 miles is most likely experiencing the normal break-in condition of not-yet-fully-seated piston rings. [A] New rings installed in freshly honed bores require 2,000 to 5,000 miles to fully conform to the bore surface through controlled micro-wear. During this break-in period, the partially seated rings allow more blowby than a fully seated set, temporarily elevating crankcase pressure above the specification that was designed for a broken-in engine. The pressure should decrease as the rings seat.

11. B — When a timing belt jumps on an interference engine, each cylinder is at a different point in its four-stroke cycle at the exact moment the belt jumps. [A] Cylinders 1 and 3 happened to be at positions in their timing cycle where the valves were most vulnerable to piston contact — perhaps at or near TDC with valves extended into the combustion chamber. Cylinders 2 and 4, at different positions in their cycles, had their valves in less vulnerable positions and sustained less severe (or no) valve damage. The uneven damage pattern directly reflects each cylinder's timing position at the moment of failure.

12. A — Resurfacing removes material from the entire deck surface uniformly — even though only the center is warped, the machining process cuts the entire surface to a single flat plane. [B] To remove a 0.005-inch center warpage, the machine must cut 0.005 inches from the center while the edges (which were already flat) lose proportionally less material. The total depth removed across the surface leaves 0.003 inches of remaining allowable resurfacing depth ($0.008 - 0.005 = 0.003$) for potential future service. The head is repairable.

13. D — The idle pressure of 16 PSI is still above the 15 PSI minimum, but the speed pressure of 38 PSI has fallen below the 40 PSI minimum specification. [A] This means the engine now fails to meet specification under the higher-demand conditions of elevated RPM. Normal post-break-in bearing wear should produce a gradual decline that stabilizes well within specification by 15,000 miles. A speed pressure decline of 17 PSI (55 to 38) in 15,000 miles — with the reading now below specification — exceeds the normal break-in wear rate and warrants investigation for assembly errors, contamination, or oil system problems.

14. C — An intermittent hesitation that occurs once per 15-minute drive, produces no codes, shows no abnormal scan data during shop testing, and cannot be reproduced by the technician requires data capture during the actual failure event. [A] A continuous data logger records all sensor values, fuel trim, ignition timing, and misfire counts over several days of the customer's normal driving. When the hesitation occurs, the logged data from the seconds surrounding the event reveals the failing parameter — whether it is a momentary fuel pressure drop, an ignition timing error, a sensor spike, or an EVAP purge event.

15. A — Individual cam lobes cannot be reliably repaired on a production camshaft — welding and regrinding a single lobe introduces metallurgical inconsistencies at the weld interface that cannot match the original hardened surface. [B] The entire exhaust camshaft must be replaced. Additionally, all exhaust cam followers that ride on the camshaft should be replaced because the worn lobe may have damaged the follower contact surfaces, and worn followers installed on a new cam would accelerate the new lobe's deterioration. The intake cam and followers can be retained if they are within specification.

16. B — A vibration that occurs at exactly 55 mph on cruise control — but not at 50 or 60 mph, and not at 55 mph without cruise control — is a drivetrain resonance that exists only under one precise set of conditions. [A] Cruise control locks the engine at a specific steady-state RPM, gear ratio, converter lockup status, and load that differs from the driver's naturally varying throttle input at the same speed. This precise combination of engine frequency, transmission ratio, driveshaft speed, and steady-state load creates a torsional vibration that any variation in those parameters breaks.

17. D — A violently positive block test — fluid changing color within 10 seconds with vigorous bubbling — indicates a large volume of combustion gas is entering the coolant. [A] A minor head gasket seep produces a slow, gradual color change over 30 to 60 seconds. A violent reaction within 10 seconds confirms a severe breach that is allowing a high volume of combustion gas to pass into the coolant with every power stroke. This finding indicates an advanced failure that requires immediate repair — the engine should not be driven further.

18. A — A 6 PSI idle drop (30 to 24) and a 5 PSI speed drop (55 to 50) over the 500-mile interval from the first to second oil change is within the expected range of normal post-break-in bearing wear-in. [D] New bearing overlay material wears most rapidly during the first few thousand miles as it conforms to the journal surface. The rate of wear decelerates as the surfaces reach their equilibrium running condition. All current readings remain comfortably within specification. The technician should document the readings and recheck at the next service interval to confirm the rate is decelerating as expected.

19. C — An engine that overheats specifically during maximum thermal output conditions (loaded mountain climbing) while operating normally in all other conditions — with the fan running, thermostat verified, correct coolant level, and negative block test — is reaching the upper limit of its cooling system's heat rejection capacity. [D] The most likely cause is a partial radiator restriction that reduces the system's maximum cooling capacity below what is needed for extreme loads. Under normal driving, the reduced capacity is still adequate. Under maximum sustained load, the restricted system cannot reject heat fast enough to prevent the temperature from rising above normal.

20. B — Both technicians are correct. [D] Technician A correctly identifies the standard practice: the rear main seal lip should be pre-lubricated before installation to prevent the dry seal from scuffing against the crankshaft surface during the first seconds of operation. Technician B adds an important nuance: some seal manufacturers specify a particular lubricant (such as the seal manufacturer's proprietary assembly lube) for their specific seal material — using engine oil or petroleum jelly on a seal designed for a different lubricant can cause the seal material to swell, harden, or deteriorate prematurely.

21. C — Localized pitting at the midpoint of the bore on the thrust side — shallow, covering a small area, with all surrounding surfaces smooth — is most consistent with electrolysis corrosion. [C] Stray electrical current from a missing or corroded engine ground path can travel through the engine block and concentrate at the thinnest wall sections between the bore and coolant jacket. The electrical energy causes localized electrochemical erosion (pitting) at the point where current density is highest. This is a known condition on engines with grounding problems, particularly in vehicles with aftermarket electrical accessories.

22. D — The oil pressure warning light illuminating briefly during right turns only — with correct oil level — indicates the oil pickup is momentarily uncovered during the lateral G-force of the turn. [D] In a rear-ump pan on a longitudinally mounted engine, right turns push oil to the left (driver's) side of the pan. If the pickup screen is positioned such that the oil sloshes away from it during right turns, the pump draws air momentarily, pressure drops below the warning light threshold, and the light illuminates. When the vehicle straightens, oil returns to the pickup and pressure recovers immediately.

23. A — A hydraulic lifter plunger that moves freely downward but returns very slowly compared to the other lifters has a compromised internal check valve or a leaking plunger-to-bore seal. [B] The slow return means oil is escaping from the high-pressure chamber faster than the check valve can retain it — the spring pushes the plunger up, but the oil leaks out instead of supporting the plunger's return. During engine operation, this lifter cannot maintain zero lash because it bleeds down faster than the oil supply can replenish it, producing the persistent tick. The lifter must be replaced.

24. B — A 2 in. Hg vacuum dip each time the A/C compressor clutch engages, with stable idle speed and recovery within 3 seconds, is a completely normal engine response to the sudden parasitic load of the compressor. [A] When the electromagnetic clutch engages, the compressor places an instantaneous mechanical load on the crankshaft through the serpentine belt. This sudden load momentarily reduces the engine's net power output, dropping the intake vacuum briefly. The idle speed control system increases airflow to compensate, and within 3 seconds the vacuum recovers. The cycling pattern simply reflects the compressor's normal on/off cycling.

25. D — A greenish discoloration on one exhaust valve seat that is not present on the other seats — on a head from an engine with known coolant consumption — strongly suggests a crack between a coolant passage and the exhaust seat area. [B] During engine operation, coolant seeps through the crack onto the hot valve seat surface. The coolant evaporates instantly, but its dye and additive compounds (which give coolant its green color) are deposited on the seat surface as a residue. The crack may be too small for the pressure test to detect, or the pressure test conditions may not replicate the thermal expansion that opens the crack during running.

26. C — A very thin oil film on the filter housing surface — not a drip, just a sheen — with the filter properly installed at the correct torque and the gasket evenly compressed, should first be investigated at the mating surface on the engine. [D] A nick, scratch, or casting imperfection on the filter housing mounting surface prevents the filter gasket from making complete contact around its full circumference. Even a small surface defect allows a micro-seep of pressurized oil that produces the thin film without an active drip. The technician should inspect the surface with a flashlight and fingertip for any irregularity.

27. A — An engine with 230,000 miles that has become generally noisier over 50,000 miles — with oil pressure at the lower end of specification and compression uniformly 15% below specification — is experiencing the cumulative effect of wear across every system simultaneously. [A] Increased bearing clearances produce more mechanical noise at each bearing position. Worn cam followers and valve guides produce valvetrain noise. A stretched timing chain produces chain slap. Worn rings increase blowby noise. The sum of all these individual clearance increases throughout the engine produces the perceived overall increase in mechanical sound.

28. C — The bearing shells measure 0.0785 inches, and the specification is 0.0780 plus or minus 0.0005 inches — meaning the acceptable range is 0.0775 to 0.0785 inches. [C] The measured thickness of 0.0785 falls exactly at the upper limit of the tolerance range and is therefore within specification. The bearing is acceptable for installation. A bearing at the upper thickness limit will produce a slightly tighter clearance than one at the lower limit, but this is accounted for in the designed clearance specification range.

29. B — The engine stalls only when three specific loads are applied simultaneously: A/C compressor parasitic drag, torque converter engagement in Drive, and brake booster vacuum demand from a firmly pressed pedal. [A] Each load individually is within the idle control system's compensation capacity. However, the simultaneous application of all three exceeds the engine's idle reserve — the margin between the current idle airflow and the minimum airflow needed to sustain combustion. The idle control system cannot increase airflow quickly enough to prevent the RPM from dropping below the combustion-sustaining threshold.

30. A — A 2-inch gouge that is 0.003 inches deep running perpendicular to the fire ring area of cylinder 3 creates a direct leak path that the head gasket cannot bridge. [C] MLS head gaskets require an extremely smooth, flat surface (15 to 30 microinches Ra) to seal — a 0.003-inch gouge is roughly 100 times deeper than the gasket's sealing tolerance. The entire block deck must be resurfaced to a depth that removes the full gouge, restoring a uniform flat surface. Metallic epoxy in a fire ring area is unreliable under the extreme pressures and temperatures of combustion.

31. D — A gurgling sound from the engine compartment after shutdown that was not present six months ago, combined with a slowly dropping coolant level and no external leaks, points to combustion gas in the cooling system. [D] During engine operation, a developing head gasket breach forces combustion gas into the coolant under high pressure. When the engine is shut off, the gas is no longer being pushed in — but the gas that accumulated during the drive rises through the coolant as bubbles, producing the audible gurgling. The 20-second duration corresponds to the time needed for the trapped gas to percolate to the top of the system.

32. C — A relative compression test spike that is 30% higher than normal on one cylinder means the starter is working significantly harder to compress the contents of that cylinder. [A] Normal compression involves compressing gas — which is compressible. If liquid (fuel from a leaking injector or coolant from a gasket breach) has accumulated above the piston on cylinder 4, the starter encounters an incompressible substance that requires dramatically more current to push the piston through. This hydrostatic condition produces the higher-than-normal current spike. A standard compression test at 148 PSI may still read within specification if the liquid amount is small.

33. B — Liquid trapped in the bottom of a blind bolt hole is incompressible. [C] When the bolt is threaded into the hole and torqued, the bolt tip compresses the liquid at the bottom. The torque wrench may click at the specified value because the resistance from the compressed liquid registers as torque — but the bolt has not achieved the designed clamping force against the head gasket because the liquid, not the gasket, is absorbing the force. In severe cases, the hydraulic pressure from the compressed liquid can crack the block casting around the bolt hole. All bolt holes must be dry before torquing.

34. A — Two cylinders marginally below the 145 PSI minimum (140 and 142 PSI), with oil pressure in the lower third of the specification range at both idle and speed, describe an engine with moderate wear consistent with its mileage. [A] The engine is functional — no catastrophic failure exists — but it is clearly past its peak. The customer should understand that the engine will continue to lose performance and consume more oil as the wear progresses, and should factor the cost of an eventual rebuild or replacement into the purchase economics.

35. D — The pressure decrease rate is clearly decelerating: 4 PSI drop in the first 400 miles (32 to 28), 2 PSI in the next 500 miles (28 to 26), 1 PSI in the next 1,500 miles (26 to 25), and 1 PSI in the next 2,500 miles (25 to 24). [D] This decelerating curve is the textbook normal break-in pressure trajectory — rapid initial wear as new bearing surfaces conform to the journals, followed by progressively slower wear as the surfaces reach their equilibrium. All readings remain well above the 20 PSI minimum. The bearings are approaching their final running clearance.

36. A — Both technicians describe important practical considerations for the wet compression test. [A] Technician A correctly warns that too much oil can produce a falsely high reading by partially hydro-locking the small clearance volume above the piston — the oil volume adds to the effective compression by reducing the remaining air space. Technician B correctly notes the wet test should immediately follow the dry test on the same cylinder so the comparison is direct and the cylinder conditions are identical.

37. B — An oil level that rises above the full mark with a fuel odor, on a vehicle driven exclusively on 5-mile cold-weather trips, is the classic presentation of fuel dilution from incomplete combustion. [E] During cold starts and short trips, the rich cold-start fuel mixture does not burn completely. Unburned fuel washes past the piston rings into the crankcase. On a fully warmed engine driven for sustained periods, the oil temperature rises enough to evaporate the accumulated fuel through the PCV system. The customer's 5-mile trips in cold weather never allow the oil to reach this evaporation temperature, so fuel accumulates progressively.

38. D — Two of eight rocker arm positions receiving no oil during three minutes of continuous pre-priming — while the other six flow normally — indicates a complete blockage in the oil delivery path

feeding those two specific positions. [D] The most likely cause is assembly debris (gasket material, dried RTV sealant, metal shavings, or cleaning solvent residue) lodged in the oil gallery passages that feed those specific lifter bores. The blockages must be cleared before the engine is started — running without oil delivery to those positions will destroy the cam lobes and lifters within minutes.

39. C — After exhausting all standard diagnostic tests (pressure test, block test at two RPMs, UV dye test, oil analysis, and exhaust condensate analysis) without identifying the coolant loss source, the most sensitive remaining test is a cylinder-by-cylinder leak-down correlation test. [A] By pressurizing each cylinder individually to 80–100 PSI (far higher than the cooling system's 16 PSI) while simultaneously monitoring the cooling system for any pressure rise or coolant level change, the technician can identify which specific cylinder has a combustion-to-coolant breach that is too small for any other test to detect.

40. B — A plus 20% fuel trim on bank 1 after an intake manifold gasket replacement, with a negative smoke test, is a common and frustrating diagnostic scenario. [A] A smoke test pressurizes the intake system — but some gasket leaks only occur under vacuum, not pressure. When the intake manifold is under vacuum during running, the negative pressure pulls the gasket away from the sealing surface at the leak point. When positive pressure from the smoke machine is applied, it pushes the gasket against the surface and seals the leak. The technician should use a propane enrichment test during running to detect the vacuum-dependent leak.

41. A — A persistent misfire on a specific cylinder despite swap-testing the plug, coil, and injector — with normal cranking compression and a near-perfect leak-down — rules out the standard causes. [A] The remaining possibility is a dynamic valve timing issue specific to that cylinder: a cam lobe ground to an incorrect profile, a cam follower assembled incorrectly, or a shim error that alters the valve events in a way that only manifests during running. Cranking compression tests the static seal, but the dynamic valve opening and closing events during actual combustion at speed can differ significantly from the slow cranking conditions.

42. D — Blue smoke that appears only during sustained closed-throttle deceleration — and disappears when the throttle opens — is the classic presentation of worn valve stem seals leaking under high vacuum. [A] During sustained deceleration with the throttle closed, intake manifold vacuum reaches its maximum (typically 22 to 25 in. Hg). This extreme vacuum pulls oil past the worn valve stem seals and into the intake ports, where it accumulates. When the throttle is opened, the vacuum drops, the oil seepage stops, and the accumulated oil burns off as the brief blue puff. The low overall oil consumption (1 quart per 5,000 miles) confirms the leakage is intermittent rather than continuous.

43. C — All six measurements fall between 3.8197 and 3.8203 inches — within the specified tolerance of 3.8200 plus or minus 0.0005 (acceptable range 3.8195 to 3.8205). [C] The taper of 0.0004 inches and

out-of-round of 0.0003 inches are both minimal and well within typical machining precision. The bore has been properly bored and honed to the 0.020-inch oversize specification and is ready for piston and ring installation with the matching 0.020-oversize piston.

44. B — The oil consumption rate of one quart per 1,500 miles falls within the manufacturer's published normal range of up to one quart per 1,000 miles. [A] All diagnostic tests — compression, leak-down, PCV function, no visible smoke, no external leaks — confirm no engine defect exists. The engine is consuming oil within its designed parameters. The technician should explain this clearly to the customer, referencing the manufacturer's published specification as the documented standard for this engine.

45. A — Hot idle pressure of 18 PSI — 2 PSI below the 20 PSI minimum — on a rebuilt engine with verified assembly clearances points to a suction-side air leak that reduces pump efficiency at the low-demand condition of hot idle. [D] The oil pickup tube O-ring is the most common source. When the oil is hot and thin, the reduced viscosity weakens the pump's suction seal at a marginal O-ring. Air enters the suction side, reducing the volume of oil the pump draws per revolution. At higher RPM (2,500), the increased pump speed and flow demand overwhelm the small air leak, and the pressure reads within specification.

46. D — A loud rod knock confirmed by the cylinder-disable test on cylinder 6, combined with speed oil pressure of 30 PSI (well below the 40 PSI minimum), indicates a severe rod bearing failure that has progressed beyond a simple noise concern. [A] The below-spec speed pressure confirms the bearing clearance on cylinder 6 is so excessive that it is draining oil from the entire system. The engine must be removed for bearing replacement on cylinder 6 at minimum, with inspection of the crankshaft rod journal and all other bearings — because the debris from the failed bearing has been circulating through the oil system.

47. C — On a rebuilt engine undergoing pre-delivery quality checks, all four exhaust ports should produce equal pulse strength — a noticeably weaker pulse on cylinder 3 indicates that cylinder is not producing the same combustion force as the others. [A] A weak exhaust pulse can indicate a fuel delivery issue, an ignition problem, a valve timing error, or a compression problem on that cylinder. The fact that the standard compression test passed does not rule out a dynamic operating condition that differs from the static cranking test. The technician should investigate cylinder 3 before delivering the vehicle.

48. B — The increasing cold-to-hot pressure differential (from 3 PSI at 5,000 miles to 5 PSI at 10,000 miles) is a normal consequence of the slight bearing clearance increase from post-break-in wear. [D] As clearances increase marginally, the viscosity-related pressure difference between cold (thick) and hot (thin) oil becomes more pronounced — thick cold oil produces higher pressure through the enlarged

clearances, while thin hot oil flows even more easily through them, producing a proportionally larger drop. The critical measure is the hot idle pressure itself — at 22 PSI, it exceeds the 20 PSI minimum and is within specification.

49. A — A fuel system that reads 30 PSI at key-on (well below the 55 PSI specification) after sitting overnight, but reaches full specification pressure after 3 seconds of pump operation, confirms fuel pressure is bleeding down during the sitting period. [E] A properly sealing fuel system maintains near-specification pressure for hours after key-off. The 30 PSI residual (instead of 0) suggests a slow leak rather than a complete dump. The most likely components are the fuel pump check valve (which prevents fuel from draining back to the tank) or a fuel injector with a slow drip (which allows fuel to seep into a cylinder overnight).

50. D — With an 82% overall average and four domains above 80%, the technician's single greatest opportunity for score improvement is raising Domain C from 68% to 75% or higher. [A] Improving a weak domain from 68% to 78% adds approximately 10 percentage points on 20% of the exam's questions — a significant overall score boost. Further improving domains already at 80%+ yields diminishing returns because those domains are already well above the passing threshold. Focused, intensive review of the engine block and rotating assembly content — the chapter material, all missed Domain C questions, and their explanations — produces the maximum score gain per study hour invested.