PRACTICE EXAM 8: ASE A1 ENGINE REPAIR SIMULATION (50 QUESTIONS)

1. A technician performs a compression test on a V8 engine and gets the following results: Cyl 1 = 155, Cyl 2 = 160, Cyl 3 = 150, Cyl 4 = 158, Cyl 5 = 60, Cyl 6 = 155, Cyl 7 = 158, Cyl 8 = 152 PSI. A wet test on cylinder 5 raises the reading to 65 PSI. A leak-down test on cylinder 5 shows 45% leakage with air bubbling in the coolant overflow tank. Which of the following is the MOST likely cause?

A. A burned exhaust valve on cylinder 5 that cannot seat against the eroded valve seat

B. Severely worn piston rings on cylinder 5 allowing compression bypass into the crankcase

C. A head gasket failure between the cylinder 5 combustion chamber and a coolant passage

D. A cracked piston crown on cylinder 5 that is allowing compression into the oil sump

2. A customer reports that a ticking noise from the engine appeared immediately after a neighbor changed the engine oil as a favor. The oil level reads correct and the oil appears clean. The noise tracks with engine RPM and is isolated to the valvetrain area. The engine had no noise before the oil change. Which of the following should the technician check FIRST?

A. The valve lash settings to verify that the rocker arm adjustment was not disturbed

B. The oil filter to verify it is the correct part number and application for the engine

C. The timing chain tension to determine if the chain tensioner lost pressure during the drain

D. The lifter preload on all cylinders to verify that oil reached the hydraulic lifters properly

3. Technician A says that an engine with a 10:1 compression ratio requires higher-octane fuel than an engine with a 9:1 compression ratio. Technician B says that excessive carbon buildup on the piston crowns effectively increases the compression ratio. 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

4. A six-cylinder engine stumbles and nearly stalls for approximately two seconds every time the air conditioning compressor clutch engages at idle. The engine recovers and idles normally afterward. Compression, oil pressure, and coolant levels are all normal. A vacuum gauge drops from 18 in. Hg to 12 in. Hg momentarily when the A/C engages, then recovers to 17 in. Hg. Which of the following conclusions is MOST accurate?

A. The engine has a significant mechanical problem that is exposed by the compressor load

B. The A/C compressor is internally seized and placing an abnormal load on the crankshaft

C. The idle vacuum is borderline and any additional engine load will cause a stalling condition

D. The idle speed control system is responding slowly to the compressor load but is functioning

5. An engine develops a rhythmic ticking from the valvetrain area after an extended highway drive. The noise was not present when the trip began. The oil level checks one quart low. After topping off the oil, the tick continues without change. The oil pressure gauge reads within specification at all engine speeds. Which of the following is the MOST likely cause?

A. A collapsed hydraulic lifter that will pump up once oil circulates for several more minutes

B. A lifter or rocker arm component that sustained wear damage during the low-oil condition

C. The oil viscosity has thinned from the highway drive and will thicken once the engine cools

D. An exhaust manifold bolt that loosened from thermal cycling during the sustained highway drive

6. A technician is checking the crankshaft for straightness during an engine rebuild. The crankshaft is supported on V-blocks at the front and rear main journals. A dial indicator placed on the center main journal reads 0.003 inches of total indicator runout as the crankshaft is rotated one full turn. The specification allows a maximum of 0.001 inches of runout. Which of the following is the correct action?

A. Replace the crankshaft because it is bent beyond the allowable specification for straightening

B. Regrind the center main journal to a smaller diameter to compensate for the eccentricity

C. Straighten the crankshaft using a hydraulic press if economically feasible for the application

D. Install oversize main bearings on the center journal only to accommodate the runout variation

7. A customer's vehicle has a 2.0L turbocharged four-cylinder engine with 45,000 miles. The customer reports that the engine uses approximately one quart of oil every 2,000 miles. There are no leaks, no smoke, no misfires, and no DTCs. The manufacturer's owner's manual states that oil consumption of up to one quart per 2,000 miles is within normal operating parameters for this engine. Which of the following is the MOST appropriate recommendation?

A. Perform a compression test to determine if the piston rings are sealing properly on all cylinders

B. Replace the turbocharger seals because turbo engines inherently consume oil through the turbo

C. Switch to a higher-viscosity oil than the manufacturer recommends to reduce oil consumption

D. Inform the customer that the oil consumption is within the manufacturer's stated normal range

8. A technician is replacing the front crankshaft seal and discovers that a shallow groove has been worn into the crankshaft snout surface by the old seal. The groove is approximately 0.005 inches deep. Which of the following repair methods is MOST appropriate?

A. Apply a bead of silicone RTV sealant around the new seal lip to fill the groove at the contact

B. Install the new seal offset slightly from the groove so it rides on an unworn section of the snout

C. Install a crankshaft repair sleeve over the snout to provide a new, smooth sealing surface

D. Regrind the crankshaft snout on a lathe to a smaller diameter and install a custom undersized seal

9. A four-cylinder engine has a rough idle and a P0304 (cylinder 4 misfire) code. The spark plug from cylinder 4 appears steam-cleaned and white compared to the other three plugs, which are a normal tan color. The cylinder 4 spark plug also has small white crystalline deposits near the ground electrode. Which of the following is the MOST likely cause of the misfire?

A. A failed ignition coil on cylinder 4 that produces a weak spark insufficient for combustion

B. Coolant entering the combustion chamber of cylinder 4 through a head gasket breach

C. A clogged fuel injector on cylinder 4 that is not delivering adequate fuel to the cylinder

D. Carbon fouling on the cylinder 4 spark plug electrode that is preventing proper spark delivery

10. Technician A says that the bypass passage in the cooling system allows coolant to circulate through the engine while the thermostat is closed. Technician B says that the bypass passage prevents the water

pump from operating against a dead head (completely sealed outlet) when the thermostat is closed. 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

11. A vehicle with a V6 engine is brought in for a vibration complaint at 2,000 to 2,500 RPM that was not present before a recent engine repair that included cylinder head removal. The vibration disappears above and below the affected RPM range. The engine runs smoothly on all cylinders with no misfires. A scan tool shows no DTCs. Which of the following is the MOST likely cause?

A. A warped cylinder head from uneven torquing that creates a slight compression imbalance

B. A vacuum hose left disconnected that causes a lean condition only at the resonant RPM

C. Spark plugs of a different brand than original that have a slightly different combustion characteristic

D. The harmonic balancer was disturbed during the repair and is no longer damping vibrations properly

12. An engine that has been sitting for three years without being started is being evaluated for rebuild versus replacement. The technician rotates the crankshaft by hand and it turns freely. The cylinders show light surface rust when viewed with a borescope. A compression test shows readings between 45 and 75 PSI across all four cylinders with no consistent pattern. After cranking the engine for 30 seconds with the spark plugs removed and the oil filler cap off, the technician reinstalls the plugs and repeats the compression test. All cylinders now read between 120 and 135 PSI. Which of the following BEST explains the improvement?

A. The cranking redistributed oil to the cylinder walls, and the compression rings have freed from corrosion

B. The initial low readings were caused by a dead battery that improved after charging from the cranking

C. The rust on the cylinder walls actually improved the ring seal by increasing surface friction

D. The cranking heated the engine enough to close the clearance gaps between the pistons and bores

13. A technician discovers during an intake manifold gasket replacement on a V6 engine that one of the coolant crossover passages in the intake manifold is almost completely blocked with green crystallized coolant deposits. The customer has no overheating complaint. Which of the following is the MOST appropriate action?

A. Clean the manifold passages and the corresponding block passages before reinstalling the gasket

B. Install the new gasket without cleaning because the engine has not been overheating from the blockage

C. Clean only the manifold passage and flush the block passage by pouring coolant through the opening

D. Replace the intake manifold because crystallized deposits indicate the casting is deteriorating internally

14. A technician is diagnosing a knocking noise on a high-mileage engine. The knock is present at idle, becomes louder when the engine is loaded, and does not change when individual cylinders are disabled. The noise is a heavy, deep thud localized to the lower block area. The customer mentions that the oil pressure warning light occasionally flickers at stop lights. Which of the following diagnoses is MOST consistent with ALL of these findings?

A. A worn crankshaft thrust bearing that produces noise under axial loading from the transmission

B. Worn main bearings causing the crankshaft to impact the bearing surfaces under load at idle

C. A loose flywheel that produces a knock synchronized with crankshaft rotation during all conditions

D. A worn oil pump that cannot maintain adequate pressure and is producing cavitation noise at idle

15. A technician is evaluating a vehicle for purchase. The engine has 195,000 miles. A compression test shows all six cylinders between 118 and 128 PSI. The manufacturer's specification is 145 to 170 PSI. Oil pressure at hot idle is 12 PSI with a minimum specification of 10 PSI. The engine does not knock, does not leak, and uses one quart of oil every 1,500 miles. Which of the following BEST describes this engine's overall condition?

A. The engine is in good condition because compression is within 10% across all cylinders

B. The engine has a specific component failure that is reducing compression on all cylinders

C. The engine is mechanically sound and the low compression is an artifact of the testing method

D. The engine is significantly worn throughout but still functional with no single catastrophic failure

16. Technician A says that when performing a wet compression test, the oil should be squirted into the cylinder through the spark plug hole immediately before cranking. Technician B says that approximately one tablespoon of engine oil is the correct amount for a wet compression test. 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 customer reports that the engine temperature gauge spikes briefly to the hot zone when climbing a steep hill with the air conditioning running but returns to normal once the vehicle reaches level road. The coolant level is at the correct mark. No codes are stored. The cooling fan engages when the temperature rises. Which of the following is the MOST likely cause?

A. A worn water pump impeller that cavitates under the combined thermal load of hill climbing with A/C

B. An air pocket trapped in the cooling system that migrates to the temperature sensor during the climb

C. A partially restricted radiator that cannot dissipate enough heat under maximum engine load conditions

D. A thermostat that is opening too late and cannot keep up with the heat output during sustained load

18. A technician inspects a set of connecting rod bolts during an engine rebuild. The bolts are from a TTY (torque-to-yield) application. They appear to be in good condition with no visible damage or corrosion. The technician measures the bolt length and finds each bolt is 0.003 to 0.005 inches longer than the manufacturer's new bolt specification. Which of the following is the correct action?

A. Reuse the bolts because the stretch amount is within the typical reuse tolerance for rod bolts

B. Reuse the bolts after verifying the thread condition is acceptable with a thread gauge check

C. Shorten the bolts by grinding the ends to restore the original length specification for reuse

D. Replace all connecting rod bolts because TTY bolts are permanently stretched and cannot be reused

19. A technician is diagnosing a vehicle that overheats only when driving at sustained highway speed on hot days. The engine temperature is normal during city driving in all weather conditions. The electric cooling fan operates correctly. The coolant level is full. The thermostat has been replaced and verified as functional. Which of the following is the MOST likely cause?

A. A water pump that cannot circulate enough coolant volume at the higher engine RPM of highway speed

B. A partially restricted radiator that cannot reject enough heat under maximum sustained thermal load

C. A collapsed lower radiator hose that restricts coolant flow at the higher pump speed of highway driving

D. An exhaust restriction that is generating excess underhood heat only during sustained highway driving

20. A customer brings in a vehicle with a complaint that the engine produces a whistle or high-pitched hiss from the engine compartment that varies with engine RPM. The noise is not present at key-on engine-off. A quick visual inspection reveals no obvious disconnected hoses. Which of the following should the technician investigate as the MOST likely source?

A. An exhaust manifold gasket leak that produces a hissing sound from hot gas escaping under pressure

B. A failing alternator bearing that produces a whine proportional to alternator shaft rotation speed

C. A small vacuum leak at a hose connection, gasket surface, or brake booster fitting on the intake

D. A serpentine belt tensioner bearing that is developing wear and producing speed-dependent noise

21. A rebuilt engine has been running for 1,000 miles. The technician performs the first post-break-in oil analysis. The report shows elevated levels of silicon, copper, and aluminum in the oil. Iron levels are within normal limits. Which of the following BEST explains the elevated silicon level specifically?

A. Residual honing abrasive or assembly debris that was not fully cleaned from the block during rebuild

B. A failed exhaust gasket that is allowing silicone-based gasket material to contaminate the oil

C. Normal break-in wear of the aluminum pistons and copper-backed bearings in the rebuilt engine

D. External contamination from a dirty oil funnel or container used during the initial oil fill procedure

22. A four-cylinder engine with a single overhead camshaft produces a slight but consistent misfire at idle that smooths out above 1,500 RPM. A compression test shows all cylinders between 148 and 155 PSI. Ignition and fuel components have been verified as functional. A vacuum gauge shows a steady 17 in. Hg at idle with no fluctuation. The PCV valve, hoses, and fresh air inlet are all functional and correctly connected. Which of the following is the MOST likely remaining cause?

A. A worn camshaft lobe on one cylinder producing insufficient valve lift only at low RPM

B. A marginally cracked intake manifold runner that only leaks enough to affect idle mixture

C. A faulty engine coolant temperature sensor that is slightly off-calibration during idle operation

D. An EGR valve that is not closing fully at idle and allowing a small amount of exhaust gas into the intake

23. A technician is checking the cylinder head bolt holes in an aluminum engine block before reinstalling the head. Two of the twelve bolt holes have damaged threads in the upper portion. The bolts can be started but become very tight after two turns and will not thread fully by hand. Which of the following is the correct repair?

A. Apply anti-seize compound to the bolt threads and use a wrench to force them past the damage

B. Install thread inserts in the damaged holes to restore full thread integrity before head installation

C. Drill out the damaged holes to the next larger size and install oversize head bolts for those locations

D. Use a thread chaser or tap to clean the damaged threads and verify the bolts thread smoothly

24. An engine exhibits an intermittent rough idle that occurs approximately once every 15 to 20 minutes while the engine is idling in the service bay. The roughness lasts about 5 seconds and then the engine returns to smooth idle. No codes are stored during or after the events. Compression and all mechanical tests are within specification. Which of the following is the MOST likely cause?

A. An intermittent ignition coil failure on one cylinder that temporarily misfires and then recovers

B. A sticking IAC valve that periodically restricts idle airflow before freeing and restoring normal flow

C. An EVAP purge valve that opens briefly on a scheduled PCM purge cycle and momentarily enriches the idle

D. A failing crankshaft position sensor that drops signal intermittently and causes a momentary misfire

25. A technician removes a cylinder head from a four-cylinder engine and discovers that the head gasket has a visible burn-through between cylinders 2 and 3, but also discovers that cylinder 3's exhaust valve appears burned and has a section of its face eroded away. Which of the following sequences of events MOST likely led to this condition?

A. The burned exhaust valve on cylinder 3 caused a persistent hot-gas leak that eventually degraded the gasket between cylinders 2 and 3 as the escaping gas eroded the gasket material over time

B. The head gasket failed first between cylinders 2 and 3, and the resulting compression loss caused cylinder 3 to run lean and burn the exhaust valve

C. Both failures occurred independently and simultaneously due to a single severe overheating event

D. The burned valve and the gasket failure are unrelated coincidental findings on a high-mileage engine

26. A technician is performing an engine assembly and needs to verify that the piston cooling jets (oil squirters) are functioning after the oil pump is installed. Which of the following is the correct verification method?

A. Run the engine and check for oil spray pattern on the piston undersides through the oil filler opening

B. Connect an external oil pressure source to the main gallery and verify each jet sprays consistently

C. Blow compressed shop air through each jet nozzle and listen for airflow at the jet outlet opening

D. Pre-prime the oil system with a drill-driven priming tool and observe each jet for oil delivery

27. A vehicle's engine has been diagnosed with a worn exhaust camshaft lobe on cylinder 4 of a DOHC engine. The customer wants to know the minimum repair necessary. Which of the following is the correct repair scope?

A. Replace only the worn exhaust cam lobe using a weld-and-grind lobe restoration procedure

B. Replace the exhaust camshaft and all exhaust cam followers or lifters that ride on the camshaft

C. Replace only the exhaust cam follower on cylinder 4 because the follower caused the lobe to wear

D. Regrind the worn lobe to a smaller profile and adjust the valve lash to compensate for the reduced lift

28. Technician A says that the oil filter should be pre-filled with oil before installation during an engine rebuild to reduce the dry-start period. Technician B says that the most effective method to protect a

rebuilt engine during first start is to pre-prime the entire oil system using an external priming tool. 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

29. A technician is diagnosing a coolant leak on a V6 engine. After cleaning and pressure testing, a small but steady drip of coolant is observed coming from one of the frost plug (core plug) locations on the rear of the engine block, between the engine and the firewall. Which of the following makes this repair particularly challenging?

A. Frost plugs are pressed into the block with an interference fit and cannot be removed once installed

B. The frost plug material has corroded into the block bore and may damage the bore during extraction

C. The rear frost plug location requires transmission removal or significant disassembly for access

D. Frost plugs on the rear of the block are a different size than the front plugs and may not be stocked

30. An engine misfires only during the first 10 seconds of a cold start and then runs perfectly. The misfire is on cylinder 2. The spark plug from cylinder 2 shows a wet, oily electrode and insulator. All other plugs are dry and normal. A compression test performed immediately after the cold-start misfire event shows cylinder 2 at 145 PSI — within specification. Which of the following is the MOST likely cause?

A. A fuel injector on cylinder 2 that drips fuel when the engine is off, fouling the plug overnight

B. A cracked piston on cylinder 2 that leaks oil only when the engine is cold and the piston contracted

C. A burned exhaust valve on cylinder 2 that leaks only at the cold clearance before thermal expansion

D. A worn valve stem seal on cylinder 2 that allows oil to pool on the valve and foul the plug overnight

31. A technician is measuring the main bearing oil clearance on a rebuilt engine using Plastigage. After torquing the number 3 main cap and removing it, the Plastigage strip is very wide — indicating a

clearance of 0.0005 inches. The specification is 0.001 to 0.003 inches. Which of the following does this measurement indicate?

A. The clearance is too loose and oil pressure will be low at this bearing journal location

B. The clearance is too tight and the bearing will overheat from insufficient oil film thickness

C. The clearance is within the normal break-in range and will increase as the engine wears in

D. The Plastigage was installed incorrectly and the measurement must be repeated for accuracy

32. Technician A says that valve overlap occurs when both the intake and exhaust valves are open at the same time near TDC. Technician B says that increasing valve overlap improves low-RPM idle quality by allowing better cylinder scavenging. 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

33. A technician inspects a used engine that was running when removed from a donor vehicle. The oil pan is removed and the technician notices that the main bearing caps on positions 1 through 4 all have matching numbers stamped into them that correspond to their block positions. However, the number 5 main cap has no number stamp. Which of the following is the MOST likely explanation?

A. The number 5 cap was replaced with an aftermarket cap during a previous repair procedure

B. The cap was installed in the wrong position during a previous repair and was never corrected

C. Some manufacturers stamp only four of five caps, with the remaining cap's position being obvious

D. The number 5 cap is the thrust bearing cap, which is often marked differently than the others

34. A customer reports that the engine makes a squealing noise when first started on cold mornings that lasts approximately 15 seconds and then stops. The noise does not occur on warm restarts throughout the day. The serpentine belt was replaced 3,000 miles ago and appears to be in good condition. Which of the following is the MOST likely cause?

A. The replacement belt is an incorrect size that fits but does not maintain adequate tension when cold

B. The automatic belt tensioner spring has weakened and cannot maintain proper belt tension in the cold

C. The alternator pulley one-way clutch has failed and the pulley is freewheeling during deceleration

D. The power steering pump seals are stiff when cold, creating higher resistance until they warm up

35. A technician discovers during a rebuild that the engine block has been align-bored at some point in its service history. The technician measures the main bearing bore diameters and finds they are 0.010 inches larger than the standard specification. Which of the following bearing selection is required?

A. Standard bearings because the align bore process does not change the bearing bore diameter

B. 0.010-inch undersize bearings because the bore has been enlarged by the align bore process

C. Bearings with 0.005-inch extra thickness on each half to fill the enlarged bore and restore clearance

D. Custom-machined bearings ordered to the exact measured bore diameter for a precision fit

36. A vehicle's engine stalls immediately after starting when the brake pedal is pressed firmly. The engine restarts normally when the brake is released. The brake booster vacuum hose is connected to the intake manifold. Which of the following is the MOST likely cause?

A. A ruptured brake booster diaphragm that creates a massive vacuum leak when the brakes are applied

B. A clogged brake booster check valve that prevents vacuum from reaching the booster properly

C. Excessive engine compression that cannot maintain idle against the sudden brake booster load

D. A broken brake booster pushrod that allows the master cylinder to push back into the booster

37. An engine produces a rattling noise from the timing chain area that is most noticeable during the first three seconds of a cold start and then disappears completely. The engine has a hydraulic timing chain tensioner. Oil level and condition are correct. The noise has been gradually worsening over the past year. Which of the following is the MOST likely cause?

A. A stretched timing chain that has exceeded the tensioner's maximum extension travel range

B. A hydraulic tensioner that drains oil overnight and takes a few seconds to refill at each startup

C. Worn timing chain guide pads that no longer dampen chain vibration during initial low oil pressure

D. A worn camshaft sprocket with chipped teeth that rattle until the chain seats under full tension

38. A technician performs a cylinder leak-down test on all four cylinders and gets the following results: Cyl 1 = 6%, Cyl 2 = 8%, Cyl 3 = 5%, Cyl 4 = 7%. All leakage was heard as faint hissing at the oil filler cap with no audible leakage at the tailpipe, intake, or coolant. Which of the following is the correct interpretation?

A. The engine has excessive ring wear on all cylinders and requires an overhaul to restore sealing

B. The valves are all sealing properly but the head gasket may have a minor internal breach to the oil

C. All cylinders are within the acceptable range and the slight ring bypass is normal for a running engine

D. The engine is in excellent condition because a small amount of ring bypass is present on every engine

39. A technician is installing a new camshaft in an OHV engine during a rebuild. The new camshaft has a slightly more aggressive lobe profile than the original — 0.015 inches more lift and 10 degrees more duration. The same hydraulic lifters and pushrods from the original engine will be reused. Which of the following potential problems should the technician check for BEFORE starting the engine?

A. Whether the valve springs are strong enough for the higher lift without allowing valve float

B. Whether the oil pump can supply adequate volume for the increased camshaft bearing load

C. Whether the crankshaft keyway is compatible with the new camshaft's drive sprocket timing

D. Whether the higher-lift cam lobes will cause the valves to contact the pistons at full lift

40. Technician A says that a coolant temperature sensor that reads lower than actual engine temperature will cause the PCM to deliver a richer fuel mixture than needed. Technician B says that the same faulty sensor may delay cooling fan activation because the PCM does not recognize the true temperature. 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

41. A technician measures the valve seat width on a freshly cut exhaust valve seat and finds it is 1/8 inch (0.125 inches) wide. The specification calls for 1/16 to 3/32 inch (0.0625 to 0.09375 inches). Which of the following consequences will result from this oversized seat width?

A. The valve will run hotter because the wider seat creates more friction during valve operation

B. The valve will have increased lift because the wider seat shifts the valve's resting position lower

C. The valve may not seal as tightly because the wider seat reduces the unit sealing pressure per area

D. The valve spring installed height will change because the wider seat recesses the valve deeper

42. A vehicle has a repeated pattern of fouled spark plugs on cylinder 3 only. The plug fouls with a black, oily deposit every 2,000 to 3,000 miles. After replacing the plug, the cylinder runs normally until the plug fouls again. Compression on cylinder 3 is 148 PSI — within specification. No blue smoke is observed at any time. Which of the following is the MOST likely cause?

A. A faulty fuel injector on cylinder 3 that occasionally overdelivers fuel and fouls the plug

B. A worn valve guide or seal on cylinder 3 that allows a slow but steady oil leak onto the plug

C. A piston ring that is stuck in its groove on cylinder 3 allowing intermittent oil past the pack

D. A cracked spark plug well in the valve cover allowing oil to pool around the plug and seep in

43. A rebuilt engine passes all quality checks and runs perfectly for 5,000 miles. The customer then reports that the oil pressure gauge reading has dropped 5 PSI at idle compared to the reading at the 500-mile break-in check. All other engine parameters are normal. Oil level and viscosity are correct. Which of the following BEST explains this gradual pressure decrease?

A. The oil pump is beginning to fail and will need replacement within the next 10,000 miles

B. The pressure relief valve spring has weakened from heat cycling and needs to be replaced

C. The oil pressure sending unit has drifted in calibration and is no longer reading accurately

D. Normal bearing wear during the post-break-in period has slightly increased oil clearances

44. A technician is evaluating the cylinder bores of a cast iron block during a rebuild. All bores show light but uniform glazing — a shiny, smooth surface with no visible crosshatch pattern remaining. There is no scoring, cracking, or taper beyond specification. Which of the following is the correct action

A. Hone the bores to remove the glaze and restore a proper crosshatch pattern for new ring seating

B. Install new rings without honing because the glazed surface provides an ideal sealing surface

C. Bore all cylinders to the next oversize because glazing indicates the bore surface has hardened

D. Clean the bores with solvent only and install new rings because the smooth surface reduces friction

45. A technician is working on a vehicle that had its timing belt replaced by another shop. The engine runs but has significantly reduced power, poor fuel economy, and a check engine light with code P0016 (crankshaft position to camshaft position correlation, bank 1 sensor A). Which of the following is the MOST likely cause?

A. A faulty camshaft position sensor on bank 1 that was damaged during the timing belt replacement

B. Incorrect timing belt installation with the camshaft sprocket one or more teeth off from the mark

C. A defective new timing belt that has stretched enough to cause a correlation error between sensors

D. An incorrect crankshaft position sensor signal caused by a damaged reluctor ring on the crankshaft

46. A technician is disassembling an engine and finds that the crankshaft harmonic balancer bolt is extremely difficult to remove — requiring an impact wrench at full force. After removal, the bolt threads appear undamaged but the bolt is coated with red threadlocker. Which of the following is the correct procedure for reinstallation?

A. Reinstall the bolt dry with no threadlocker because the factory specification does not call for it

B. Apply blue (medium-strength) threadlocker because red is too strong for a serviceable fastener

C. Apply red (high-strength) threadlocker to match the original application found during disassembly

D. Apply engine oil to the bolt threads per the standard practice for crankshaft-mounted fasteners

47. An engine block is being inspected during a rebuild. The technician discovers that one freeze plug hole on the left side of the block is heavily corroded and the plug bore is pitted and enlarged approximately 0.010 inches beyond its original diameter. A standard replacement freeze plug will not seal in the enlarged bore. Which of the following is the MOST appropriate repair?

A. Install an oversize freeze plug designed to seal in a slightly enlarged bore from corrosion wear

B. Apply marine-grade epoxy to the standard plug and bore surface to fill the gap and create a seal

C. Weld the corroded bore to build up material and then machine it back to the standard plug diameter

D. Use a threaded screw-in type freeze plug that does not depend on the bore diameter for its seal

48. Technician A says that a cylinder with 0% leakage on a leak-down test indicates a perfect cylinder with no wear. Technician B says that 0% leakage is theoretically impossible on a running engine and the tester may be malfunctioning. Who is correct?

A. Technician B only

B. Technician A only

C. Both Technician A and Technician B

D. Neither Technician A nor Technician B

49. A technician discovers that an engine has been assembled with the oil pump drive gear installed one tooth off from its correct timing position. The engine has not been started. Which of the following is the consequence if the engine were started in this condition?

A. The engine will have no oil pressure because the oil pump cannot function when mistimed

B. The oil pump will still function normally because oil pump drive timing does not affect pump operation

C. The engine will produce oil pressure but at a reduced rate that will starve the farthest bearings

D. The oil pump will spin in reverse, pumping oil backward through the system and causing damage

50. A technician is diagnosing an engine that produces a loud single backfire through the exhaust on shutdown — the backfire occurs the moment the ignition is turned off. The engine runs normally at all other times. Which of the following is the MOST likely cause?

A. A burned exhaust valve that allows unburned fuel to exit the cylinder and ignite in the hot exhaust

B. Retarded ignition timing that leaves unburned fuel in the cylinder at the moment of key-off shutdown

C. An excessively rich idle mixture that puts unburned fuel in the exhaust, which ignites on shutdown

D. A failing catalytic converter that stores heat and ignites any residual fuel vapor in the exhaust stream.

Practice Exam 8: 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. C — Low compression on a single cylinder that does not improve on a wet test (ruling out rings), combined with air bubbling in the coolant during a leak-down test, is the definitive pattern for a head gasket failure between that cylinder's combustion chamber and a coolant passage. [A] The wet test eliminates rings because oil cannot seal a gasket breach at the top of the cylinder. The bubbles in the coolant confirm that compressed air is crossing from the combustion chamber into the cooling system through the gasket.

2. B — A valvetrain tick that appeared immediately after an oil change on an engine that was previously quiet should first be investigated at the oil filter — the only component that was changed. [D] An incorrect filter (wrong bypass valve pressure, wrong flow capacity, or missing anti-drainback valve) can reduce oil delivery to the hydraulic lifters, causing them to bleed down and produce ticking. Verifying the filter part number against the manufacturer's specification is a quick check that eliminates the most probable cause.

3. A — Both technicians are correct. [A] Technician A is right: higher compression ratios produce higher peak cylinder pressures and temperatures, increasing the tendency for the air-fuel mixture to auto-ignite (detonate), which is why higher-compression engines require higher-octane fuel to resist detonation. Technician B is also right: carbon deposits on the piston crown and combustion chamber reduce the available volume at TDC, effectively raising the compression ratio and creating detonation-favorable conditions even on engines designed for regular fuel.

4. D — A vacuum drop from 18 to 12 in. Hg when the A/C compressor engages is a significant momentary load, but the recovery to 17 in. Hg within two seconds indicates the idle speed control system is compensating — just slowly. [A] The engine's compression and oil pressure are normal, confirming no mechanical problem. The A/C compressor engagement places an instantaneous parasitic load that the idle control must compensate for by increasing airflow. The two-second delay is longer than ideal but the system is ultimately functioning, indicating a sluggish but operational idle control response.

5. B — A valvetrain tick that appeared during driving, persists after the oil level is restored, and is present despite normal oil pressure indicates a component was permanently damaged during the low-oil

episode. [D] When the oil level drops one quart, the reduced volume can cause momentary oil starvation at the valvetrain — the farthest point from the pump. A lifter check valve, rocker arm contact surface, or cam follower that was damaged during the starvation period continues to produce noise even after oil is restored because the physical damage is permanent.

6. A — A crankshaft with 0.003 inches of runout — three times the 0.001-inch maximum specification — is bent beyond the typical correction range for automotive crankshafts. [C] While some crankshafts can be straightened in a hydraulic press, the success rate decreases as the distortion increases, and a press-straightened crankshaft may spring back toward its bent condition over time. At this level of distortion, replacement is the most reliable and safest approach to ensure long-term engine durability.

7. D — The oil consumption rate of one quart per 2,000 miles matches exactly the manufacturer's published normal operating parameter for this engine. [D] All diagnostic indicators are normal — no leaks, no smoke, no misfires, no codes. The technician should inform the customer that the consumption rate falls within the manufacturer's acceptable range and does not indicate a defect requiring repair. Recommending unnecessary disassembly or oil viscosity changes for consumption the manufacturer considers normal is technically and ethically inappropriate.

8. C — A crankshaft repair sleeve is a precision-machined thin steel sleeve that is pressed over the worn seal journal, providing a new, smooth, unworn surface for the new seal lip to ride on. [D] The sleeve eliminates the groove without requiring crankshaft replacement or the unreliable approach of applying sealant to a dynamic rotating seal. RTV sealant on a rotating seal lip would be destroyed immediately by the shaft's rotation. Offsetting the seal is not an engineered or reliable solution.

9. B — A spark plug that appears steam-cleaned and white with crystalline deposits on a misfiring cylinder is the hallmark of coolant entering that combustion chamber. [A] The steam from vaporized coolant washes carbon deposits off the plug, leaving it abnormally clean compared to the others. The white crystalline deposits are the residue of antifreeze additives that remain after the coolant has boiled off. This combination — steam-cleaned appearance plus crystalline residue — is diagnostic for a head gasket breach to a coolant passage on that specific cylinder.

10. A — Both technicians are correct. [D] Technician A is right: when the thermostat is closed during warm-up, coolant must still circulate through the engine to prevent hot spots and ensure even heating — the bypass passage provides this internal circulation path. Technician B is also right about the hydraulic consequence: without the bypass, the water pump would push against a completely sealed system when the thermostat is closed, creating a dead-head condition that could damage the pump seal and impeller.

11. D — A vibration at a specific RPM range that developed after engine work involving cylinder head removal points to a component that was disturbed during the service. [A] The harmonic balancer is routinely removed or loosened during major engine work, and if it was damaged, improperly reinstalled, or its rubber bonding was compromised, it may no longer effectively dampen torsional vibrations at specific crankshaft frequencies. The vibration appearing only in a narrow RPM band is characteristic of a resonance issue rather than a mechanical imbalance.

12. D — Erratic, low compression readings that normalize dramatically after extended cranking on a long-dormant engine are caused by stuck piston rings that freed during the cranking process. [C] During three years of storage in a humid environment, moisture and varnish caused the rings to stick in their grooves. The initial cranking — especially with the plugs removed to reduce resistance — worked the rings free as oil circulation and mechanical movement broke the corrosion bond, restoring their ability to seal against the bore wall.

13. C — A coolant passage that is almost completely blocked with crystallized deposits will eventually cause overheating or localized hot spots as the restriction worsens. [D] Even though the customer has no current overheating complaint, the restriction must be addressed while the manifold is off. Cleaning both the manifold passages and the corresponding block passages ensures full coolant flow is restored before reassembly. Reinstalling a nearly blocked passage invites a future overheating problem that will be far more expensive to address.

14. B — All findings align with worn main bearings: a heavy, deep thud at the lower block that does not change with cylinder disable testing (main bearings support all cylinders), worsening under load (higher combustion forces increase bearing impact), and a flickering oil pressure light at idle (excessive clearance allows oil to leak past faster than the pump can supply at low RPM). [A] The combination of lower-engine knock, no change on cylinder disable, and marginal oil pressure at idle is the complete diagnostic picture for worn main bearings.

15. D — Compression uniformly below specification (118–128 versus 145–170) across all six cylinders, oil pressure just above minimum, and moderate oil consumption describe an engine with generalized wear throughout — not a single catastrophic failure. [A] The compression is evenly distributed (within 10% across cylinders), confirming no individual cylinder failure. This is a high-mileage engine that is worn but still operational. It will continue to lose performance gradually and will eventually require overhaul or replacement, but no immediate catastrophic failure is imminent.

16. A — Both technicians are correct. [A] Technician A is right: the oil must be squirted into the cylinder immediately before cranking so it is still liquid on the bore surface when the test is performed — if you wait too long, the oil drains down and the test loses its diagnostic value. Technician B is right

about the quantity: approximately one tablespoon (15–20 ml) is enough to temporarily seal worn rings without risking hydrostatic lock from too much liquid above the piston.

17. C — An engine that overheats only during maximum thermal load (steep hill climbing with A/C on) but maintains normal temperature under lighter conditions points to a cooling system that cannot reject heat at its peak capacity. [D] A partially restricted radiator allows adequate coolant flow for normal driving but cannot pass enough volume to dissipate the maximum heat output of a fully loaded engine on a sustained climb. The working fan and correct coolant level eliminate those variables, leaving the radiator as the capacity-limiting component.

18. D — TTY connecting rod bolts are stretched beyond their elastic limit during installation — the measured 0.003 to 0.005 inches of additional length confirms they have been permanently elongated. [C] Unlike conventional bolts that can be reused if they meet dimensional specifications, TTY bolts are designed for single use. The permanent stretch means the bolt's yield point has been consumed, and reinstalling it would result in unpredictable clamping force. A rod bolt failure at operating speed causes catastrophic engine destruction.

19. B — An engine that overheats only during sustained highway speed driving on hot days — with a verified functional fan, correct coolant level, and good thermostat — points to a radiator that cannot reject enough heat under maximum sustained thermal demand. [D] During city driving, the intermittent load cycles and fan operation provide adequate cooling. Sustained highway speed produces continuous maximum heat output, and a partially restricted radiator cannot pass enough coolant volume or expose enough core surface area to dissipate the heat at the rate it is being generated.

20. C — A high-pitched hiss or whistle that varies with engine RPM and is not present at key-on engine-off (ruling out electrical component noise) is most consistent with a vacuum leak. [A] When the engine runs, intake manifold vacuum creates a pressure differential that draws air through any breach in the system — a cracked hose, a loose fitting, a leaking gasket, or a brake booster connection. The escaping air through the small opening produces the characteristic whistle or hiss that rises and falls with changes in manifold vacuum as RPM varies.

21. A — Silicon (not silicone) in oil analysis results specifically indicates the presence of abrasive contaminants — either residual honing grit (silicon carbide), sand, or other silica-based debris. [D] Elevated silicon in a recently rebuilt engine most commonly results from inadequate cleaning of the block during the rebuild. Honing abrasive that was not fully removed from the oil galleries and bore surfaces was dislodged by oil circulation and is now circulating through the system. Copper and aluminum levels from normal bearing and piston break-in wear are expected and less concerning than the silicon finding.

22. D — A consistent idle misfire that smooths out above 1,500 RPM, with normal compression, verified ignition and fuel, steady vacuum, and a functional PCV system, points to a small amount of exhaust gas leaking into the intake manifold at idle through an EGR valve that is not fully closing. [A] The inert exhaust gas dilutes the intake charge at idle, causing a lean misfire. At higher RPM, the increased airflow volume overwhelms the small EGR leak, and the dilution effect becomes negligible. This is a common but subtle cause of idle-only roughness that is easily overlooked.

23. B — Head bolt holes in aluminum blocks with damaged threads cannot simply be forced — cross-threading or forcing bolts through damaged threads will worsen the damage and result in insufficient clamping force that guarantees a head gasket failure. [C] Thread inserts (HeliCoil or Time-Sert) are the standard repair for damaged threads in aluminum engine components. The insert provides a new, hardened steel thread surface inside the repaired hole, restoring full thread integrity and clamping capability. A thread chaser might clean minor contamination but cannot repair actually damaged thread material.

24. C — An intermittent rough idle that occurs briefly every 15 to 20 minutes and then resolves on its own matches the pattern of the EVAP system purge valve opening on a scheduled PCM purge cycle. [A] When the PCM commands the purge valve open, fuel vapors from the charcoal canister are drawn into the intake manifold. If the vapor concentration is high, the sudden enrichment can momentarily upset the idle air-fuel balance. The event is brief because the PCM adjusts fuel trim to compensate, and it recurs at regular intervals based on the PCM's purge schedule.

25. A — The most logical failure sequence is that the exhaust valve burned first, creating a persistent hot-gas leak past the valve seat. [B] The hot combustion gas escaping past the burned valve is directed at the head gasket surface between cylinders 2 and 3, gradually eroding the gasket material at that location until the gasket breaches between the two combustion chambers. This sequence — valve failure leading to gasket erosion — is a recognized failure progression, whereas a gasket failure would not typically cause a valve to burn.

26. D — Pre-priming the oil system with a drill-driven priming tool is the correct and most thorough method to verify piston cooling jet function before the engine is started. [D] The priming tool pressurizes the entire oil system — galleries, bearings, and jets — without running the engine. The technician can visually observe each jet for a consistent spray pattern while the system is pressurized. This verification confirms both that each jet is receiving oil flow and that the spray is properly aimed at the piston underside.

27. B — When an exhaust camshaft lobe is worn, the entire exhaust camshaft must be replaced — individual lobes cannot be reliably repaired on a production camshaft. [B] Additionally, all exhaust cam

followers or lifters that ride on the camshaft should be replaced because the worn lobe may have damaged the follower surfaces, and installing a new camshaft against worn followers would accelerate the new lobe's wear. The intake camshaft and its followers do not need replacement if they are within specification.

28. A — Both technicians describe valid methods of reducing dry-start risk, but Technician B's method is more effective. [D] Pre-filling the oil filter reduces the time the pump needs to fill the filter housing before oil reaches the galleries — Technician A is correct that this helps. Pre-priming the entire oil system with an external tool fills every gallery, bearing, and passage before the engine turns — Technician B is correct that this is the most effective protection. Both methods are beneficial, and the best practice is to use both together.

29. C — Frost plugs (core plugs) on the rear of the engine block are located between the back of the block and the firewall or transmission bellhousing — an area with extremely limited access. [D] Depending on the vehicle, reaching the rear frost plugs may require removing the transmission, lowering the subframe, or removing the engine to create enough clearance to extract the old plug and install the replacement. This access difficulty is what makes rear frost plug leaks disproportionately expensive to repair relative to the simplicity of the actual plug replacement.

30. D — An oily spark plug on a specific cylinder that fouls only during overnight sitting, with normal compression when tested afterward, is the classic presentation of a worn valve stem seal on that cylinder. [A] While the engine sits overnight, oil seeps past the worn seal and pools on top of the closed valve. On the next start, the pooled oil is drawn into the cylinder and coats the spark plug, causing the 10-second misfire until the oil burns off. The normal compression reading confirms the rings are sealing properly — the oil is entering from the top of the cylinder, not past the rings.

31. B — A Plastigage reading of 0.0005 inches is below the minimum specification of 0.001 inches, meaning the bearing clearance is too tight. [C] Insufficient clearance restricts the oil film thickness between the journal and bearing surface. Without an adequate oil wedge, the bearing runs hot, the oil film breaks down, and the bearing surface contacts the journal directly — leading to rapid overheating, scoring, and eventual bearing seizure. The bearing or journal combination must be corrected to bring the clearance within the 0.001 to 0.003-inch specification.

32. A — Technician A only is correct: valve overlap occurs near TDC between the exhaust and intake strokes when both valves are briefly open simultaneously. [B] Technician B is wrong because increased valve overlap actually degrades low-RPM idle quality — at idle, the slow gas velocity means exhaust gas can be pulled back into the cylinder through the open exhaust valve during the overlap period,

diluting the fresh intake charge and causing a rough, unstable idle. Increased overlap benefits high-RPM performance but hurts idle quality.

33. D — The number 5 (rear) main bearing cap on many engines serves as the thrust bearing cap and is often marked or identified differently than the other numbered caps. [C] Some manufacturers use a different marking system, a different material, or simply omit the sequential number on the thrust cap because its unique flanged design and position make it easily identifiable. The absence of a matching number stamp does not indicate an incorrect or replacement cap — it reflects the manufacturer's marking convention.

34. B — A cold-morning-only belt squeal that lasts approximately 15 seconds on a belt that is only 3,000 miles old and in good condition points to the tensioner rather than the belt. [E] When cold, the tensioner spring must overcome the stiffened belt and cold pulley surfaces. A tensioner with a weakened spring cannot apply adequate tension in these conditions, allowing the belt to slip. As components warm and the belt becomes more pliable, the reduced stiffness allows the marginal tensioner to maintain grip and the squeal stops.

35. C — Align boring enlarges the main bearing bores by removing material from the cap-to-block mating surfaces, which reduces the bore diameter, and then remachining the bore to a round, aligned specification. [C] The result is a bore that is 0.010 inches larger than standard. To restore the correct oil clearance, bearings with 0.005 inches of extra wall thickness per half-shell are required — this adds 0.010 inches across the full diameter, filling the enlarged bore and restoring the designed clearance between the bearing and crankshaft journal.

36. A — An engine that stalls immediately when the brake pedal is pressed firmly indicates a massive vacuum leak triggered by brake application. [A] The brake booster uses intake manifold vacuum to assist braking. If the booster diaphragm is ruptured, pressing the brake pedal opens the diaphragm to atmospheric pressure, creating a sudden, large vacuum leak through the booster hose into the intake manifold. This massive unmetered air entry overwhelms the fuel system's ability to compensate, and the engine stalls from the extreme lean condition.

37. B — A timing chain rattle that occurs only during the first few seconds of cold startup and has been gradually worsening is the classic behavior of a hydraulic tensioner that drains oil overnight. [B] When the engine sits, oil slowly leaks past the tensioner's internal seals and check valve, allowing the plunger to retract. On the next start, the chain is slack until oil pressure refills the tensioner and extends the plunger — the rattle during this refill period is the chain slapping against the guides. As the tensioner wears internally, the drain-down accelerates and the startup rattle duration increases.

38. C — Leak-down readings of 5% to 8% across all four cylinders with the only leakage audible at the oil filler cap (indicating minor ring bypass) and no leakage at the exhaust, intake, or coolant represent a healthy engine with normal, acceptable sealing. [A] Zero leakage is virtually impossible on any running engine — some minimal air passage past the ring pack is inherent in the piston ring design. Readings under 10% are generally considered excellent, and the absence of leakage at the valves and head gasket confirms those components are sealing properly.

39. D — A camshaft with more lift than the original increases the maximum distance the valves travel into the combustion chamber. [B] On an interference engine — or even on a non-interference engine with tight piston-to-valve clearances — the additional 0.015 inches of valve lift may bring the valve close enough to the piston crown to make contact at TDC on the overlap period. The technician must check piston-to-valve clearance using modeling clay or a checking spring before starting the engine.

40. A — Both technicians are correct. [E] Technician A is right: a coolant temperature sensor that reads lower than actual tells the PCM the engine is colder than it really is, causing the PCM to maintain cold-start fuel enrichment longer and deliver more fuel than the actual temperature requires. Technician B is also right: the PCM uses the same temperature signal to determine when to activate the cooling fan, so an artificially low reading delays fan activation past the actual safe temperature threshold, allowing the engine to overheat before the fan turns on.

41. C — A valve seat width of 1/8 inch exceeds the maximum specification of 3/32 inch, making the seat too wide. [B] Sealing pressure is calculated as force divided by area — with the same spring force acting over a wider contact area, the pressure per unit area decreases. Reduced unit sealing pressure means the valve face does not press as tightly against the seat, increasing the risk of combustion gas leakage past the valve. The top and bottom cuts must be deepened to narrow the seat back to within specification.

42. B — Repeated oil fouling on a single cylinder's spark plug at regular intervals, with normal compression and no visible smoke, indicates a slow but steady oil leak into that specific cylinder's combustion chamber. [A] A worn valve guide or valve stem seal on cylinder 3 allows oil to gradually seep past the stem and accumulate on the plug over 2,000 to 3,000 miles of driving. The oil amount is too small to produce visible smoke or affect compression but is sufficient to eventually coat the plug enough to cause a misfire.

43. D — A 5 PSI drop in idle oil pressure over 5,000 miles of post-break-in operation with all other parameters normal is consistent with the normal progressive increase in bearing clearances as new surfaces wear into their final running condition. [D] New bearings and journals undergo a controlled wear-in process during the first several thousand miles. As the soft bearing overlay material conforms to

the journal surface, clearances open very slightly from their as-assembled dimensions. This normal process stabilizes after the initial wear-in period and the pressure decrease levels off.

44. A — Cylinder bore glazing occurs when the crosshatch honing pattern has been worn away by extended operation, leaving a smooth, polished surface that new piston rings cannot seat against. [C] Without the microscopic valleys of the crosshatch pattern to retain oil and provide a controlled abrasion surface for ring break-in, new rings will slide over the glazed surface without seating, resulting in poor compression, oil consumption, and blowby. Honing to restore the crosshatch pattern is essential before installing new rings.

45. B — Reduced power, poor fuel economy, and a P0016 camshaft-to-crankshaft correlation code immediately following a timing belt replacement is the classic signature of incorrect cam timing — the belt was installed one or more teeth off from the correct mark alignment. [E] The P0016 code confirms the PCM has detected that the camshaft position does not correlate with the expected crankshaft position. Rechecking and correcting the timing belt alignment to the manufacturer's marks resolves all three symptoms.

46. C — The presence of red (high-strength) threadlocker on the original harmonic balancer bolt indicates that the manufacturer applied it as part of the original assembly specification. [C] High-strength threadlocker is used on the harmonic balancer bolt because this fastener operates under extreme cyclic loading from crankshaft torsional vibrations, and loosening would allow the balancer to shift or come off — a catastrophic failure. The bolt should be reinstalled with red threadlocker to match the original application.

47. A — An oversized freeze plug is the most appropriate repair for a corroded plug bore that has enlarged beyond the standard plug diameter. [C] Oversize freeze plugs are manufactured specifically for this common repair scenario — they are slightly larger in diameter than standard plugs and are designed to seal in bores that have been enlarged by corrosion. Epoxy is not a reliable seal for a pressurized cooling system. Welding risks warping the block, and screw-in plugs, while effective, may not be available for all bore sizes and positions.

48. A — Technician B only is correct: 0% leakage on a leak-down test is theoretically impossible because every engine has some minimal leakage past the piston rings — the rings are designed with end gaps that create inherent leak paths. [A] A reading of 0% likely indicates the tester is not functioning correctly, the supply pressure is not properly calibrated, or the gauges are not reading accurately. Even a brand-new engine would show 1% to 5% leakage under normal leak-down testing conditions.

49. B — An oil pump drive gear that is one tooth off from its specified position does not affect the pump's ability to produce pressure. [D] The oil pump is a positive-displacement device that generates pressure and flow based on the rotation of its internal gears or rotors — it does not have a "timing" relationship like the valve timing system. The drive gear position affects only the rotational alignment between the pump drive shaft and its driving component, not the pump's functional operation. The pump will produce normal oil pressure regardless of drive gear indexing.

50. C — A loud single backfire through the exhaust at the moment of key-off shutdown indicates unburned fuel is present in the exhaust system and ignites when the engine stops. [E] An excessively rich idle mixture delivers more fuel than can be completely combusted during each cycle. The excess unburned fuel accumulates in the hot exhaust manifold and catalytic converter. At the moment the ignition is turned off, the residual fuel in the exhaust ignites from the extreme heat of the exhaust components, producing the characteristic shutdown backfire.