PRACTICE EXAM 4: ASE A1 ENGINE REPAIR SIMULATION (50 QUESTIONS)

1. A technician performs a compression test on a V6 engine after a timing chain replacement. Cylinders 1, 3, and 5 (left bank) all read 155 PSI. Cylinders 2, 4, and 6 (right bank) all read 60 PSI. Which of the following is the MOST likely cause of these results?

A. The right bank cylinder head gasket was damaged during the timing chain service

B. All three right bank pistons have worn rings that are not sealing during cranking

C. The camshaft timing on the right bank is incorrect by one or more sprocket teeth

D. The right bank exhaust manifold has a large leak that is reducing compression

2. A vehicle with 130,000 miles has a complaint of blue exhaust smoke that is visible during highway deceleration when the driver lifts off the throttle but not visible during acceleration or steady cruise. Which of the following is the MOST likely cause?

A. Worn piston rings on multiple cylinders that cannot maintain a seal at high vacuum

B. Worn valve stem seals that allow oil past the stems under high deceleration vacuum

C. A PCV valve stuck in the open position drawing excessive crankcase oil into the intake

D. A leaking turbocharger oil seal that allows boost-side oil into the intake manifold

3. An engine is being assembled after a complete rebuild. The technician torques all main bearing caps to specification and then attempts to rotate the crankshaft by hand. The crankshaft will not rotate — it is locked solid. Which of the following is the MOST likely cause?

A. The main bearing oil clearance is at the tight end of the specification range

B. The thrust bearing is too thick and has clamped the crankshaft against the block

C. The assembly lubricant applied to the bearings has created a hydraulic lock condition

D. One or more main bearing caps are installed in the wrong position or orientation

4. Technician A says that an engine oil leak that appears suddenly at multiple locations simultaneously is likely caused by a PCV system malfunction. Technician B says that a clogged PCV system increases crankcase pressure and forces oil past seals and gaskets. 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

5. A customer complains of a ticking noise from the engine that is loudest when the engine is cold and fades to nearly inaudible after five minutes of warm-up. The noise tracks with engine RPM and is isolated to the lower left side of the engine block. Which of the following is the MOST likely cause?

A. A worn connecting rod bearing on a left-bank cylinder that tightens when warm

B. Piston slap from a piston with excessive skirt-to-bore clearance when cold

C. A collapsed hydraulic lifter on the left bank that refills after oil pressure builds

D. A cracked exhaust manifold on the left bank that seals as the metal expands

6. A technician is inspecting a timing chain for wear with the timing cover removed. Using a finger to press on the chain at the midpoint of its longest span, the chain deflects approximately 3/4 inch from its rest position. The manufacturer's specification allows a maximum of 1/2 inch of deflection. Which of the following is the correct action?

A. Reinstall the timing cover because the chain deflection is within normal tolerance

B. Replace the timing chain, sprockets, and tensioner as a complete set

C. Replace only the chain tensioner because it is the component causing the slack

D. Adjust the chain tensioner to remove the excess slack and restore proper tensi

7. A four-cylinder engine produces a heavy knocking noise at idle that becomes louder momentarily when the throttle is blipped. The technician performs a cylinder cut-out test by disabling fuel injectors one at a time. The knock becomes significantly quieter when the injector on cylinder 2 is disabled but returns immediately when the injector is reconnected. Which of the following is the MOST likely cause?

A. A worn connecting rod bearing on cylinder 2 that impacts under combustion load

B. A loose wrist pin on the piston of cylinder 2 producing a double-knock at TDC

C. Excessive main bearing clearance at the journal closest to cylinder 2 position

D. A cracked piston crown on cylinder 2 that flexes under combustion pressure

8. A technician is diagnosing a no-start condition on a vehicle that was running normally until the engine suddenly died while driving at 40 mph. The engine cranks at an unusually fast speed. There is no spark and no fuel injector pulse. A compression test shows 0 PSI on all cylinders. Which of the following BEST explains all of these findings simultaneously?

A. A failed PCM that has stopped commanding both the ignition and fuel systems

B. A broken serpentine belt that has stopped the alternator and water pump output

C. A failed fuel pump that has stopped fuel delivery and starved the engine of fuel

D. A broken timing belt that has stopped the camshaft and eliminated the CMP signal

9. Technician A says that aluminum cylinder heads warp more easily than cast iron heads when overheated. Technician B says that aluminum heads should be cleaned in a hot tank using a caustic cleaning solution. Who is correct?

A. Both Technician A and Technician B

B. Technician B only

C. Technician A only

D. Neither Technician A nor Technician B

10. A technician measures crankshaft main journal number 3. The diameter reads 2.4985 inches in one direction and 2.4988 inches at 90 degrees, both at the same axial location. The second measurement pair, taken 1 inch away along the journal length, reads 2.4983 inches and 2.4986 inches. What is the maximum out-of-round measurement on this journal?

A. 0.0003 inches, which is the largest difference between perpendicular readings at one location

B. 0.0005 inches, which is the overall range across all four measurements taken

C. 0.0002 inches, which is the difference between the two axial measurement locations

D. 0.0006 inches, which is the sum of both out-of-round measurements at both locations

11. A freshly rebuilt engine starts and runs smoothly, but the oil pressure gauge reads only 10 PSI at idle and 20 PSI at 2,500 RPM. The specification requires 25 PSI minimum at idle and 40 to 65 PSI at 2,500 RPM. The oil level is correct and the correct viscosity was used. Which of the following is the MOST likely cause?

A. The main and rod bearing clearances are all on the tight end of specification

B. The oil filter is a high-restriction performance filter reducing system pressure

C. The engine has not yet been broken in and pressure will increase with use

D. The oil pump pickup tube O-ring is missing or damaged and the pump is drawing air

12. A customer complains that the engine overheats only when towing a trailer uphill at highway speed. Under all other driving conditions, the temperature remains normal. The cooling fan, thermostat, coolant level, and belt tension have all been verified as correct. Which of the following is the MOST likely cause?

A. A failing water pump bearing that allows the impeller to slip under high-load conditions

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

C. An exhaust restriction from a clogged catalytic converter generating additional underhood heat

D. A head gasket that leaks combustion gas into the coolant only under high cylinder pressures

13. During a valve job, a technician discovers that the valve seat on the number 2 exhaust port has receded into the cylinder head beyond the point where it can be recut to the correct width. Which of the following is the correct repair?

A. Install the valve without reconditioning the seat and rely on lapping to create a seal

B. Build up the seat surface with weld material and then recut it to specification angle

C. Replace the valve seat insert by pressing out the old insert and pressing in a new one

D. Machine a deeper pocket in the port to accept a thicker replacement valve for that seat

14. Technician A says that when a piston cooling jet (oil squirter) is clogged, the affected piston will run hotter than the other pistons. Technician B says that a misaligned piston cooling jet can contribute to detonation on the affected cylinder. 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

15. A vehicle's engine cranks normally but will not start. The technician verifies adequate spark and fuel delivery. A compression test shows all four cylinders between 135 and 145 PSI. The scan tool shows no communication with the PCM. Which of the following is the MOST likely cause of the no-start?

A. A PCM failure or PCM power supply fault preventing engine management operation

B. Low compression that is borderline and insufficient to support stable combustion

C. Contaminated fuel that has the correct pressure but insufficient combustible quality

D. A restricted exhaust system that is creating too much back-pressure to allow starting

16. A technician removes the oil filler cap on a running engine and feels strong positive pressure blowing out of the opening rather than the slight vacuum that should be present. The PCV valve has just been replaced with a new one and the hoses are clear. Which of the following is the MOST likely cause?

A. The new PCV valve is defective and stuck in the closed position from the factory

B. The oil filler cap gasket is deteriorated and creating a false pressure reading

C. Excessive blowby from worn piston rings is overwhelming the PCV system capacity

D. The fresh air inlet hose to the crankcase is connected to the wrong manifold port

17. An engine with a dual overhead cam design has a VVT-related rattle on cold startup that lasts approximately 3 seconds. The customer also reports a check engine light with codes P0011 (intake camshaft position timing over-advanced, bank 1) and P0014 (exhaust camshaft position timing over-advanced, bank 1). Oil changes have been performed every 10,000 miles with conventional oil. The

manufacturer specifies 5,000-mile intervals with full synthetic. Which of the following is the MOST likely root cause?

A. Worn timing chain guides from lack of lubrication causing excessive chain slack

B. A failed PCM that is sending incorrect duty cycle signals to the VVT solenoids

C. Worn camshaft bearings that allow the camshafts to shift under oil pressure loads

D. Sludge buildup from extended oil change intervals clogging VVT oil control valves

18. A technician is performing an exhaust back-pressure test on a vehicle with a loss-of-power complaint. At idle, the reading is 1.0 PSI. At a steady 2,500 RPM, the reading climbs to 2.5 PSI and then slowly continues rising to 4.0 PSI over the next 30 seconds while RPM is held constant. Which of the following does this progressive pressure increase indicate?

A. Normal exhaust system behavior as the catalytic converter reaches operating temperature

B. A restricted catalytic converter that progressively traps exhaust as flow volume builds

C. An exhaust manifold gasket leak that worsens as the manifold expands with temperature

D. A failing muffler with collapsed internal baffles that vibrate at sustained engine speeds

19. A technician measures the bore on a six-cylinder engine and finds that cylinder 5 has 0.006 inches of taper and 0.004 inches of out-of-round, while all other cylinders have less than 0.002 inches of taper and 0.001 inches of out-of-round. The manufacturer's maximum specification is 0.003 inches for taper and 0.0015 inches for out-of-round. Which of the following is the correct repair approach?

A. Bore only cylinder 5 to the next oversize and install an oversize piston in that cylinder only

B. Bore all six cylinders to the same oversize to maintain uniform displacement across the engine

C. Hone all six cylinders with a light hone to refresh the crosshatch pattern for new ring sets

D. Bore only cylinder 5 to the next oversize while honing the other five cylinders for new rings

20. A vehicle with a V8 engine exhibits a rough idle that smooths out above 1,200 RPM. A vacuum gauge shows a rhythmic fluctuation between 15 and 19 in. Hg at idle that steadies to 18 in. Hg above 1,200 RPM. Which of the following is the MOST likely cause?

A. A vacuum leak at the intake manifold gasket causing a lean condition at idle

B. A restricted exhaust that creates back-pressure only at lower engine speeds

C. A burned valve on one cylinder that leaks compression during each cycle

D. Retarded ignition timing that reduces engine efficiency only at idle speed

21. A technician discovers during head gasket removal that the gasket has a visible breach between the number 4 combustion chamber and an adjacent coolant passage, but there is also a separate breach between cylinders 4 and 5. Before the teardown, the vehicle exhibited white exhaust smoke, milky oil, and low compression on both cylinders 4 and 5. After inspecting the gasket, which of the following BEST explains why both symptoms — coolant consumption and cross-cylinder compression loss — were present simultaneously?

A. The gasket had two separate failures that each produced a different symptom independently

B. The cylinder head cracked between cylinders 4 and 5 and the gasket failure is secondary

C. The engine block deck warped severely enough to allow the gasket to fail in multiple areas

D. A single overheating event caused a thermal shock crack through the entire gasket surface

22. Technician A says that a connecting rod alignment check should be performed before installing pistons during an engine rebuild. Technician B says that a slightly bent connecting rod can be straightened on a hydraulic press and safely reused. Who is correct?

A. Both Technician A and Technician B

B. Technician A only

C. Neither Technician A nor Technician B

D. Technician B only

23. A customer reports that the temperature gauge reads slightly below normal during highway driving in cold weather but returns to normal in city driving. The heater output is adequate under all conditions. Which of the following is the MOST likely cause?

A. A thermostat that opens at a slightly lower temperature than its rated specification

B. A malfunctioning temperature gauge sender that reads low at highway airflow speeds

C. A water pump that circulates too much coolant volume at higher engine RPM speeds

D. A radiator that is oversized for the application and dissipates too much heat at speed

24. A technician is replacing valve stem seals on an engine with the cylinder head still installed. The technician is using compressed air through the spark plug hole to hold the valves closed while removing the springs. On cylinder 3, when air pressure is applied, the technician hears air escaping from the tailpipe. Which of the following is the correct action?

A. Continue with the seal replacement because a small amount of valve leakage is normal

B. Replace only the exhaust valve seal on cylinder 3 and skip the intake valve seal

C. Apply more air pressure to force the exhaust valve to seat and then remove the spring

D. Inform the customer that cylinder 3 has an exhaust valve sealing problem requiring further repair

25. An engine with 200,000 miles has a consistent oil pressure of 15 PSI at idle and 35 PSI at 2,500 RPM when hot. The specification requires a minimum of 10 PSI at idle and 40 to 65 PSI at 2,500 RPM. The engine runs without knocking and the customer has no noise complaints. Which of the following is the MOST appropriate recommendation?

A. Immediately rebuild the engine because the oil pressure is dangerously low at speed

B. Advise the customer that while idle pressure is acceptable, speed pressure is low and monitoring is needed

C. Inform the customer that oil pressure is within specification and no action is required

D. Switch to a heavier viscosity oil to increase pressure readings across all RPM ranges

26. A technician is diagnosing a coolant leak on a V6 engine. After cleaning and pressure testing, coolant is observed seeping from the area where the intake manifold meets the cylinder head on the right bank. No coolant is visible at the head gasket joint or any external hose connections. Which of the following is the MOST likely source?

A. A cracked cylinder head on the right bank that is leaking coolant from the casting

B. An external head gasket failure that appears to originate at the intake manifold area

C. A failed intake manifold gasket that is leaking coolant at the manifold-to-head joint

D. A hairline crack in the intake manifold itself caused by thermal stress from engine heat

27. A technician checks the oil on the dipstick during a routine service and notices that the oil is significantly above the full mark — approximately one quart overfull. The customer states that no oil has been added between changes. The oil does not smell like fuel and has a normal appearance. Which of the following could cause the oil level to rise above the full mark without adding oil?

A. A worn PCV valve allowing excess air into the crankcase and aerating the oil volume

B. A failed oil cooler that is leaking excessive oil into the pan from the cooler reservoir

C. Worn piston rings that are allowing combustion gases to pressurize the crankcase

D. A leaking liquid-cooled oil cooler allowing coolant to enter the crankcase oil supply

28. After a head gasket replacement, a technician fills the cooling system and runs the engine. The temperature gauge reads normal, but the customer returns three days later stating the heater only blows cold air on one side of the vehicle. The coolant level has dropped slightly. Which of the following is the MOST likely cause?

A. Air still trapped in the cooling system from an incomplete bleeding procedure

B. A defective replacement head gasket that has already failed and is leaking coolant

C. A thermostat that is stuck partially open and not allowing adequate heater flow

D. A clogged heater core that was damaged by debris from the original gasket failure

29. Technician A says that during a wet compression test, approximately one tablespoon of oil should be added to the cylinder through the spark plug hole. Technician B says that adding too much oil during a wet test can cause a hydrostatic lock condition. 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

30. A technician is inspecting the cylinder head bolt holes in an engine block during a rebuild and discovers that two of the bolt holes have coolant standing in them. All head bolts on this engine pass through the deck surface into blind holes that do not intersect coolant passages. Which of the following is the MOST likely explanation?

A. The head gasket previously failed and allowed coolant to seep into the bolt holes

B. Condensation from temperature cycling has accumulated in the bolt holes over time

C. The block cleaning process forced cleaning solution into the holes and it was not dried

D. A crack in the block is allowing coolant from an adjacent passage to seep into the holes

31. A four-cylinder turbocharged engine produces a hissing noise from the engine compartment under boost that was not present before. The vehicle also exhibits a noticeable loss of power during acceleration. A scan tool shows a P0299 (turbo underboost condition) code. Which of the following is the MOST likely cause?

A. A stuck-closed wastegate that is preventing exhaust from reaching the turbine

B. A worn turbocharger compressor wheel that cannot generate adequate boost pressure

C. A boost leak from a cracked or disconnected intercooler hose between the turbo and intake

D. A clogged air filter that is restricting airflow into the compressor inlet of the turbocharger

32. A technician is diagnosing an engine noise that sounds like a sharp, metallic double-tap occurring once per crankshaft revolution. The noise is present at idle and does not change significantly with load. Using a stethoscope, the noise is loudest at the wrist pin area of cylinder 1. Which of the following is the MOST likely cause?

A. Excessive clearance between the wrist pin and the piston pin bore or small-end bushing

B. A worn connecting rod big-end bearing on cylinder 1 that impacts the crankshaft journal

C. A cracked piston skirt on cylinder 1 that flexes and contacts the bore wall at each stroke

D. Excessive main bearing clearance at the journal nearest to cylinder 1 in the engine block

33. An engine misfires intermittently on cylinder 4 at idle but runs smoothly at all other speeds. A compression test shows 150 PSI on all cylinders. A leak-down test shows 5% leakage on all cylinders.

The spark plug, coil, and injector on cylinder 4 have been swapped with cylinder 2, but the misfire remains on cylinder 4. Which of the following should the technician investigate NEXT?

A. The fuel rail pressure at idle to verify it is within specification under low-demand conditions

B. A vacuum leak specific to the number 4 intake runner that only affects idle mixture

C. The camshaft lobe for cylinder 4 to check for wear that reduces valve lift at low RPM

D. The ECU calibration for cylinder 4 fuel delivery timing at idle operating conditions

34. A technician is performing a parasitic draw test and measures 45 milliamps with all modules in sleep mode. The manufacturer's specification allows a maximum of 50 milliamps. The customer complains that the battery goes dead after the vehicle sits for two weeks without being driven. Which of the following BEST explains this situation?

A. The parasitic draw is excessive and must be reduced to prevent battery discharge

B. A failing alternator is not fully charging the battery during normal driving periods

C. The battery cables have excessive resistance that prevents full charging while running

D. The parasitic draw is within specification but the battery is too weak to sustain it for two weeks

35. A technician discovers that an engine has been assembled with the number 3 piston installed backwards — the directional arrow on the piston crown points toward the rear of the engine instead of the front. Which of the following is the MOST likely consequence of this error?

A. The compression ratio on cylinder 3 will be noticeably lower than all other cylinders

B. The engine will produce a loud knocking noise from cylinder 3 at all operating speeds

C. The piston valve relief notches may not align with the valves, risking valve-to-piston contact

D. The wrist pin offset will cause abnormal thrust patterns but no immediate damage

36. Technician A says that a spark plug with a cracked porcelain insulator should be replaced immediately even if the engine appears to run normally. Technician B says that a cracked plug insulator can cause intermittent misfires that may not be detectable at idle. 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 with an automatic transmission exhibits a rhythmic clunking noise from the rear of the engine at idle in Drive. The noise disappears in Park and Neutral. Individual cylinder disable testing does not change the noise. Which of the following is the MOST likely cause?

A. Worn main bearings that only exhibit noise under the forward load of Drive gear

B. A cracked or damaged flexplate that flexes under torque converter load in gear

C. A failing torque converter that produces a vibration transmitted to the engine block

D. A loose flywheel bolt that vibrates when drivetrain torque is applied through the bolt

38. A six-cylinder engine has a vacuum gauge reading of exactly 21 in. Hg at idle that suddenly drops to 0 in. Hg when the engine is snapped to wide-open throttle, then returns to 24 in. Hg on deceleration before settling back to 21 in. Hg at idle. Which of the following does this pattern indicate?

A. A restricted exhaust system that is limiting the engine's ability to develop vacuum

B. Retarded valve timing that reduces the engine's pumping efficiency at all speeds

C. A normal, healthy engine with no mechanical restrictions or sealing problems

D. A worn camshaft that cannot open the valves fully to allow complete cylinder filling

39. A technician measures the valve spring installed height on a valve that has been reground and finds the installed height is 0.060 inches greater than the specification. Which of the following is the MOST likely reason the installed height has increased?

A. Grinding the valve face shortened the valve, allowing the spring to extend further

B. The valve guide has worn and is allowing the valve to sit deeper in the head

C. The valve seat has receded into the head and the valve sits lower in the chamber

D. The valve spring has taken a set and shortened, which increases the installed height

40. A technician is checking the tension on a hydraulic timing chain tensioner during engine service. With the tensioner removed, the plunger can be pushed in easily with a finger and does not spring back. Which of the following is the correct interpretation?

A. The tensioner is functioning normally because hydraulic tensioners rely on oil pressure

B. The tensioner is worn internally and should be replaced before reinstalling the chain

C. The tensioner needs to be primed with oil before reinstallation to restore its function

D. The tensioner plunger has been over-extended and needs to be reset per manufacturer procedure

41. A technician performs a block test (combustion leak test) on a vehicle with an overheating complaint. The test fluid changes from blue to yellow. The technician then performs a compression test and finds all six cylinders within 5% of each other and within specification. Which of the following BEST explains how the head gasket can be failing while compression is normal?

A. The block test produced a false positive from chemical fumes in the engine compartment

B. The gasket has failed between a combustion chamber and a coolant passage only

C. The compression readings are artificially elevated because the engine is overheating

D. The gasket failure is at an oil passage and not at a combustion chamber or coolant area

42. A technician is assembling a rebuilt engine and is staggering the piston ring end gaps on each piston. The top compression ring gap is positioned at approximately 11 o'clock. Which of the following describes the correct position for the second compression ring gap?

A. Directly opposite at approximately 5 o'clock relative to the top compression ring gap

B. At the same position as the top ring because ring rotation during operation will stagger them

C. At approximately 2 o'clock, which is 90 degrees clockwise from the top ring position

D. Offset approximately 180 degrees from the top compression ring gap position on the piston

43. A customer reports that the engine runs normally until the vehicle hits a bump or pothole, at which point the engine momentarily stumbles and then recovers. This is repeatable over various road surfaces. Which of the following is the MOST likely cause?

A. Worn engine mounts that allow the engine to shift and stretch a vacuum hose to its limit

B. A cracked flexplate that flexes when the drivetrain is shocked by road surface impacts

C. A loose or damaged electrical connector or ground wire that momentarily loses contact

D. Low fuel pressure that drops momentarily when the fuel in the tank sloshes from impact

44. An engine has been diagnosed with a failed head gasket between the number 2 combustion chamber and a coolant passage. During the repair, the technician inspects the cylinder head and block deck surfaces and finds the head warpage is within specification. Which of the following should the technician investigate to determine WHY the gasket failed?

A. Whether the original head bolts were torque-to-yield bolts that may have been reused

B. The compression ratio to determine if detonation forces caused the gasket breach

C. The root cause of the original overheating event that likely initiated the gasket failure

D. The gasket manufacturer's batch records to determine if the gasket was defective

45. A technician is checking the cooling system on a vehicle that overheats intermittently. The radiator cap is rated at 16 PSI. When tested, the cap releases at 10 PSI. Which of the following symptoms would this weak cap cause?

A. The engine would run cooler than normal because lower pressure allows faster flow

B. The coolant boiling point is lowered, allowing the coolant to boil at a lower temperature

C. The coolant would freeze at a higher temperature due to the reduced system pressure

D. The water pump would cavitate at lower RPM because of reduced system back-pressure

46. Technician A says that Grade 8 bolts are identified by six radial lines on the hex head in the SAE system. Technician B says that metric Class 10.9 bolts are stronger than metric Class 8.8 bolts. 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

47. A technician is verifying the timing mark alignment on a DOHC engine after reassembly. The crankshaft timing mark is aligned correctly, the intake camshaft sprocket mark is aligned correctly, but the exhaust camshaft sprocket mark is one tooth retarded from its correct position. The engine is an interference design. Which of the following is the correct action?

A. Do not start the engine and immediately correct the exhaust cam timing alignment

B. Correct the timing only if the engine will not start after attempting to crank it over

C. Start the engine because one tooth off on the exhaust cam will not cause valve contact

D. Rotate the engine by hand two revolutions to verify whether the marks self-correct

48. A technician is road testing a vehicle after an engine repair and notices that the engine surges at steady cruise — RPM fluctuates between 1,800 and 2,200 RPM without any throttle input change. The condition was not present before the repair. Which of the following is the MOST likely cause?

A. A worn camshaft lobe that was not detected during the repair and is causing misfires

B. The replacement head gasket has a slight leak that is causing intermittent compression loss

C. A fuel injector that was not reconnected properly and is causing an intermittent lean condition

D. A vacuum hose that was left disconnected or misrouted during the engine reassembly

49. During a break-in oil change at 500 miles on a rebuilt engine, the technician notices the oil on the dipstick has a slight gasoline odor. The oil level appears slightly above the full mark. The engine runs normally with no misfires, no codes, and no smoke. Which of the following is the MOST likely cause?

A. A ruptured fuel pressure regulator diaphragm that is leaking fuel into the intake manifold

B. Fuel wash past the rings during the extended cranking periods of initial break-in starting

C. A leaking fuel injector that has been dripping fuel into one cylinder since the rebuild began

D. Contaminated fuel that contains a solvent additive mimicking the smell of raw gasoline

50. Technician A says that during the first 500 miles of engine break-in, the engine should be operated exclusively at idle to prevent damage to new bearing surfaces. Technician B says that sustained idle during break-in does not generate adequate cylinder pressure to properly seat new piston rings. 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

Practice Exam 4: 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 — Three cylinders on one bank reading uniformly low while all three cylinders on the opposite bank read normal after a timing chain service points to a cam timing error on the affected bank. [A] On a V6 with separate camshaft drives for each bank, if one camshaft sprocket is misaligned by one or more teeth, all cylinders on that bank will have retarded or advanced valve timing, producing uniformly low compression across that entire bank while the correctly timed bank reads normal.

2. B — Blue smoke that appears specifically during deceleration (high manifold vacuum with throttle closed) and disappears during acceleration and cruise is the classic pattern of worn valve stem seals. [A] During deceleration, the elevated vacuum in the intake manifold pulls oil past the compromised seals into the intake ports. When the throttle opens for acceleration, vacuum drops and the oil pull diminishes. Worn piston rings would produce smoke under load, not during deceleration.

3. D — A crankshaft that will not rotate after all main caps are torqued indicates a physical obstruction or interference in the bearing assembly. [C] The most common cause is one or more main bearing caps installed in the wrong position or reversed orientation — each cap is machined as a matched pair with its

specific block saddle, and installing a cap in the wrong location distorts the bearing bore to the point where it clamps the crankshaft journal and prevents rotation.

4. A — Both technicians are correct. [D] Technician A is right that sudden simultaneous oil leaks at multiple locations point to a PCV system malfunction as the common root cause. Technician B correctly explains the mechanism: a clogged PCV system prevents crankcase ventilation, allowing blowby gases to build pressure in the crankcase that forces oil past every seal and gasket. Fixing the PCV system first often eliminates or reduces multiple leaks without replacing any gaskets.

5. B — A knocking noise from the lower block area that is loudest when the engine is cold and fades significantly during warm-up is the classic presentation of piston slap. [A] When cold, the aluminum piston has not yet expanded to fill the cylinder bore, resulting in excessive clearance that allows the piston skirt to rock and slap the bore wall. As the piston heats and expands, the clearance tightens and the noise diminishes. A rod bearing knock would not improve with temperature.

6. B — Timing chain deflection of 3/4 inch exceeds the 1/2-inch maximum specification, confirming the chain has stretched beyond serviceable limits. [B] The chain, both sprockets, and the tensioner should be replaced as a complete set because worn sprockets will accelerate the wear on a new chain, and a worn tensioner cannot maintain proper tension. Replacing only the tensioner does not address the stretched chain itself.

7. A — A heavy knock from the lower engine that intensifies when the throttle is blipped and disappears when a specific cylinder's injector is disabled is the definitive diagnostic pattern for a worn connecting rod bearing on that cylinder. [A] Disabling the injector on cylinder 2 removes combustion load from that piston, so the connecting rod no longer hammers against the worn journal. The immediate return of the knock when the injector is reconnected confirms the load-dependent nature of the noise.

8. D — A broken timing belt simultaneously explains all findings: fast cranking speed (no compression resistance), no spark (the camshaft position sensor loses its signal because the camshaft has stopped), no injector pulse (the PCM requires a CMP signal for sequential injection), and 0 PSI compression on all cylinders (valves are not moving). [A] No other single failure explains all four findings. A failed PCM would not produce zero compression, and a broken serpentine belt would not affect compression or camshaft rotation.

9. C — Technician A only is correct: aluminum has a higher coefficient of thermal expansion than cast iron, making aluminum heads more prone to warpage from the uneven expansion that occurs during overheating. [B] Technician B is wrong because aluminum heads must never be cleaned in a caustic hot

tank solution — the caustic chemical attacks and corrodes aluminum. Aluminum heads require aluminum-safe cold tank solutions or manual cleaning with appropriate non-caustic chemicals.

10. A — Out-of-round is the difference between perpendicular measurements taken at the same axial location on the journal. [C] At the first location, the two readings are 2.4985 and 2.4988, yielding an out-of-round of 0.0003 inches. At the second location, the readings are 2.4983 and 2.4986, yielding an out-of-round of 0.0003 inches. The maximum out-of-round is 0.0003 inches. Taper would be calculated by comparing measurements along the journal length, not at the same location.

11. D — A freshly rebuilt engine with very low oil pressure at all RPMs despite correct oil level and viscosity most likely has an air leak at the oil pump pickup tube. [D] A missing or damaged O-ring where the pickup tube connects to the oil pump allows the pump to draw air along with oil, dramatically reducing its ability to build pressure. The pump cavitates on the air-oil mixture and cannot generate rated output. This is a common assembly error that is relatively easy to correct.

12. B — An engine that overheats only under maximum load conditions (towing uphill at highway speed) while remaining normal under lighter loads points to a radiator that has partially restricted internal passages. [D] The restriction is not severe enough to cause overheating under normal driving, but under maximum heat output — high RPM, heavy load, sustained duration — the reduced coolant flow through the restricted radiator cannot remove heat fast enough. The cooling system works fine under moderate demand but fails at peak capacity.

13. C — When a valve seat insert has receded beyond the point where it can be recut to specification, the correct repair is to remove the old insert and press in a new one. [B] The new insert is machined to the correct seat angles and width after installation. Building up with weld material is not a standard or reliable repair for precision valve seats. Lapping without reconditioning would not create an adequate seal on a severely receded seat.

14. A — Both technicians are correct. [C] Technician A is right because piston cooling jets spray oil onto the underside of the piston to remove heat — if the jet is clogged, the piston runs hotter. Technician B is also right because a hotter piston crown raises the combustion chamber temperature, creating conditions favorable for detonation on that cylinder. This is particularly relevant on turbocharged engines where piston cooling is critical for managing boost-related heat.

15. A — Good spark, good fuel, and good compression eliminate the three fundamental combustion requirements as the problem. [A] If the scan tool cannot communicate with the PCM, the module may have failed or lost power — and without a functioning PCM, the engine management system cannot

coordinate ignition timing, fuel injection timing, and other critical functions needed for the engine to start and run, even though the individual components may be receiving power through backup circuits.

16. C — Positive pressure at the oil filler cap with a new, verified-good PCV valve and clear hoses means the crankcase is generating more blowby gas than the PCV system can evacuate. [A] The PCV system has a fixed maximum flow capacity, and when severely worn piston rings allow excessive combustion gas to blow past into the crankcase, the volume of blowby overwhelms the system. This condition indicates significant internal engine wear — the rings can no longer seal adequately under compression.

17. D — VVT-related cold-start rattle combined with cam timing codes on an engine with double the recommended oil change interval using conventional oil instead of the specified synthetic points directly to sludge contamination of the VVT oil control valves and cam phaser passages. [B] Extended intervals with conventional oil allow varnish and sludge to accumulate in the fine-mesh screens and narrow oil passages that feed the VVT system. The correct repair starts with oil control valve replacement, oil and filter change with the correct specification, and code clearing.

18. B — Exhaust back-pressure that starts within specification at idle but progressively rises at sustained RPM indicates a restriction that cannot handle sustained flow volume. [E] A partially clogged catalytic converter allows low-volume idle exhaust to pass but cannot keep up with the higher volume at 2,500 RPM. As exhaust gas accumulates behind the restriction faster than it can pass through, pressure builds progressively — the hallmark of a catalytic converter with a partially melted or collapsed substrate.

19. D — Only cylinder 5 exceeds the manufacturer's taper and out-of-round specifications, so only cylinder 5 requires boring to the next oversize. [C] The remaining five cylinders are within specification and can be reused with a light hone to restore the crosshatch pattern and standard-size rings. Boring all six cylinders to match cylinder 5 would unnecessarily remove material from bores that are still serviceable, wasting cylinder wall thickness that may be needed for future service.

20. C — A rhythmic vacuum gauge fluctuation at idle (swinging between 15 and 19 in. Hg in a repeating pattern) that steadies above idle is the classic diagnostic pattern of a burned valve on one cylinder. [A] Each time the affected cylinder reaches its compression or power stroke, the leaking valve allows pressure to escape, producing a momentary vacuum dip. At higher RPM, the fluctuations become too rapid for the gauge needle to follow individually, and the reading appears to steady.

21. A — A head gasket can fail in multiple locations simultaneously, each producing independent symptoms. [A] The breach between the combustion chamber and coolant passage explains the white

smoke and milky oil (coolant entering both the combustion chamber and the oil system). The separate breach between cylinders 4 and 5 explains the low compression on both cylinders (compression leaking from one chamber to the other). Both failures were likely initiated by the same overheating event but manifested at different gasket locations.

22. B — Technician A only is correct: connecting rod alignment must be verified before installing pistons because a bent or twisted rod causes uneven piston travel that leads to bore scuffing, accelerated wear, and noise. [C] Technician B is wrong because a connecting rod that has been bent has likely sustained internal metallurgical damage (fatigue, micro-cracking) that is not corrected by straightening. The rod may appear geometrically correct but fail catastrophically under the cyclic stresses of engine operation.

23. A — A temperature gauge reading slightly below normal during sustained highway driving in cold weather suggests the thermostat is opening at a temperature slightly lower than its rated specification. [D] At highway speed, the combination of high airflow through the radiator and a thermostat that opens early allows the cooling system to remove more heat than the engine produces under those conditions, causing the temperature to stabilize below the normal range. The adequate heater output confirms coolant is circulating and the engine is not drastically undercooled.

24. D — Air escaping from the tailpipe when compressed air is applied to the cylinder means the exhaust valve is not sealing — this is a mechanical problem that goes beyond valve stem seal replacement. [B] The purpose of the compressed air is to hold the valves closed while the springs are removed for seal service. If the exhaust valve cannot hold air pressure, it has a sealing deficiency (burned face, worn seat, carbon deposit, or slight bend) that must be addressed. The customer must be informed that additional valve work is needed.

25. B — Idle pressure of 15 PSI meets the 10 PSI minimum specification, but the 35 PSI reading at 2,500 RPM falls below the 40 PSI minimum. [D] The engine is not in immediate danger at idle, but the below-spec pressure at speed indicates the system cannot maintain adequate oil film protection under higher loads and RPM. The most appropriate recommendation is to advise the customer of the condition, monitor it closely at subsequent oil changes, and plan for eventual repair as the condition worsens.

26. C — Coolant seeping specifically from the joint where the intake manifold meets the cylinder head, with no leakage at the head gasket joint or external hoses, points to a failed intake manifold gasket. [D] On many V-type engines, the intake manifold gaskets seal coolant passages that run between the block and the intake manifold. When these gaskets fail, coolant leaks externally at the manifold-to-head seam. This is a common failure on certain V6 engines and is sometimes mistaken for a head gasket leak due to its proximity.

27. D — An oil level that rises above the full mark without oil being added, with no fuel smell or abnormal appearance, indicates another fluid is entering the crankcase. [D] A failed liquid-cooled engine oil cooler allows coolant to cross into the oil system under the higher pressure of the cooling system. In small quantities, the coolant may not visibly change the oil color or produce an obvious smell but will raise the level measurably. Checking for coolant loss and inspecting the oil for emulsification confirms the diagnosis.

28. A — Poor heater output on one side combined with a slightly low coolant level three days after a cooling system service indicates air is still trapped in the system. [D] Air pockets preferentially collect in the heater core because it is typically the highest point in the cooling circuit. The trapped air prevents coolant from fully filling the heater core, reducing heat output. The slight coolant drop confirms that air was occupying space that should have been filled with coolant. Re-bleeding the system resolves the condition.

29. B — Both technicians are correct. [A] Technician A is right that approximately one tablespoon (15–20 ml) of oil is the correct amount for a wet compression test — enough to temporarily seal the ring-to-bore gap without introducing excessive fluid. Technician B is also right that adding too much oil fills the combustion chamber above the piston with incompressible liquid, creating a hydrostatic lock condition that can bend the connecting rod during cranking.

30. D — Coolant standing in blind head bolt holes that do not intersect coolant passages indicates an abnormal path for coolant to reach those holes. [C] The most likely explanation is a crack in the block between a coolant passage and the bolt hole, allowing pressurized coolant to seep through. This finding must be investigated before the rebuild proceeds — installing a head gasket over cracked bolt holes will result in ongoing coolant loss and potential repeat gasket failure.

31. C — A hissing noise under boost combined with power loss and an underboost code directly indicates pressurized charge air is escaping the intake tract before reaching the engine. [A] A cracked or disconnected intercooler hose is the most common source of a boost leak. The hissing is the sound of pressurized air escaping through the breach. The turbocharger is functioning but its output is being lost before it reaches the cylinders, explaining both the noise and the power loss.

32. A — A sharp, metallic double-tap noise at the wrist pin area that occurs once per crankshaft revolution at idle is the classic presentation of wrist pin knock. [C] The double-tap occurs because the piston changes direction at TDC — the loose wrist pin impacts once as the piston decelerates and once as it accelerates in the opposite direction. Connecting rod bearing knock produces a single knock per revolution and is loudest under load, not a double-tap at idle.

33. B — With normal compression, normal leak-down, and the misfire remaining on cylinder 4 after swapping the coil, plug, and injector, all major ignition, fuel, and mechanical causes have been eliminated except for a condition specific to the physical location of cylinder 4. [A] A vacuum leak at the number 4 intake runner — such as a cracked runner, a damaged gasket at that runner, or a disconnected vacuum hose near that port — would cause a lean misfire only on that cylinder at idle when the leak has the greatest proportional effect on mixture strength.

34. D — A 45 mA parasitic draw is within the manufacturer's 50 mA specification, so the draw itself is not the problem. [E] However, even a normal parasitic draw will eventually discharge a battery that sits for an extended period without being recharged. If the battery is aging and has reduced capacity, or if two weeks of normal draw depletes it below the starting threshold, the issue is battery capacity — not excessive drain. A battery load test or conductance test would confirm whether the battery can sustain the normal draw for that duration.

35. C — Many pistons have valve relief notches (also called eyebrows or valve pockets) machined into the crown at specific locations to provide clearance for the intake and exhaust valves. [C] These notches are positioned to align with the valve locations when the piston is installed with the correct orientation. Installing the piston backwards reverses the notch positions, and the valves may now contact the piston crown at TDC — particularly on interference engines or engines with aggressive cam profiles. This can cause bent valves and damaged pistons.

36. A — Both technicians are correct. [E] Technician A is right that a cracked insulator compromises the plug's ability to contain the high-voltage spark within the intended path, and it should be replaced immediately regardless of apparent running condition. Technician B is also right because a cracked insulator can allow the spark to short-circuit through the crack under high cylinder pressures (during acceleration or heavy load) while appearing to function normally at idle — causing an intermittent misfire that is load-dependent.

37. B — A rhythmic clunk at idle in Drive that disappears in Park and Neutral, unaffected by cylinder disable testing, points to a flexplate problem. [A] The flexplate connects the crankshaft to the torque converter. In Drive, the torque converter applies a constant axial and torsional load to the flexplate. A cracked flexplate flexes under this load, producing a rhythmic noise synchronized with crankshaft rotation. In Park or Neutral, the converter load is removed and the flexplate relaxes, eliminating the noise.

38. C — This vacuum gauge pattern describes a perfectly normal, healthy engine. [A] A steady 21 in. Hg at idle indicates good cylinder sealing and correct valve timing. The drop to 0 in. Hg at wide-open throttle is normal because the open throttle eliminates the intake restriction that creates vacuum. The

spike to 24 in. Hg on deceleration (closed throttle, engine braking) is normal because the pistons pull against a nearly sealed manifold. The return to 21 in. Hg at idle completes the normal cycle.

39. A — Grinding the valve face during reconditioning removes material from the seating surface, effectively shortening the overall valve length. [B] A shorter valve sits higher in the head, allowing the valve spring to extend further beyond its designed installed height. The spring is less compressed and therefore exerts less closing force. This is corrected by installing a shim under the spring to restore the correct installed height and closing force.

40. D — Many hydraulic timing chain tensioners have a ratchet mechanism that prevents the plunger from retracting once extended — this is by design to maintain chain tension even during momentary oil pressure drops. [B] If the plunger has extended fully (from chain wear stretching) and can be pushed in easily without spring-back, it may have exceeded its travel range and needs to be reset according to the manufacturer's procedure or replaced if the ratchet mechanism has worn out.

41. B — A head gasket can fail between a combustion chamber and a coolant passage without failing between adjacent combustion chambers. [D] In this scenario, combustion gases are being pushed into the coolant (positive block test) but the seal between adjacent cylinders is intact, so compression readings remain normal. The gasket is allowing hot exhaust gas into the coolant and coolant into the combustion chamber, causing overheating and coolant loss, but the compression seal is maintained.

42. D — The second compression ring gap should be positioned approximately 180 degrees (directly opposite) from the top compression ring gap to maximize the sealing path that combustion gases must travel to bypass both rings. [C] If both gaps were aligned or close together, blowby gases would have a short, direct path past both rings simultaneously. Staggering them 180 degrees forces the gases to travel halfway around the piston circumference between the two ring gaps, dramatically improving the seal.

43. C — An engine that stumbles momentarily when hitting bumps and immediately recovers points to an electrical connection problem — a loose connector, corroded terminal, or damaged ground wire that momentarily loses contact when the engine shifts on its mounts from the road impact. [E] The interruption is too brief and too precisely correlated with physical shock to be a fuel, compression, or mechanical issue. Inspecting engine harness connectors, sensor connections, and ground straps for looseness or damage would reveal the faulty connection.

44. C — Head gasket failure is almost always a consequence of an underlying condition, not a spontaneous event. [D] The most common root cause is an overheating episode — a cooling fan failure, thermostat failure, coolant leak, or other cooling system problem that allowed temperatures to exceed the gasket's design limits. Identifying and correcting the original overheating cause during the repair

prevents the new gasket from failing the same way. Simply replacing the gasket without fixing the root cause guarantees a repeat failure.

45. B — A radiator cap that releases at 10 PSI instead of its rated 16 PSI reduces the cooling system operating pressure by 6 PSI. [D] Each PSI of system pressure raises the coolant boiling point by approximately 3°F, so losing 6 PSI lowers the boiling point by approximately 18°F. The coolant can now boil at a lower engine temperature, causing localized boiling, steam pocket formation, and overheating — particularly under heavy load when engine temperatures are highest.

46. A — Both technicians are correct. [C] Technician A is right: SAE Grade 8 bolts are identified by six evenly spaced radial lines on the hex head, indicating the highest common automotive bolt strength grade. Technician B is also right: in the metric system, a higher property class number indicates greater tensile strength — Class 10.9 bolts have a higher tensile and yield strength than Class 8.8 bolts and are used in more demanding applications.

47. C — On an interference engine, even one tooth off on any camshaft sprocket can bring a valve into the piston travel path at certain crankshaft positions. [B] The timing must be corrected before the engine is cranked or started. Attempting to start the engine to "see if it runs" risks catastrophic valve-to-piston contact that bends valves, cracks guides, and damages pistons — turning a simple timing correction into a major engine repair. Always verify all timing marks before the first rotation.

48. D — An RPM surge at steady cruise that was not present before an engine repair is almost certainly caused by something that was disturbed during the service. [E] A disconnected or misrouted vacuum hose creates an unmetered air leak that the PCM attempts to compensate for by adjusting fuel delivery. The PCM's fuel trim corrections and idle control adjustments cause the RPM to hunt up and down as the system alternates between too lean and overcorrected. Checking all vacuum hose connections against the VECI diagram is the correct first step.

49. B — A slight gasoline odor in the oil with a marginally elevated oil level on a freshly rebuilt engine is most commonly caused by fuel wash during the extended cranking periods of initial startup. [C] During break-in, the engine may require prolonged cranking before it fires for the first time — during this cranking, the injectors deliver fuel that is not fully burned and some washes past the new (not yet fully seated) rings into the crankcase. The condition typically resolves as the rings seat and cranking returns to normal. The first break-in oil change at 500 miles removes the diluted oil.

50. A — Technician B only is correct: sustained idle during break-in does not generate enough cylinder pressure to force the piston rings firmly against the cylinder walls, which is essential for the micro-wear process that conforms the ring face to the bore surface. [C] Technician A is wrong because idle-only

operation during break-in actually harms ring seating — the rings may glaze (polish the bore smooth rather than wearing into it) and never seal properly. Varying RPM under moderate load is the correct break-in approach because it applies varying cylinder pressures across the full bore surface.