PRACTICE EXAM 6: ASE A1 ENGINE REPAIR SIMULATION (50 QUESTIONS)

1. A vehicle with 175,000 miles is brought in for an oil consumption evaluation. The technician adds UV dye to the engine oil and drives the vehicle for 200 miles. Under UV light inspection, no external fluorescence is found anywhere on the engine or undercarriage. The vehicle consumed half a quart during the test drive. Which of the following conclusions is supported by these findings?

A. The oil is being consumed internally because no external leak path was identified

B. The UV dye was too diluted to be detectable and the test must be repeated with more dye

C. The oil consumption is caused by an overfilled crankcase that is being blown out the PCV

D. The oil pan drain plug gasket is leaking but the oil is being blown away by road airflow

2. A technician is performing a cranking vacuum test on an engine that will not start. The vacuum gauge connected to the intake manifold shows 0 in. Hg during cranking. On a healthy engine, cranking vacuum should be approximately 1 to 4 in. Hg. Which of the following is the MOST likely cause of the zero vacuum reading?

A. A severely restricted exhaust system that is preventing any air from being drawn in

B. A completely dead battery that is not allowing the starter to crank the engine at all

C. A vacuum gauge that is defective and needs to be replaced with a calibrated unit

D. A timing belt or chain failure that has stopped valve operation during cranking

3. A four-cylinder engine has the following compression readings: Cyl 1 = 165 PSI, Cyl 2 = 160 PSI, Cyl 3 = 130 PSI, Cyl 4 = 162 PSI. The manufacturer's specification is 145 to 175 PSI. 10% of the highest reading (165) is 16.5, making the minimum acceptable 148.5 PSI. A wet test on cylinder 3 raises it to 160 PSI. Which of the following is the correct diagnosis for cylinder 3?

A. The head gasket has failed between cylinder 3 and an adjacent coolant passage

B. The exhaust valve on cylinder 3 is burned and not seating against the valve seat

C. The piston rings on cylinder 3 are worn and the wet test confirms ring bypass

D. The intake valve on cylinder 3 has excessive carbon preventing full valve closure

4. Technician A says that pre-ignition occurs when a hot spot in the combustion chamber ignites the air-fuel mixture before the spark plug fires. Technician B says that detonation occurs when the air-fuel mixture auto-ignites after the spark plug has already fired, creating two colliding flame fronts. 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

5. A technician is inspecting a set of used head bolts removed from an engine that uses conventional (non-TTY) head bolts. The bolts show no visible damage, corrosion, or thread deformation. Using a thread pitch gauge and comparing to the specification, the bolt lengths are all within the manufacturer's reuse tolerance. Which of the following is the correct action?

A. The bolts may be cleaned, inspected, and reused if they meet all dimensional specifications

B. The bolts must always be replaced regardless of condition because they have been torqued once

C. The bolts should be replaced because residual stress from the first installation weakens them

D. Only the bolts from the highest-stress locations should be replaced while the others are reused

6. A customer states that the engine makes a loud screeching noise for approximately three seconds at every cold start. The noise stops abruptly. It does not occur on restarts when the engine is warm. The noise appears to come from the front of the engine. Which of the following is the MOST likely cause?

A. A hydraulic timing chain tensioner that takes three seconds to build oil pressure and tension

B. A variable valve timing phaser that rattles until oil fills its internal chambers at startup

C. A serpentine belt that slips on the pulleys until friction heat warms and softens the belt surface

D. A water pump bearing that makes noise until the shaft seal lubricates the bearing at pressure

7. A freshly rebuilt engine is running at idle. The technician notices a thin stream of engine oil weeping from where the oil filter housing meets the engine block. The oil filter is hand-tight plus three-quarters of a turn as specified. Which of the following should the technician check FIRST?

A. The oil filter gasket surface on the block for residual old gasket material from the previous filter

B. The engine oil pressure to determine if the system is producing excessive pressure at idle

C. The oil filter brand to determine if it is an aftermarket filter that may be dimensionally incorrect

D. Whether the old oil filter gasket stuck to the block and a double-gasket condition exists

8. An engine with an electronically controlled thermostat produces a code P0128 (coolant thermostat temperature below regulating temperature). The engine takes noticeably longer than normal to warm up. The heater output is reduced during warm-up. Which of the following is the MOST likely cause?

A. A thermostat that is stuck in the fully closed position and overheating the engine

B. A thermostat that is stuck open or opening prematurely, preventing normal warm-up

C. A cooling fan that is running continuously and overcooling the engine at all speeds

D. A coolant temperature sensor that is reading higher than actual and fooling the PCM

9. A technician removes the oil filler cap while the engine is running and holds a piece of tissue paper over the opening. The tissue is pulled firmly against the opening by suction and held there. Which of the following does this indicate?

A. The PCV system is blocked and crankcase pressure is dangerously high inside the engine

B. The crankcase has excessive blowby that is creating a strong vacuum inside the crankcase

C. The engine oil level is dangerously low and the pump is creating vacuum in the crankcase

D. The PCV system is functioning correctly and creating a slight vacuum in the crankcase

10. A V8 engine has a persistent misfire on cylinder 7. A compression test shows cylinder 7 at 145 PSI. All other cylinders are between 150 and 160 PSI. The manufacturer's minimum is 140 PSI, and all cylinders are within 10% of each other. The spark plug, coil, and injector have been verified as functional. Which of the following is the correct conclusion

A. Cylinder 7 has insufficient compression to fire and requires a valve job to restore sealing

B. The compression is acceptable and the misfire has a non-mechanical cause requiring further diagnosis

C. The compression readings indicate general engine wear that is causing misfires on all cylinders

D. Cylinder 7 should have a leak-down test performed because the compression is borderline low

11. A technician is rebuilding an engine and must select the correct connecting rod bearings. The crankshaft rod journals have been reground to 0.020-inch undersize. The connecting rod big-end bore diameters are within standard specification. Which of the following bearing selections provides the correct oil clearance?

A. Standard thickness bearing shells because the rod bore is at standard specification

B. 0.010-inch undersize bearing shells to split the difference between standard and reground size

C. 0.020-inch undersize bearing shells to match the 0.020-inch undersize journal dimension

D. 0.030-inch undersize bearing shells to provide additional clearance for the smaller journals

12. A technician is diagnosing an intermittent overheating condition. The vehicle overheats only after being driven for 30 minutes in stop-and-go traffic. At highway speed, the temperature remains normal. A scan tool shows that the cooling fan command is ON when the temperature rises, but the fan does not spin. Applying battery voltage directly to the fan motor causes it to spin at normal speed. Which of the following is the MOST likely cause?

A. A failed cooling fan relay that is not passing current to the motor despite receiving the command

B. A faulty coolant temperature sensor that is not triggering the fan at the correct temperature

C. A defective PCM that is sending the fan command signal but at insufficient voltage levels

D. A worn fan motor that operates when tested directly but has too much resistance to run normally

13. Technician A says that the stoichiometric air-fuel ratio for gasoline is approximately 14.7 parts air to 1 part fuel by weight. Technician B says that an engine running at the stoichiometric ratio is running slightly rich to protect the catalytic converter. Who is correct?

A. Both Technician A and Technician B

B. Technician B only

C. Neither Technician A nor Technician B

D. Technician A only

14. A vehicle owner reports that the engine has developed a rhythmic ticking noise that was not present during the last service three weeks ago. The technician checks the oil level and finds it two quarts low. After adding oil to the correct level, the ticking persists. Using a stethoscope, the noise is isolated to the number 5 exhaust rocker arm. Which of the following is the MOST likely cause?

A. The low oil condition caused temporary starvation to the number 5 lifter, but the noise is from a separate issue

B. The number 5 exhaust lifter was permanently damaged by the oil starvation and must be replaced

C. The number 5 exhaust valve has collapsed from excessive heat caused by low oil cooling capacity

D. Running two quarts low caused the number 5 exhaust cam lobe to wear flat from lack of lubrication

15. A technician is using a dial indicator to check crankshaft end play on a rebuilt engine. With the crankshaft pushed fully rearward, the indicator is zeroed. When the crankshaft is pushed fully forward, the indicator reads 0.003 inches. The specification is 0.002 to 0.010 inches. Which of the following is the correct interpretation?

A. The end play is too tight and the thrust bearing must be replaced with a thinner unit

B. The end play of 0.003 inches is within the manufacturer's specification and is acceptable

C. The end play measurement is invalid because the indicator should read maximum travel first

D. The crankshaft should be removed and the thrust bearing surfaces inspected for premature wear

16. A vehicle is brought in with a complaint that the engine oil smells like gasoline and the oil level on the dipstick is slightly above the full mark. The engine runs normally with no misfires, no codes, and no visible smoke. The vehicle is primarily driven on short trips of three miles or less in cold weather. Which of the following BEST explains this condition?

A. Fuel condensation from short-trip driving where the engine never reaches full operating temperature

B. A leaking fuel injector that is dripping raw fuel into a cylinder and washing it past the rings

C. A ruptured fuel pressure regulator diaphragm allowing fuel into the vacuum line and then crankcase

D. Excessive fuel system pressure from a stuck-closed pressure regulator forcing fuel past the injectors

17. A technician replaces the cylinder head gasket on a four-cylinder engine. After reassembly, the engine starts and runs, but the technician hears a rhythmic hissing noise from the exhaust manifold area that is most pronounced at idle. The noise was not present before the repair. All exhaust manifold bolts are torqued to specification. Which of the following is the MOST likely cause?

A. A cracked exhaust manifold that occurred during removal due to thermal shock from coolant

B. A loose spark plug on one cylinder that is allowing exhaust gas to leak past the threads

C. An internal exhaust leak through the new head gasket caused by a misaligned gasket installation

D. A failed exhaust manifold gasket that was not replaced during the cylinder head service

18. A customer complains that the vehicle stalls when making sharp left turns at low speed. The engine restarts immediately after stalling. The oil level is one quart below the minimum mark on the dipstick. No other symptoms are present during straight-line driving or right turns. Which of the following BEST explains this condition?

A. Centrifugal force moves the low oil volume away from the pickup during sharp turns

B. The oil is foaming from air entrainment during turns, preventing the pump from priming

C. The oil pickup screen moves away from the sump during the lateral forces of a left turn

D. The low oil level causes the oil to overheat in the exposed upper bearing surfaces during turns

19. Technician A says that valve seat width should be measured after cutting and should be within the manufacturer's specification — typically 1/16 to 3/32 inch. Technician B says that a valve seat that is too narrow transfers less heat from the valve, causing the valve to run hotter. 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

20. A technician is assembling a rebuilt engine and discovers that one of the new main bearing shells is 0.001 inches thicker than the others in the set. The bearing packaging indicates all shells are standard size. Which of the following is the MOST appropriate action?

A. Do not use the bearing shell and obtain a replacement from a new set to ensure uniformity

B. Install the thicker bearing and check the clearance with Plastigage to verify it is within spec

C. File the bearing shell to remove the excess 0.001 inches and match it to the other shells

D. Install the bearing as-is because 0.001 inches of thickness variation is within normal tolerance

21. A V6 engine has a vacuum gauge reading that drops from a normal 19 in. Hg to approximately 8 in. Hg when the air conditioning compressor clutch engages at idle. The reading recovers to 17 in. Hg after two seconds as the idle speed control adjusts. With the A/C off, the vacuum reading is steady at 19 in. Hg. Which of the following does this pattern indicate?

A. A normal response caused by the temporary load increase from the A/C compressor engagement

B. A significant engine mechanical problem that is revealed only under the added compressor load

C. A failing A/C compressor that is seizing intermittently and overloading the engine at idle speed

D. An exhaust restriction that becomes apparent only under the added load of accessory operation

22. During the disassembly of a high-mileage engine, a technician finds thick, dark sludge deposits in the valve cover, on the rocker arms, in the oil pan, and coating the oil pickup screen. The oil passages in the block are partially restricted with hardened varnish. Which of the following is the MOST likely cause of this condition?

A. The use of synthetic oil that is not compatible with the engine's internal seal materials

B. An internal coolant leak that has been mixing with the oil and forming a sludge emulsion

C. Extended oil change intervals that allowed the oil to break down and form deposits

D. A defective oil filter that allowed unfiltered oil to circulate and deposit contaminants

23. A technician performs a block test (combustion leak test) on an engine suspected of a head gasket failure. The test fluid remains blue and does not change color. The customer insists the head gasket is failing. Which of the following actions is MOST appropriate to confirm or rule out the diagnosis?

A. Repeat the block test at elevated RPM under load to increase cylinder pressure at the breach

B. Declare the head gasket intact because the block test is the definitive final diagnostic step

C. Replace the head gasket anyway because the customer's symptoms are convincing enough

D. Perform only a visual inspection of the coolant for bubbles because the block test has failed

24. A technician is diagnosing a vehicle with an engine oil leak that appears at the rear of the engine between the engine and transmission. The leak is slow but consistent. The transmission fluid level is full and appears normal. Which of the following should the technician determine FIRST to guide the diagnosis?

A. Whether the engine has been recently serviced, as a service error may have caused the leak

B. Whether the leaking fluid is engine oil or transmission fluid by color, smell, and consistency

C. Whether the rear main seal was recently replaced, indicating a possible installation defect

D. Whether the PCV system is functioning, as crankcase pressure can cause rear seal failure

25. A technician performs a relative compression test using a starter current clamp and oscilloscope. The waveform shows that all cylinders produce similar amplitude current spikes except cylinder 4, which shows a spike approximately 40% higher than the others. Which of the following conditions could cause a higher-than-normal current spike on one cylinder?

A. Low compression on cylinder 4 requiring less starter effort to compress the reduced charge

B. A burned exhaust valve on cylinder 4 that leaks compression during the compression stroke

C. A disconnected spark plug wire on cylinder 4 that prevents combustion in that cylinder

D. A hydrostatic lock condition on cylinder 4 from liquid accumulation above the piston crown

26. All of the following engine conditions would cause the oil pressure warning light to flicker at idle when the engine is at operating temperature EXCEPT:

A. Engine oil diluted with fuel, reducing viscosity below the designed operating range

B. A worn oil pump with excessive internal gear-to-housing clearance on the pressure side

C. Excessive main and rod bearing clearances from long-term wear over high mileage

D. A stuck-closed oil pressure relief valve that holds maximum pressure in the oil gallery

27. A technician is performing a three-angle valve job on an aluminum cylinder head. After cutting the 45-degree seat, the seat contact ring is positioned too low on the valve face — near the center of the face rather than near the margin. Which of the following cuts should be made to raise the contact position toward the margin?

A. Increase the 60-degree bottom cut to remove material from below the seat contact area

B. Increase the 30-degree top cut to remove material from above the seat contact area

C. Recut the 45-degree seat at a slightly steeper angle to shift the contact band upward

D. Lap the valve aggressively to redistribute the contact pattern toward the correct position

28. A technician discovers that the coolant recovery tank on a vehicle is constantly overflowing with coolant being pushed out of the radiator. The engine temperature gauge reads slightly above normal. A new radiator cap rated at the correct pressure has just been installed. Which of the following is the MOST likely cause?

A. The new radiator cap is defective and is releasing pressure below its rated specification

B. The cooling system has been overfilled, leaving no expansion room for heated coolant

C. Combustion gases entering the cooling system through a head gasket breach are pressurizing it

D. The water pump is generating too much flow pressure and overwhelming the radiator cap

29. A technician installs a new set of spark plugs in an aluminum four-cylinder engine. On the third plug, the technician notices the plug suddenly becomes very easy to turn before reaching the specified torque. Which of the following has MOST likely occurred?

A. The spark plug has seated fully against the cylinder head and no further torque is required

B. The spark plug threads in the aluminum cylinder head have stripped from over-tightening

C. The spark plug has a tapered seat that self-limits torque when properly seated in the head

D. The spark plug thread compound has lubricated the threads and reduced turning resistance

30. An engine with 95,000 miles produces a noticeable ticking noise from the top of the engine at idle that increases in rate with RPM. The noise is present at all temperatures. The technician removes the valve cover and discovers that one of the exhaust rocker arm adjusting screws has backed out approximately two full turns from its original setting. The engine has mechanical (solid) valve lash adjusters. Which of the following should the technician do?

A. Replace the exhaust rocker arm because the adjusting screw backing out indicates a worn pivot

B. Replace the camshaft because the lash adjustment backing out is caused by a worn cam lobe

C. Readjust the valve lash to specification and apply the manufacturer-specified thread retention method

D. Replace all rocker arms and adjusting screws as a set because one failure indicates system wear

31. A technician is checking an engine's cooling system and notices that the lower radiator hose feels rigid and does not compress at all when squeezed. All other hoses are flexible and resilient. Which of the following is the correct assessment?

A. The lower hose has an internal spring that provides rigidity, and this firmness may be normal

B. The lower hose is heat-damaged and has hardened, requiring immediate replacement for safety

C. The lower hose coolant has crystallized inside the hose and is blocking flow to the water pump

D. The lower hose internal spring has rusted and expanded, creating an internal flow restriction

32. A vehicle equipped with a turbocharged engine has recently had the turbocharger replaced. The customer returns one week later stating that the engine oil level dropped one quart in 500 miles with no visible leaks. The exhaust shows a slight blue haze under boost. Which of the following is the MOST likely cause?

A. The replacement turbocharger has a manufacturing defect in the compressor housing gasket

B. The new turbocharger is oversized for the application and generating excessive crankcase vacuum

C. The engine's piston rings were damaged by the original turbocharger failure and are now leaking oil

D. The turbocharger oil drain line is restricted, causing oil to back up and leak past the turbine seal

33. Technician A says that when performing an engine oil pressure test, the mechanical gauge should be installed in the oil pressure sending unit port with the engine off and cold. Technician B says that the oil

pressure reading at operating temperature is the most diagnostically relevant measurement. 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

34. A technician notices that an engine coolant temperature sensor is reading 195°F on the scan tool, but an infrared thermometer pointed at the thermostat housing reads 225°F. Which of the following is the MOST likely explanation for this discrepancy?

A. The coolant temperature sensor has drifted out of calibration and is reading lower than actual

B. The infrared thermometer is measuring the surface temperature of the housing, not the coolant

C. The thermostat is stuck partially closed, creating a hot spot at the housing that differs from coolant temp

D. The scan tool is rounding the sensor reading down to the nearest 5-degree increment for display

35. A technician is performing a starter current draw test on a four-cylinder engine. With the fuel and ignition systems disabled, the starter draws 320 amps during cranking. The specification for this engine is 120 to 180 amps. The battery is fully charged and passes a load test. Which of the following is the MOST likely cause of the excessive draw?

A. A defective starter motor with shorted field windings drawing excessive current from the battery

B. Corroded battery cables that are increasing resistance and causing the starter to draw more current

C. An internal engine mechanical problem creating excessive resistance to crankshaft rotation

D. A weak battery that is delivering voltage but at an abnormally high current output rate

36. A technician discovers during engine disassembly that the timing chain has stretched so severely that one bank of a V6 engine has jumped two teeth on its camshaft sprocket. Prior to disassembly, the engine exhibited rough running, loss of power, and a check engine light with multiple misfire codes on that bank. Which of the following additional conditions should the technician check for before reassembly?

A. Bent valves from possible piston-to-valve contact if the engine is an interference design

B. Worn main bearings from the vibration caused by the misfiring cylinders during operation

C. A cracked engine block from the thermal stress of running with misfires for an extended period

D. Worn piston rings from the combustion gas blowby caused by the retarded valve timing condition

37. A technician is measuring valve stem-to-guide clearance on a set of exhaust valves. The guide bore measures 0.3435 inches and the valve stem measures 0.3410 inches. The specification for exhaust valve stem-to-guide clearance is 0.002 to 0.004 inches. Which of the following is the correct assessment?

A. The clearance is within specification at 0.0025 inches and both the guide and valve are serviceable

B. The clearance is excessive at 0.0025 inches and the guide requires replacement or repair

C. The clearance cannot be determined without measuring the guide in a second perpendicular direction

D. The clearance is within specification but should be measured at three heights to check for taper

38. An engine has been diagnosed with excessive oil consumption. The technician has confirmed worn valve stem seals as the cause. The customer wants to know if the seals can be replaced without removing the cylinder head. Which of the following is the correct response?

A. Valve stem seals can never be replaced without removing the head because the valves must come out

B. Valve stem seals can be replaced in-vehicle by using compressed air to hold the valves closed

C. Valve stem seals can only be replaced in-vehicle on OHV engines, not on overhead cam engines

D. Valve stem seals should always be replaced with the head removed to ensure proper installation

39. A customer reports a brief whiff of blue smoke from the exhaust each morning when first starting the engine. The smoke clears within 10 seconds and does not return during normal driving. The engine has 140,000 miles. A compression test shows all cylinders within specification and within 5% of each other. Oil consumption is approximately one quart every 2,500 miles. Which of the following is the MOST likely cause?

A. Worn piston rings on one or more cylinders that only leak oil during the static overnight period

B. A PCV valve stuck in the open position that draws excess oil vapor into the intake at startup

C. Worn valve stem seals that allow oil to pool on the valves overnight and burn on the first start

D. Excessive oil level that causes the crankshaft counterweights to splash oil into the cylinders

40. A vehicle has had three consecutive batteries fail within the warranty period. Each battery tests good at installation but is found dead after the vehicle sits for four to five days. A parasitic draw test shows 40 mA with all modules asleep — within the 50 mA specification. Which of the following is the MOST likely explanation?

A. A faulty alternator that is overcharging and damaging the batteries through electrolyte boiling

B. The 40 mA draw, while within specification, is high enough to discharge the battery over five days

C. A defective battery brand that cannot hold a charge despite passing initial load testing procedures

D. The vehicle's charging system has excessive voltage drop that prevents the battery from fully charging

41. A technician is performing a valve adjustment on a DOHC engine with mechanical shim-over-bucket valve lash adjusters. The clearance on the number 2 exhaust valve measures 0.006 inches. The specification is 0.010 to 0.012 inches. Which of the following correctly describes this condition and the needed correction?

A. The clearance is too loose and a thicker shim must be installed to reduce the gap to specification

B. The clearance is within specification because the measurement falls between 0.006 and 0.012 inches

C. The exhaust valve seat has receded and the valve must be replaced to restore proper clearance

D. The clearance is too tight and a thinner shim must be installed to increase the gap to specification

42. A technician performing an engine rebuild discovers that two adjacent cylinders on a V8 engine share a common coolant passage between them in the block deck surface area. During inspection, coolant is observed weeping from one of the cylinder walls into the bore when the block is pressure-tested. Which of the following is the MOST likely cause?

A. A crack in the cylinder wall between the bore and the coolant passage requiring block replacement

B. A core plug in the coolant passage that was not removed during cleaning and is now corroded through

C. A head bolt hole that intersects the coolant passage and is wicking coolant into the bore area

D. Porosity in the original block casting that has slowly eroded through the cylinder wall over time

43. An engine has been diagnosed with a warped cylinder head from a severe overheating event. The aluminum head has 0.006 inches of warpage measured diagonally. The manufacturer's maximum warpage specification is 0.003 inches, and the maximum total resurfacing depth allowed is 0.008 inches. The head has never been resurfaced. Which of the following is the correct repair approach?

A. Replace the cylinder head because the warpage exceeds the maximum resurfacing capacity

B. Resurface the head to remove the warpage, as 0.006 inches is within the allowable resurfacing depth

C. Attempt to straighten the head using a controlled heating and cooling process before resurfacing

D. Install the head with a thicker composite gasket that can accommodate the 0.006-inch warpage

44. A technician is diagnosing a ticking noise from the engine. The noise is present only when the engine is under boost from the turbocharger. At idle and during light throttle, the engine is quiet. Under acceleration in second and third gear, a rapid ticking is audible. Which of the following is the MOST likely cause?

A. A worn turbocharger compressor wheel rubbing against the housing under boost pressure

B. Exhaust valve lash that has increased to the point where it is audible only under boost load

C. A loose wastegate actuator arm that vibrates when the wastegate is being held closed under boost

D. An exhaust manifold crack that opens under the thermal expansion of full boost operation

45. An engine with a dual overhead cam design has been rebuilt with a new timing chain kit. After the rebuild, the engine runs smoothly at idle but develops a noticeable vibration at 3,000 RPM that was not present before. All ignition and fuel components have been verified. A compression test shows all cylinders within 5% of each other. Which of the following should the technician investigate FIRST?

A. The harmonic balancer for rubber deterioration that may have worsened during the rebuild

B. The engine mounts for damage from the engine removal and reinstallation process

C. The timing chain alignment marks to verify that the intake and exhaust cams are correctly timed

D. The flywheel or flexplate bolt torque to ensure the fasteners were properly tightened

46. A technician is diagnosing a high-mileage engine with blue smoke that is visible only during heavy acceleration and disappears at cruise and idle. A compression test shows all cylinders near the low end of the specification but within 10% of each other. A wet test shows a 15 to 20 PSI improvement on all cylinders. Which of the following is the MOST likely cause?

A. Worn valve stem seals on all cylinders that leak oil under the high vacuum of acceleration

B. Worn piston rings on all cylinders that allow oil past under the higher cylinder pressures of acceleration

C. A failing turbocharger seal that allows oil into the intake tract only under positive boost pressure

D. A PCV system malfunction that draws excessive crankcase oil vapor during heavy throttle demand

47. A technician is working on a vehicle that has the engine oil changed every 15,000 miles. The manufacturer recommends 7,500-mile oil change intervals. During a valve cover gasket replacement, the technician observes heavy sludge deposits on the underside of the valve cover and on the cam journals. Which of the following recommendations is MOST appropriate?

A. Advise the customer to follow the manufacturer's recommended oil change interval going forward

B. Perform an engine flush with a chemical additive to dissolve the sludge before the next oil change

C. Replace the engine because the sludge indicates irreversible internal damage to bearing surfaces

D. Switch to a higher-viscosity oil that can better withstand the extended drain interval in this engine

48. A technician is diagnosing an engine that has a misfire only during deceleration — the engine stumbles and occasionally backfires through the intake when the throttle is closed after highway driving. The engine runs smoothly at idle and under acceleration. Which of the following is the MOST likely cause?

A. A burned exhaust valve that leaks only under the high vacuum conditions of deceleration

B. A stuck-open EGR valve that allows exhaust gas into the intake only during deceleration

C. An intake valve that is hanging slightly open due to a weak valve spring or deposit buildup

D. A fuel injector that is leaking fuel during deceleration when fuel pressure spikes momentarily

49. All of the following measurements or inspections should be performed on a crankshaft during engine rebuild EXCEPT:

A. Checking journal surface finish with a profilometer after regrinding to verify the Ra specification

B. Measuring main and rod journal diameters for taper and out-of-round at multiple positions

C. Inspecting the fillet radii at each journal for nicks, scratches, or improper grinding marks

D. Measuring the crankshaft bolt hole thread depth to verify adequate engagement for the balancer bolt

50. A technician has just completed a head gasket repair and needs to verify that the repair was successful. After the engine has been run to operating temperature and through two full heat cycles, which of the following is the MOST effective final verification test?

A. Perform a combustion leak test to confirm no combustion gases are present in the coolant

B. Monitor the engine temperature gauge for 30 minutes of driving to verify it stays in range

C. Check the engine oil for any sign of milky discoloration from coolant cross-contamination

D. Perform a cooling system pressure test with the engine off to confirm the system holds pressure

Practice Exam 6: 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. A — UV dye added to the engine oil would fluoresce at any external leak point under ultraviolet light, and no fluorescence was found after 200 miles of driving. [A] This eliminates all external leak paths and confirms that the oil is being consumed internally — burned in the combustion chamber through worn rings, valve guides, or valve stem seals. The next diagnostic step would be a compression test, wet test, and exhaust smoke analysis to determine the specific internal consumption pathway.

2. D — Zero vacuum during cranking means the pistons are moving up and down but no air is being drawn into the cylinders — the valves are not opening and closing. [A] A broken timing belt or chain stops the camshaft while the crankshaft continues to rotate, so the pistons travel through their strokes but the valves remain stationary. Without valve operation, no intake vacuum can develop. A restricted

exhaust would reduce vacuum but not eliminate it entirely, and a dead battery would prevent cranking altogether.

3. C — Cylinder 3 at 130 PSI is below both the manufacturer's minimum (145 PSI) and the 10% variation threshold (148.5 PSI). [A] The wet test raised the reading from 130 to 160 PSI — a significant improvement that confirms the piston rings are the problem. The added oil temporarily sealed the worn ring-to-bore gap, restoring compression. If the valves or head gasket were the cause, the oil would not have improved the seal because those leak paths are at the top of the cylinder where oil cannot reach.

4. B — Both technicians are correct and are describing two distinct abnormal combustion events. [A] Pre-ignition occurs when a hot spot (carbon deposit, overheated plug electrode, sharp gasket edge) ignites the mixture before the spark plug fires — combustion begins prematurely. Detonation occurs after the spark plug fires when the unburned portion of the charge auto-ignites ahead of the advancing flame front, creating two colliding pressure waves. Both are damaging, but pre-ignition is generally more destructive.

5. A — Non-TTY (conventional) head bolts are designed to operate within their elastic limit during installation, meaning they return to their original length when removed. [B] If the bolts pass all dimensional inspections — correct length, undamaged threads, no visible corrosion or stretching — they may be cleaned and reused according to most manufacturers' guidelines. TTY bolts, by contrast, are stretched beyond their elastic limit and must always be replaced. The distinction between TTY and non-TTY reuse is a commonly tested concept.

6. C — A loud screech at cold startup that lasts a few seconds and stops abruptly is the classic presentation of serpentine belt cold slippage. [E] When the engine is cold, the belt rubber is stiff and the contact surfaces are cold and dry, reducing friction between the belt and the pulleys. The initial cranking and idle load exceeds the belt's cold grip, causing it to slip and screech. Within seconds, friction heat warms the belt surface, increasing grip, and the noise stops. This is distinct from VVT rattle, which produces a metallic rattle rather than a screech.

7. D — An oil leak at the oil filter-to-block junction on a properly installed filter is most commonly caused by a double-gasket condition — the old filter's gasket stuck to the block when the old filter was removed, and the new filter's gasket was installed on top of it. [D] Two stacked gaskets cannot compress evenly, creating a gap that allows oil to seep under pressure. The technician should remove the new filter and inspect the block mounting surface for the presence of the old gasket.

8. B — Code P0128 specifically indicates that the engine is not reaching the expected operating temperature within a specified time period — the thermostat is not regulating properly. [D] A thermostat

stuck open or opening prematurely allows coolant to flow through the radiator continuously, overcooling the engine and preventing it from reaching normal operating temperature. This directly explains the slow warm-up and reduced heater output. A stuck-closed thermostat would cause overheating, not undercooling.

9. D — Tissue paper being pulled against the oil filler cap opening and held by suction indicates the crankcase is under slight vacuum — exactly what a properly functioning PCV system produces. [A] The PCV valve draws blowby gases from the crankcase into the intake manifold, creating a slight negative pressure in the crankcase. This is the expected result on a healthy engine with a working PCV system. Positive pressure (tissue blown away) would indicate PCV failure or excessive blowby.

10. B — Cylinder 7 at 145 PSI meets the manufacturer's minimum of 140 PSI and is within 10% of the highest reading (155 PSI × 0.90 = 139.5 PSI), so the engine mechanical condition passes both tests. [A] With acceptable compression and verified-good ignition and fuel components, the misfire on cylinder 7 has a non-mechanical cause that lies outside the A1 domain — possibly a wiring issue, vacuum leak at that runner, or an ECM calibration problem. The A1 technician's role is to confirm mechanical integrity, which has been done.

11. C — Undersize bearings are thicker to compensate for the smaller-diameter reground journal, restoring the original oil clearance. [C] The journals were reground to 0.020-inch undersize, so 0.020-inch undersize bearing shells must be used. The "undersize" designation refers to the journal size, not the bearing size — a 0.020-inch undersize bearing has walls that are 0.010 inches thicker per side (0.020 total across the diameter) to fill the gap created by the smaller journal.

12. A — The scan tool confirms the PCM is commanding the fan on, and the fan motor runs when powered directly — this isolates the failure to the electrical path between the PCM command and the fan motor. [D] The relay is the most likely component in this path to fail because it is an electromechanical device with contacts that can corrode, weld, or burn over time. The PCM sends a low-current signal to the relay coil, and the relay switches the high-current circuit to the fan motor. A failed relay does not pass current despite receiving the command.

13. D — Technician A only is correct: the stoichiometric ratio for gasoline is approximately 14.7:1 by weight, which represents the theoretically ideal ratio where all fuel and all oxygen are consumed during combustion. [A] Technician B is wrong — stoichiometric is neither rich nor lean by definition, it is the chemical balance point. Modern engines oscillate slightly rich and lean around stoichiometric during closed-loop operation for catalyst efficiency, but the stoichiometric ratio itself is not "slightly rich."

14. C — The noise persists after the oil level is restored, which eliminates temporary lifter bleed-down from low oil as the sole cause. [B] The low oil condition likely caused accelerated wear or damage to the number 5 exhaust rocker arm interface — possibly the lifter check valve, the rocker arm pivot surface, or the cam follower contact area. The sustained noise after oil restoration indicates permanent component damage that requires inspection and likely replacement of the affected lifter or rocker arm assembly.

15. B — The crankshaft end play measurement of 0.003 inches falls within the manufacturer's specification of 0.002 to 0.010 inches. [C] End play at the low end of the range is ideal on a rebuilt engine because it provides minimal axial movement while still allowing adequate oil film development on the thrust bearing surfaces. No further action is required — the thrust bearing is properly controlling crankshaft axial position.

16. A — Short-trip driving in cold weather is the most common cause of fuel-contaminated engine oil on otherwise healthy engines. [D] During cold operation, the rich cold-start fuel mixture does not burn completely, and unburned fuel washes past the piston rings into the crankcase. On a fully warmed engine driven for sustained periods, the oil temperature rises enough to evaporate the fuel out of the oil through the PCV system. Short trips prevent the oil from ever reaching this temperature, so fuel accumulates progressively.

17. D — A rhythmic hissing from the exhaust manifold area that appeared after a head gasket service and was not present before strongly indicates the exhaust manifold gasket was not replaced during reassembly. [E] Exhaust manifold gaskets are crush-type seals that deform permanently during their first installation. Reinstalling an old gasket that has already been compressed and heat-cycled cannot recreate the original seal, and exhaust gas leaks through the gaps. New exhaust manifold gaskets should always be installed during any service that requires manifold removal.

18. C — When the oil level is low and the vehicle makes a sharp left turn, the lateral G-force pushes the remaining oil volume to the right side of the oil pan, potentially uncovering the oil pickup tube on the left side. [D] If the pickup draws air instead of oil, oil pressure drops instantly, and the momentary loss of lubrication and hydraulic lifter support can cause the engine to stumble or stall. The condition occurs specifically during left turns because of the pickup tube's position relative to the oil sump geometry on this engine.

19. B — Both technicians are correct. [B] Technician A is right that valve seat width must be measured after cutting to verify it meets the manufacturer's specification — typically 1/16 to 3/32 inch. Technician B is also right about the heat transfer principle: approximately 75% of valve heat is dissipated through the seat contact area, so a seat that is too narrow provides insufficient contact area for heat transfer, causing the valve to run hotter and increasing the risk of valve burning.

20. A — A bearing shell that is measurably thicker than the others in a packaged standard-size set represents a quality control variation that should not be installed. [C] Even 0.001 inches of extra thickness translates to 0.0005 inches of reduced clearance per side, which could push the bearing clearance below the minimum specification and cause the bearing to run hot or seize. The safest action is to obtain a replacement shell from a new set that matches the dimensional specifications of the others.

21. B — A temporary vacuum drop when the A/C compressor clutch engages at idle is completely normal engine behavior. [A] The compressor places a sudden mechanical load on the engine through the serpentine belt, momentarily bogging the engine until the idle speed control system compensates by opening the throttle or increasing injector pulse width. The quick recovery to 17 in. Hg confirms the engine has adequate reserve power to absorb the load — a slow or incomplete recovery would indicate a problem.

22. C — Thick sludge deposits throughout the engine — valve covers, rocker arms, oil pan, and pickup screen — with partially restricted oil passages is the hallmark of chronically neglected oil change intervals. [D] When oil remains in the engine far beyond its designed service life, the additive package depletes, the oil oxidizes, and combustion byproducts, moisture, and acids accumulate. These contaminants polymerize into sludge and varnish that coat surfaces and restrict passages. Consistent adherence to the manufacturer's oil change interval prevents this condition entirely.

23. A — A negative block test at idle does not definitively rule out a head gasket failure because some breaches are small enough or intermittent enough that insufficient combustion gas enters the coolant at idle to change the test fluid color. [A] Running the engine at elevated RPM under load significantly increases cylinder pressure during each combustion event, forcing more gas through the breach. Repeating the test at 2,500 RPM or higher is the appropriate next step before declaring the gasket intact.

24. B — Before pursuing any specific diagnosis, the technician must first determine what fluid is leaking — engine oil and automatic transmission fluid can both appear in the rear engine area and are easily confused. [A] Engine oil is dark brown to black with a petroleum smell. ATF is typically reddish with a distinctive sweet smell. Misidentifying the fluid leads to diagnosing and repairing the wrong system entirely. Color, smell, and consistency comparison against known samples of both fluids confirms the identification.

25. D — A higher-than-normal current spike on one cylinder during a relative compression test means the starter is working harder to compress the contents of that cylinder. [A] The most likely cause of abnormally high resistance in a single cylinder is a hydrostatic lock — liquid (coolant or fuel) has accumulated above the piston, and because liquid is nearly incompressible, the starter must exert far

more effort to push the piston through TDC. Low compression would produce a lower spike, not a higher one.

26. D — A stuck-closed oil pressure relief valve holds maximum system pressure at all times rather than allowing it to drop. [D] This is the opposite of a condition that would cause the oil pressure light to flicker at idle — a stuck-closed relief valve would produce abnormally high pressure. All other conditions — fuel-diluted oil (reduced viscosity), worn pump clearances (reduced output), and worn bearings (increased leakage) — reduce oil pressure at idle and could cause the warning light to flicker.

27. A — When the seat contact ring sits too low on the valve face (near the center, away from the margin), the 60-degree bottom cut is used to remove material from below the contact area, effectively pushing the contact band upward toward the margin. [B] The bottom cut narrows the seat from the port side. The 30-degree top cut would narrow from above, which would push the contact further down — the opposite of what is needed. Seat position adjustment is always made with the cut on the side you want to move the contact away from.

28. C — A cooling system that constantly pushes coolant to the overflow despite a correct new cap and proper fill level points to an internal source of excess pressure — combustion gases entering the cooling system through a head gasket breach. [D] Hot exhaust gas under cylinder pressure is forced into the coolant jacket during each power stroke, progressively pressurizing the cooling system beyond the cap's relief threshold. The cap opens correctly at its rated pressure, but the combustion gas keeps adding pressure faster than the cap can relieve it.

29. B — A spark plug that suddenly becomes very easy to turn before reaching torque specification in an aluminum head has stripped the threads in the softer aluminum material. [E] Aluminum is significantly softer than the steel spark plug threads, and over-tightening or cross-threading can shear the aluminum threads away. The sudden loss of resistance is the telltale sign — the plug is spinning freely in damaged threads. The repair requires a thread insert (HeliCoil or Time-Sert) to restore the threaded hole before a plug can be properly installed.

30. C — An adjusting screw that has backed out on an engine with mechanical valve lash adjusters indicates the thread retention method (locknut, set screw, or thread adhesive) has failed. [A] The correct repair is to readjust the valve lash to the manufacturer's specification and then apply the appropriate retention method — tightening the locknut to specification, or applying thread retention compound if specified. Replacing the rocker arm or camshaft is not warranted for a backed-out adjusting screw alone.

31. A — The lower radiator hose contains an internal coil spring specifically designed to prevent the hose from collapsing under the suction created by the water pump. [D] This spring makes the lower hose feel significantly firmer and more rigid than the upper hose and heater hoses, which do not contain springs. A lower hose that feels firm and rigid is likely normal — the technician should verify the spring's presence by squeezing the hose and feeling for the coil resistance inside before condemning the hose.

32. D — Oil consumption and blue smoke under boost after a turbocharger replacement points to a restricted oil drain line from the turbocharger back to the crankcase. [D] If the drain line is kinked, clogged with carbon or sludge from the old turbo failure, or improperly routed during installation, oil cannot drain from the turbocharger center housing by gravity. The backed-up oil is forced past the turbine shaft seals by the positive pressure in the center housing, entering the exhaust stream and producing blue smoke.

33. B — Both technicians are correct. [D] Technician A is right that the mechanical gauge should be installed with the engine off — the sending unit port is pressurized when the engine runs, and threading a gauge adapter into a pressurized port sprays oil. Technician B is also right that the operating temperature reading is the most diagnostically relevant because oil is at its thinnest viscosity when hot, bearing clearances are at their widest, and oil pressure is at its lowest — this is when marginal conditions reveal themselves.

34. A — A 30-degree discrepancy between the ECT sensor reading and the infrared thermometer reading with the sensor reading lower strongly suggests the coolant temperature sensor has drifted out of calibration and is underreporting the actual coolant temperature. [E] While surface temperature and coolant temperature can differ by a few degrees, a 30-degree difference is far too large to attribute to normal variation. A sensor reading lower than actual causes the PCM to underestimate engine temperature, potentially delaying cooling fan activation and enriching the fuel mixture.

35. C — A starter current draw of 320 amps — nearly double the maximum specification of 180 amps — with a fully charged battery indicates the starter motor is working against abnormally high mechanical resistance inside the engine. [E] Possible causes include a seized or tight bearing, a hydro-locked cylinder, incorrect assembly clearances, or an engine that has suffered internal damage that increases rotational friction. A starter with shorted windings would draw high current regardless of engine condition, but the scenario specifies the battery is good — high current through good cables with a good battery points to the load, not the starter.

36. A — When a timing chain jumps two teeth on an interference engine, the camshaft timing is retarded far enough that the pistons may have struck the valves during operation. [B] Before reassembling the

engine with a new timing set, the technician must remove the cylinder head(s) on the affected bank and inspect all valves for bending, check valve guides for cracking, and inspect piston crowns for impact marks. Installing a new timing chain without verifying valve and piston condition risks reassembling an engine with bent valves that will not seal.

37. D — The calculated clearance is 0.3435 minus 0.3410 equals 0.0025 inches, which falls within the specification of 0.002 to 0.004 inches.

38. B — On many engines, valve stem seals can be replaced with the cylinder head still installed on the engine by using a compressed air adapter threaded into the spark plug hole to pressurize the cylinder and hold the valve closed. [B] With the valve held against its seat by air pressure, the valve spring, retainer, and keepers can be removed using a valve spring compressor, the old seal pulled off, and a new seal installed — all without the valve falling into the cylinder. This technique works on both OHV and OHC configurations.

39. C — A brief puff of blue smoke on cold startup that clears within seconds and does not recur during driving, combined with normal compression and moderate oil consumption, is the classic presentation of worn valve stem seals. [A] While the engine sits overnight, oil seeps past the worn seals and pools on top of the closed valves. On the first start, this pooled oil is drawn into the combustion chamber and burned, producing the momentary blue smoke. Once the pool is consumed, dynamic oil control during running is adequate and no further smoke is produced until the next overnight soak.

40. B — A 40 mA parasitic draw is within the 50 mA specification, so the electrical system is functioning as designed.

41. D — A valve lash measurement of 0.006 inches on a valve specified at 0.010 to 0.012 inches means the clearance is too tight — the gap between the cam follower and the shim is 0.004 to 0.006 inches less than it should be. [B] Insufficient exhaust valve clearance means the valve may not fully close when the engine is hot and components expand. A valve held slightly open leaks compression and runs hotter because it cannot transfer heat to the seat. A thinner shim increases the gap to bring it within specification.

42. A — Coolant weeping from a cylinder wall into the bore during pressure testing indicates a crack in the block casting between the coolant passage and the cylinder bore. [C] This is one of the most critical findings during engine block inspection because the crack will allow coolant to enter the combustion chamber during operation, contaminate the oil, and progressively worsen. A cracked block in this location is generally not cost-effectively repairable and typically requires block replacement.

43. B — The head has 0.006 inches of warpage, the manufacturer allows up to 0.008 inches of total resurfacing, and the head has never been resurfaced — so there is sufficient material available to machine the head flat. [B] Resurfacing to remove 0.006 inches of warpage leaves 0.002 inches of remaining resurfacing allowance for any potential future service. The head does not need replacement because the warpage is within the correctable range of the allowable resurfacing depth.

44. D — A ticking noise that appears only under boost conditions and is absent at idle and light throttle suggests a component that opens or moves specifically under the thermal expansion and exhaust pressure of full-load operation. [E] An exhaust manifold crack that is held closed by the manifold's clamping force at lower temperatures opens as the manifold expands under the extreme heat of sustained boost operation. The crack allows exhaust gas to escape and produces a rapid ticking noise synchronized with exhaust pulses. The noise disappears when the engine returns to light load and the manifold cools enough for the crack to close.

45. C — A vibration at a specific RPM that developed after a timing chain replacement on a DOHC engine should first be investigated as a timing alignment issue. [B] If the intake or exhaust camshaft is off by one tooth, the engine may idle acceptably but develop uneven combustion events at higher RPM that produce a vibration not attributable to ignition or fuel. Verifying all timing marks align correctly at the designated reference points is the most targeted and least invasive first check.

46. B — Blue smoke visible only during heavy acceleration on a high-mileage engine where the wet test shows significant improvement across all cylinders confirms worn piston rings as the cause. [A] Under heavy acceleration, cylinder pressures are at their highest, forcing more oil past the worn rings into the combustion chamber. At cruise and idle, lower cylinder pressures produce less ring bypass and the smoke is not visible. The uniform wet test improvement across all cylinders confirms the wear is ring-related and systemic rather than isolated to one cylinder.

47. A — The most appropriate recommendation is to advise the customer to follow the manufacturer's recommended oil change interval — in this case, 7,500 miles instead of the 15,000-mile interval they have been using. [D] Chemical engine flushes can dislodge large sludge deposits that clog oil passages and cause bearing starvation — they are risky on heavily sludged engines. The safest approach is to change the oil and filter at the correct interval going forward, possibly with shortened initial intervals (3,000 to 5,000 miles) to gradually remove accumulated deposits through normal oil circulation and filtration.

48. C — A misfire during deceleration — when the throttle is closed and intake manifold vacuum is at its highest — points to an intake valve that is not fully closing. [A] During deceleration, the high vacuum creates strong suction against the intake valve. If the valve is hanging slightly open due to

carbon deposits on the seat or stem, a weak valve spring, or a sticking guide, the high vacuum exacerbates the leak and disrupts combustion on that cylinder. Under acceleration and at idle, the lower vacuum is insufficient to cause the same severity of leak.

49. D — Measuring crankshaft bolt hole thread depth is not a standard crankshaft inspection procedure during an engine rebuild. [C] The bolt hole for the harmonic balancer or pulley bolt is in the nose of the crankshaft and is a fixed, machined feature that does not wear during normal engine operation. Standard crankshaft inspection includes journal diameter measurement for taper and out-of-round, surface finish verification after regrinding, fillet radius inspection, and Magnaflux crack detection — all of which directly assess the crankshaft's ability to support bearings and resist fatigue.

50. A — The combustion leak test (block test) is the most effective non-invasive verification that no combustion gases are entering the cooling system after a head gasket repair. [D] A positive test would indicate a continued or new breach between a combustion chamber and coolant passage. Temperature monitoring, oil inspection, and static pressure testing are all useful secondary checks, but only the block test directly detects the specific failure mode — combustion gas intrusion — that a head gasket repair is intended to correct.