PRACTICE EXAM 17: ASE G1 SIMULATION — 55 QUESTIONS

1. A vehicle's engine has been running with a severely restricted air filter for an extended period. Which of the following is the MOST likely chain of consequences this restriction would cause?

A. Increased exhaust temperature → catalytic converter overheating → converter failure

B. Increased intake velocity → improved fuel atomization → better fuel economy

C. Reduced engine vacuum → increased crankcase pressure → accelerated oil seal leaks

D. The engine runs rich (the restricted filter limits air while fuel delivery remains normal) → excess fuel washes oil from the cylinder walls → accelerated ring and bore wear → increased oil consumption → fouled spark plugs and catalytic converter contamination from oil and excess fuel

2. A customer brings in a vehicle that has been sitting in storage for 14 months without being started. Before attempting to start the engine, which of the following should the technician inspect FIRST?

A. The engine oil level and condition (for moisture contamination and loss of viscosity from sitting), the coolant level and condition, the battery state of charge, the fuel condition (for water contamination and oxidation), and the air intake for animal nesting or debris — all fluids and systems must be verified safe before the first start after extended storage

B. The tire pressures, which will have dropped during storage

C. The windshield wipers for dry-rotted blades

D. The exterior paint for oxidation damage from prolonged sun exposure

3. A vehicle's engine produces a loud metallic rattle that occurs ONLY during rapid deceleration from high RPM — the noise is heard for 1–2 seconds as the RPM drops quickly and then disappears. The engine is quiet at idle, during acceleration, and at steady RPM. Which of the following is the MOST likely cause?

A. A worn crankshaft main bearing that loads differently during deceleration

B. A loose flywheel bolt that shifts under the rotational deceleration force

C. A worn timing chain with a failed tensioner that allows the chain to slap the guides or cover during the momentary loss of oil pressure and the rapid RPM change of aggressive deceleration — the tensioner loses pressure momentarily and the chain slack produces a brief rattle before the tensioner re-tensions

D. A damaged harmonic balancer that wobbles at specific RPM

4. Technician A says that an engine's valve adjustment (on engines with adjustable valves) should be performed with the engine cold. Technician B says that some manufacturers specify valve adjustment with the engine at operating temperature. Who is correct?

A. Technician A only

B. Both technicians are correct — different manufacturers specify different conditions for valve adjustment; some specify cold (to account for thermal expansion when hot) and others specify hot (measuring the actual running clearance); the technician must follow the specific manufacturer's procedure, not assume one temperature applies to all engines

C. Technician B only

D. Neither Technician A nor Technician B

5. A vehicle's cooling system uses a pressurized overflow (recovery) system with a translucent plastic reservoir. The technician notices the reservoir is full to the brim and the coolant appears to be overflowing from the cap. The engine is not overheating. Which of the following is the MOST likely cause?

A. The coolant was overfilled during the last service

B. The thermostat is stuck open, causing continuous coolant flow to the radiator and back-flowing to the reservoir

C. The water pump is producing excessive pressure that overwhelms the reservoir capacity

D. The radiator cap's vacuum valve has failed — coolant that was pushed into the reservoir during heating cannot be drawn back into the radiator during cooling because the vacuum valve does not open; each heat cycle pushes more coolant into the reservoir without drawing any back, eventually overfilling it

6. A vehicle's engine oil appears dark brown after only 500 miles since the last change. The previous oil change used conventional oil, and this change used full synthetic. The engine runs normally with no DTCs. Which of the following is the correct interpretation?

A. The synthetic oil has degraded prematurely and should be changed immediately

B. The engine has an internal coolant leak that is discoloring the oil

C. Full synthetic oil has superior detergent and dispersant properties compared to conventional — it is cleaning deposits and suspending contaminants that the conventional oil left behind, causing the new oil to darken quickly; this is evidence the synthetic is performing its cleaning function, not that it has failed

D. The oil filter is bypassing and allowing unfiltered oil to circulate

7. A vehicle's engine has a knocking noise that is most noticeable at 2,000–3,000 RPM under light load. The knock disappears under heavy acceleration and at idle. The technician advances the ignition timing using a scan tool and the knock gets louder. Retarding the timing eliminates the knock. Which of the following is confirmed?

A. The knock is detonation (spark knock/ping) — the engine is experiencing abnormal combustion where the air-fuel mixture self-ignites ahead of the flame front; advancing timing worsens it because combustion begins earlier against higher cylinder pressure, while retarding timing reduces cylinder pressure at the point of ignition and eliminates the knock

B. The knock is from a worn connecting rod bearing that responds to timing changes

C. The knock is caused by a loose piston pin that shifts under different load conditions

D. The knock is exhaust system resonance that changes frequency with timing adjustments

8. A customer asks what the difference is between a "maintenance-free" battery and a "serviceable" battery. Which of the following is the correct explanation?

A. A maintenance-free battery uses sealed construction with calcium or calcium-lead alloy plates that minimize water consumption and gas emission — the electrolyte level does not need periodic checking or topping; a serviceable battery has removable vent caps that allow the technician to check electrolyte level, add distilled water, and test specific gravity; both types can fail and both can be load-tested

B. A maintenance-free battery never needs replacement because it is designed to last the life of the vehicle

C. A serviceable battery requires weekly water additions to function properly

D. There is no functional difference — the terms are purely marketing

9. A vehicle's rear drum brakes have been making a scraping noise. The technician removes the drums and finds the brake shoe friction material has completely worn through on one shoe, and the steel backing plate has been contacting the drum. The opposite shoe still has 3 mm of material. Which of the following BEST explains the uneven wear?

A. The brake shoes were manufactured with different friction material thicknesses

B. The primary (leading) and secondary (trailing) shoes are designed to wear at different rates — the secondary shoe does more of the braking work due to the self-energizing effect of the drum's rotation, and wears faster; however, ONE shoe being completely worn while the other has significant material indicates the self-adjuster for that shoe was not functioning, or the shoe was installed in the wrong position

C. The wheel cylinder was applying unequal pressure to the two shoes

D. The drum was out-of-round, contacting only one shoe

10. A vehicle's A/C system has been retrofitted from R-12 to R-134a. The customer complains that the A/C does not cool as well as it did with R-12. The system has been charged to the correct R-134a specification. Which of the following is the MOST likely explanation?

A. The R-134a compressor oil is incompatible with the system's original seals

B. The retrofit was performed incorrectly and R-12 is still mixed in the system

C. The system's expansion valve needs to be recalibrated for R-134a pressures

D. R-134a has lower cooling efficiency than R-12 in systems not originally designed for it — the condenser size, fan capacity, and system volume were engineered for R-12's thermal properties; R-134a operates at higher pressures with slightly less heat absorption capacity per unit volume, resulting in reduced cooling performance in a system optimized for R-12

11. A vehicle's engine has a PCV valve that is stuck in the closed position. Which of the following chain of consequences would this cause?

A. Excessive vacuum in the crankcase → oil drawn past valve seals → blue smoke from exhaust

B. The PCV system would bypass through the breather filter and no symptoms would be noticeable

C. Crankcase pressure builds because blowby gases cannot escape → pressure forces oil past seals and gaskets → external oil leaks and potential oil filler cap blowoff → crankcase vapors vent to atmosphere through the breather instead of being burned in the engine → increased hydrocarbon emissions

D. Engine vacuum drops → fuel system goes rich → catalytic converter overheats

12. A vehicle's front end produces a clunking noise when the vehicle transitions from forward to reverse in a parking lot — the clunk occurs at the exact moment of direction change. All suspension and steering components are tight. The brakes are in good condition. Which of the following is the MOST likely cause?

A. Worn engine or transmission mounts that allow the drivetrain to shift at the moment the torque direction reverses — when shifting from Drive to Reverse, the engine/transmission rocks on its mounts in the opposite direction; worn mounts that have lost their dampening allow the drivetrain to clunk against the mount stops at the transition point

B. A worn power steering pump bearing that loads differently in each direction

C. A loose exhaust system component that shifts when the vehicle direction changes

D. A worn steering column bearing that clunks when the steering load reverses

13. A vehicle is brought in with a complaint of a musty smell from the vents. The technician replaces the cabin air filter and treats the evaporator with antimicrobial spray. The smell returns within 2 weeks. Which of the following should the technician investigate NEXT?

A. The heater core for an internal coolant leak producing a different type of odor

B. The HVAC condensate drain tube — if the drain is partially clogged (allowing some but not all water to drain), standing water remains in the HVAC case and provides a continuous moisture source for mold regrowth; the evaporator treatment kills existing mold but cannot prevent regrowth if the environment remains wet

C. The blower motor for mold growing on the fan blades

D. The dashboard vents for accumulated dust that is producing the odor

14. A vehicle's automatic transmission shifts perfectly when cold but begins to slip in 3rd and 4th gear after 30 minutes of driving. Which of the following is the MOST likely cause?

A. A faulty shift solenoid that overheats and loses magnetic force

B. A worn valve body spring that loses tension when hot

C. The transmission fluid is at the wrong level — too high when hot, causing aeration

D. Internal clutch pack seal hardening — when the transmission fluid is cold, the seals are slightly more pliable and maintain hydraulic pressure; as the fluid heats and the seals reach operating temperature, hardened rubber seals shrink or lose flexibility, allowing pressure to bypass and the clutch packs to slip in the higher gears that require the most clamping force

15. A vehicle's brake pedal slowly sinks to the floor when the engine is running, but is firm and does not sink when the engine is off. There are no external leaks and the fluid level is stable. Which of the following is the MOST likely cause?

A. A failed brake booster that is pulling the pedal down under vacuum

B. Air in the ABS modulator that compresses only when the engine generates vacuum

C. An internal master cylinder seal leak that is aggravated by the brake booster's vacuum assist — the booster amplifies the force on the master cylinder piston, and the increased force pushes fluid past the worn internal seals; without vacuum assist (engine off), the driver's foot alone applies less force and the seals can temporarily hold against the lower pressure

D. A proportioning valve that opens under vacuum, bypassing fluid to the return line

16. A vehicle has an engine oil leak that drips only when the vehicle is parked and the engine is off — there is no drip while driving. Which of the following BEST explains this behavior?

A. When the engine is running, oil is circulating under pressure and being contained within the pressurized lubrication system; when the engine is off, oil drains from the upper engine by gravity and pools at the lowest gasket/seal points, where it seeps past a worn seal or gasket that was held closed by oil pressure or component movement during operation

B. The oil becomes thicker when hot and cannot flow through the leak

C. Engine vibration at idle seals the leak by pressing the mating surfaces together

D. The oil pump creates suction that draws oil away from the leak point during operation

17. A vehicle's steering system uses a rack-and-pinion gear. The customer reports that the steering wheel must be turned further in one direction than the other to reach full lock. Which of the following is the MOST likely cause?

A. Unequal caster angles between the left and right front wheels

B. One of the inner tie rods is a different length than the other (from a previous incorrect replacement or adjustment) or the rack has shifted in its mounts — unequal tie rod lengths create unequal steering geometry, limiting travel to full lock more on one side than the other

C. The power steering pump delivers more assist in one direction

D. The steering column has a mechanical stop that limits rotation in one direction

18. A vehicle equipped with electric power steering (EPS) has lost all power steering assist. The steering wheel turns normally but requires significant effort. There are no warning lights illuminated. Which of the following should the technician check FIRST?

A. The EPS system fuse — many EPS systems use a high-amperage fuse (40–80A) that, when blown, completely disables electric assist without necessarily triggering a warning light on all vehicles; this is the simplest and most accessible check before pursuing sensor, motor, or module diagnosis

B. The EPS control module for a software fault

C. The steering column torque sensor for calibration

D. The EPS motor for an internal short circuit

19. A vehicle's engine overheats during uphill driving at low speed but maintains normal temperature on flat highway driving. The cooling fan operates normally. Coolant level is correct. Which of the following is the MOST likely cause?

A. A water pump with a corroded or broken impeller that cannot circulate coolant at the increased flow rate needed during high-load, low-speed conditions

B. An incorrect thermostat rating installed during a previous service

C. A water pump with a corroded impeller — at highway speed, the pump turns fast enough to move adequate coolant despite the damaged impeller; during low-speed, high-load uphill driving, the pump turns slowly and the damaged impeller cannot move sufficient coolant volume to transfer the increased combustion heat to the radiator

D. A radiator cap with an incorrect pressure rating

20. A customer asks the technician to explain why their vehicle's gas mileage is worse in winter compared to summer, even though they drive the same routes. Which of the following is the MOST complete and accurate explanation?

A. Winter fuel blends contain more butane, which has lower energy density; cold engines take longer to reach closed-loop fuel control (running richer during extended warm-up); cold engine oil is thicker, creating more internal friction; tire pressures drop in cold weather, increasing rolling resistance; defrosters, heated seats, and heated mirrors add electrical load; and cold air is denser, increasing aerodynamic drag — all of these factors combine to reduce winter fuel economy

B. The thermostat opens more frequently in winter, wasting engine heat

C. The fuel injectors deliver more fuel in cold weather because the PCM adds a fixed winter enrichment factor

D. The catalytic converter operates less efficiently in cold weather, creating exhaust backpressure

21. A vehicle's front brakes produce a pulsation when braking from 70 mph but NOT when braking from 30 mph. The pulsation was not present two weeks ago. Which of the following BEST explains why the pulsation occurs only at higher speed?

A. Brake rotor thickness variation that is too small to feel at lower speeds becomes noticeable at higher speeds

B. At higher speeds, the rotor completes more revolutions per braking event, and the uneven surfaces pass between the pads more times per second — the higher frequency and greater kinetic energy amplify the pulsation to a level the driver can feel; at lower speeds, the same rotor irregularity produces a slower, weaker pulsation that falls below the driver's perception threshold

C. The brake pads are glazed and only grip unevenly at higher temperatures generated during high-speed stops

D. The calipers flex under the greater hydraulic pressure required for high-speed stops

22. A vehicle has a check engine light with P0401 (EGR Flow Insufficient). The technician finds that the EGR passages in the intake manifold are completely clogged with carbon. After cleaning, what additional component should the technician inspect to prevent rapid recarbonization?

A. The fuel injectors for proper spray pattern

B. The ignition timing for over-advance

C. The exhaust manifold for cracks

D. The PCV system — a malfunctioning PCV system (particularly one that is flowing excessive oil mist into the intake) contributes to accelerated carbon buildup in the EGR passages and intake manifold; if the PCV system is not functioning correctly, the cleaned passages will clog again within a few thousand miles

23. A vehicle's engine has a slight miss at idle that is not detectable above 1,500 RPM. The scan tool shows no misfire DTCs. The technician performs a power balance test (disabling one cylinder at a time). When cylinder 3 is disabled, there is NO RPM drop — all other cylinders cause a noticeable RPM drop when disabled. What does this confirm?

A. Cylinder 3's spark plug is fouled but still firing intermittently

B. The fuel injector on cylinder 3 is partially clogged but still delivering some fuel

C. Cylinder 3 is not contributing to engine power — it is either not firing, not receiving fuel, or has insufficient compression to produce a power stroke; disabling a cylinder that is already dead produces no change because it was not contributing power in the first place

D. The PCM misfire counter is not registering the intermittent miss on cylinder 3

24. A vehicle's battery has corrosion on the POSITIVE terminal only. The corrosion is white-green and crusty. Which of the following is the MOST likely cause?

A. Positive terminal corrosion typically indicates the battery is being overcharged — the excess charging voltage causes the positive plate to gas excessively, releasing sulfuric acid vapor that condenses on the positive terminal and reacts with the lead and copper to form the white-green corrosion; the charging system voltage should be tested

B. Positive terminal corrosion is caused by a loose cable clamp creating resistance heating

C. All battery corrosion is caused by electrolyte leaking through the terminal seal and is unrelated to the charging system

D. The battery's internal cells are failing and releasing acid through the positive post

25. A vehicle's engine has a P0300 (Random Misfire) that occurs ONLY between 2,000 and 2,500 RPM at light throttle. Below 2,000 and above 2,500, the engine runs perfectly. All individual cylinder tests are normal. Which of the following is the MOST likely cause?

A. A single ignition coil that fails only in that RPM range

B. An intake manifold runner control (IMRC) valve or variable intake system that transitions between its short-runner and long-runner configurations in that RPM range — if the transition mechanism sticks, hesitates, or partially opens/closes during the changeover, it momentarily disrupts airflow to all cylinders, creating a brief random misfire that only occurs at the RPM where the transition is commanded

C. A fuel pump that loses pressure specifically between 2,000 and 2,500 RPM

D. A catalytic converter that creates excessive backpressure only in that RPM range

26. A vehicle's automatic transmission has a delayed engagement when cold (5–7 seconds to engage Drive after starting) but engages immediately when warm. The fluid level and condition are normal. Which of the following describes the root cause mechanism?

A. The torque converter drains back to the pan overnight, and the pump must refill it before engagement

B. The shift solenoids are sluggish when cold and need time to warm up before responding

C. Cold transmission fluid has higher viscosity, which slows fluid flow through the valve body passages

D. Internal transmission seals (especially the forward clutch piston seals) harden with age and shrink when cold — they cannot maintain hydraulic pressure until the fluid warms and the seals soften and expand enough to seal; once warm, the seals function adequately and engagement is normal

27. A vehicle's rear differential produces a whining noise that varies with vehicle speed. The technician drains the differential fluid and finds metal particles on the drain plug magnet. Which of the following is the correct interpretation?

A. A small amount of fine metallic particles on the drain plug magnet is normal break-in wear

B. Metal particles indicate the differential fluid has exceeded its service life and a simple fluid change will resolve the noise

C. Metal particles combined with a whining noise indicate active gear or bearing wear — the differential should be inspected internally for damaged gear teeth, worn bearings, or improper gear mesh pattern; continuing to drive will accelerate the damage and may lead to catastrophic failure

D. The metal particles are from the drain plug magnet itself deteriorating

28. A vehicle's engine has an oil consumption problem. The technician performs a leak-down test and finds 25% leakage on cylinder 2. Air is heard escaping from the oil filler opening. All other cylinders show 5–8% leakage. What does the air at the oil filler specifically indicate?

A. The air escaping from the oil filler confirms that compression is leaking past the PISTON RINGS on cylinder 2 — the rings are the only path between the combustion chamber and the crankcase; air heard at the tailpipe would indicate an exhaust valve leak, and bubbles in the coolant would indicate a head gasket leak

B. The head gasket on cylinder 2 has failed between the cylinder and the oil passage

C. The intake valve on cylinder 2 is not seating properly

D. The oil filler cap seal has failed and is allowing air to enter from outside

29. A vehicle's engine has had the same brand and weight of oil used for every oil change. At 85,000 miles, the customer notices the engine is consuming approximately 1 quart of oil every 3,000 miles. The manufacturer states acceptable consumption is 1 quart per 3,000 miles. The customer is concerned. Which of the following is the correct advice?

A. The oil consumption rate indicates imminent engine failure

B. The consumption rate is dangerously high and the engine should not be driven

C. Switch to a thicker oil to slow the consumption rate

D. The current consumption rate falls WITHIN the manufacturer's stated acceptable range — it should be documented and monitored at each oil change to track whether the rate is stable or accelerating; if it remains at or below the manufacturer's threshold, no repair is indicated; if it accelerates beyond the threshold, further diagnosis is warranted

30. A vehicle's scan tool shows the following oxygen sensor data at idle: Bank 1 Sensor 1 switching between 0.1V and 0.9V approximately 8 times in 10 seconds. Bank 1 Sensor 2 shows a steady 0.68V. Which of the following is the correct interpretation?

A. Bank 1 Sensor 1 is switching too fast and should be replaced

B. Both sensors are operating normally — the upstream sensor (B1S1) is switching rapidly between rich and lean as the PCM hunts around stoichiometric in closed-loop control; the downstream sensor (B1S2) shows a steady, slightly rich-biased voltage indicating the catalytic converter is efficiently buffering the exhaust gas oxygen content

C. Bank 1 Sensor 2 is stuck rich and requires replacement

D. The catalytic converter has failed because the downstream sensor should show 0.45V

31. A customer's vehicle has aftermarket HID (high-intensity discharge) bulbs installed in factory halogen headlight housings. The customer complains of poor visibility despite the bright appearance. Which of the following explains this contradiction?

A. HID bulbs produce less total light output than halogen bulbs

B. The HID bulbs are wired incorrectly, producing light at reduced intensity

C. The halogen headlight reflector and lens optics are designed for a halogen bulb's specific light source geometry — the HID bulb's arc tube produces light from a different position and shape than the halogen filament, causing the reflector to scatter light instead of focusing it into a controlled beam pattern; the result is intense glare that blinds oncoming drivers while providing a poorly focused, weaker forward beam for the driver

D. The HID ballast is reducing the voltage to the bulbs below their design operating point

32. A vehicle's brake pads have been replaced with ceramic pads to replace the original semi-metallic pads. The customer reports that the brakes now produce more dust than before. Which of the following is the correct explanation?

A. Ceramic pads typically produce LESS visible dust than semi-metallic pads, but the dust is lighter in color (gray/white) and more visible on wheels — the customer may be seeing the same or less total dust but noticing it more because of the color contrast; alternatively, if the pads are a low-quality ceramic compound, they may shed material faster than quality brands

B. Ceramic pads always produce more dust than semi-metallic pads

C. The rotors must be matched to the pad material — ceramic pads on semi-metallic-compatible rotors create excessive dust

D. The brake caliper pressure is too high for ceramic pad material

33. A vehicle's engine has a vacuum reading of 21 inches of mercury (in. Hg) at idle, which drops to 0 in. Hg during a snap throttle test and then returns to 25 in. Hg before settling back to 21 in. Hg. Which of the following is the correct interpretation?

A. The vacuum drop to 0 during snap throttle indicates a restriction in the intake

B. The 25 in. Hg reading after the snap throttle indicates a sticking throttle plate

C. The engine has a weak valve spring that cannot maintain vacuum at higher RPM

D. This is a normal, healthy engine vacuum pattern — the momentary drop to 0 during snap throttle is normal as the wide-open throttle plate equalizes manifold pressure with atmospheric; the brief spike to 25 in. Hg as the throttle closes and the engine decelerates indicates good cylinder sealing; the return to 21 in. Hg steady idle vacuum confirms normal engine condition

34. A vehicle has a P0442 (EVAP System Small Leak Detected). The technician performs a smoke test and cannot find any external leak. The fuel cap seals correctly. Which of the following is a possible internal leak source that smoke testing may not reveal?

A. A cracked charcoal canister that only leaks under the specific pressure/vacuum conditions of the EVAP monitor

B. A small crack or porosity in the fuel tank itself, a hairline crack in the EVAP canister, or a vent valve or purge valve with an internal seat leak — these components may seal adequately under the relatively low pressure of a smoke machine (typically 1–2 psi) but leak under the specific pressure or vacuum conditions the PCM applies during the OBD II EVAP monitor

C. A cracked intake manifold that is drawing EVAP vapors away from the sensor

D. A restricted exhaust that creates backpressure affecting the EVAP test

35. A vehicle has a persistent coolant odor inside the cabin but the heater core shows no visible leak, the coolant level is stable, and there is no fogging on the windshield. Which of the following is the MOST likely source?

A. The coolant odor is from an external engine coolant leak near the HVAC fresh air intake

B. A very small internal heater core weep that evaporates before it forms visible drops

C. Coolant vapor from a VERY small heater core seepage, or from a minute external leak near the firewall or HVAC cowl intake — the amount of coolant evaporating is so small that the level drop is undetectable between checks, no liquid accumulates on the floor, and no windshield fogging occurs, but the sweet ethylene glycol odor is detectable by the human nose at extremely low concentrations

D. The cabin air filter is releasing a chemical that smells similar to coolant

36. A vehicle has a check engine light with P0171 (System Too Lean — Bank 1). The technician disconnects the MAF sensor. The engine idles more smoothly with the sensor disconnected. Which of the following does this confirm?

A. The MAF sensor is providing inaccurate data that is WORSE than the PCM's calculated default — when the MAF is disconnected, the PCM switches to a speed-density calculation (using MAP, IAT, and RPM) that produces a more accurate airflow estimate than the faulty MAF; this confirms the MAF sensor is the source of the lean condition

B. The MAF sensor connector has a wiring short that is loading down the PCM

C. The intake air temperature sensor within the MAF is the fault, not the airflow measurement

D. The engine needs a new PCM because it cannot process the MAF signal correctly

37. A vehicle equipped with adaptive cruise control follows the car ahead at the set following distance. When the vehicle ahead moves to another lane, the customer's vehicle suddenly accelerates hard to reach the set cruise speed. The customer finds this acceleration too aggressive. Which of the following is correct?

A. The adaptive cruise control radar needs recalibration to smooth the acceleration

B. The customer's throttle cable needs adjustment to reduce throttle response

C. The PCM requires a software update to change the acceleration profile

D. This is a normal characteristic of the adaptive cruise control system — when the vehicle ahead moves out of the sensor's path, the system commands acceleration to reach the previously set cruise speed; many vehicles offer adjustable acceleration profiles (eco, normal, sport) that change how aggressively the system accelerates to reach the set speed

38. A vehicle's transmission dipstick shows the fluid level is between the "cold" and "hot" marks when checked with the engine at full operating temperature. Which of the following is correct?

A. The fluid level is correct because it is between the two marks

B. The fluid is LOW — when checked at operating temperature, the level should be at the "hot" mark; reading between the marks when hot means the fluid has not expanded to the expected level, indicating approximately half a quart is low; the "cold" mark is only valid when the fluid is at ambient temperature

C. The transmission is overfilled and fluid should be removed

D. Transmission fluid level cannot be accurately measured when hot

39. A vehicle's engine has a ticking noise that increases with RPM. The technician removes the valve cover and observes that one rocker arm is not moving — it sits motionless while all others operate normally. Which of the following is the MOST likely cause?

A. A broken valve spring on that cylinder

B. A worn camshaft lobe that has worn flat — the lobe no longer has the profile needed to push the lifter and rocker arm; the lobe has lost its lift, the lifter sits at its base circle position at all times, and the rocker arm does not move; the ticking is from the remaining lash between the lifter and the flat lobe surface

C. A seized rocker arm pivot that prevents movement

D. A broken or collapsed lifter or a camshaft lobe that has worn completely flat — the cam lobe no longer has enough profile to actuate the lifter and rocker; the associated valve is not opening, creating a dead cylinder that ticks because the lifter/rocker clearance is never taken up by cam lobe lift

40. A vehicle's headlights appear noticeably yellower and dimmer than when the vehicle was new. The headlight lenses are clear. The charging system output is within specification. Which of the following is the MOST likely cause?

A. The headlight reflector coating has deteriorated from heat over time, reducing the reflective surface efficiency

B. The headlight wiring harness has developed resistance from corroded connectors

C. The dashboard dimmer switch has drifted from its maximum setting

D. The halogen headlight bulbs have aged — over thousands of hours of use, the tungsten filament evaporates and deposits on the inside of the glass envelope, creating a dark film that reduces light output and shifts the color temperature toward yellow; aging bulbs can lose 20–40% of their original light output before the filament finally breaks

41. A customer reports that their vehicle's engine runs fine but the temperature gauge reads cold at all times — even after extended highway driving. There is no check engine light. Which of the following is the MOST likely cause?

A. The dashboard temperature gauge sender (if separate from the PCM's ECT sensor) has failed in the low-temperature position — the engine reaches full operating temperature (confirmed by no check engine light, no P0128 code, and no drivability complaints), but the gauge sender provides an incorrect reading; if the vehicle uses a single sensor for both functions, the PCM would also see incorrect temperature and set a code

B. The thermostat is stuck open, preventing the engine from reaching operating temperature

C. The cooling fan is running continuously, overcooling the engine

D. The engine is not reaching operating temperature due to a massive coolant leak

42. A vehicle's transmission has a harsh 3-4 upshift. All other shifts are normal. The technician connects a scan tool and commands a 3-4 shift while monitoring line pressure. Line pressure is normal during 1-2 and 2-3 shifts but spikes 30 psi above specification during the 3-4 shift. Which of the following is the MOST likely cause?

A. A worn 3-4 clutch pack that is slipping and causing the PCM to increase pressure

B. A sticking 3-4 accumulator piston — the accumulator is designed to cushion the shift by absorbing pressure gradually; if the piston sticks in its bore (from debris, varnish, or a damaged seal), it cannot absorb the pressure spike, and the clutch pack engages abruptly with full line pressure, producing the harsh shift

C. A faulty throttle position sensor that over-reports throttle opening during the 3-4 transition

D. A worn governor valve that overspeeds the shift timing

43. A vehicle's A/C system is working but the vent temperature is 50°F when the outside temperature is 100°F. The customer feels the A/C is not cold enough. Which of the following is the correct assessment?

A. A 50°F vent temperature is excellent and indicates the system is cooling at its maximum capacity

B. A 50°F vent temperature in 100°F ambient is below the expected performance range and indicates the system needs diagnosis

C. A 50°F vent temperature represents a 50°F temperature drop from ambient, which falls within the generally acceptable A/C performance range of 35–50°F below ambient — the system is performing at the lower end of the acceptable range and may benefit from a charge check, but it is not malfunctioning

D. The customer should add a can of refrigerant booster to improve performance

44. A vehicle's power steering has a momentary groan or moan when the steering wheel is turned at low speed immediately after a cold start. The noise disappears after 30 seconds of driving. The fluid level is correct. Which of the following is the MOST likely cause?

A. The power steering pump vanes are worn and cannot generate adequate pressure when cold

B. A faulty power steering pressure switch that activates the idle compensation too slowly

C. The steering rack has an internal bypass that worsens when the fluid is cold

D. Cold power steering fluid has higher viscosity and may contain small amounts of entrained air from sitting overnight — the thick fluid does not flow through the pump and system as easily, causing momentary cavitation and groan; as the fluid warms and thins within the first 30 seconds, the flow normalizes and the noise disappears

45. A vehicle's engine has a vacuum leak that the technician has confirmed with a smoke test. The smoke is escaping from the brake booster vacuum hose connection at the intake manifold. The technician replaces the hose and clamp, but the leak persists. Which of the following should the technician check NEXT?

A. The intake manifold fitting itself — the barbed nipple or threaded port on the manifold where the hose connects may be cracked, corroded, or broken; a new hose clamped to a damaged fitting cannot seal, and the smoke continues to escape at the connection despite the new hose

B. The brake booster check valve for a leak-back condition

C. The PCV system for excessive crankcase pressure pushing through the intake

D. A different vacuum hose that may be leaking and being misidentified as the booster hose

46. A vehicle has a P0420 (Catalyst Efficiency Below Threshold — Bank 1) code. The customer asks whether they can drive with this code or if the vehicle must be repaired immediately. Which of the following is the correct response?

A. The vehicle must be parked immediately because a failing converter can catch fire

B. The vehicle is safe to drive — a P0420 indicates the catalytic converter's efficiency has degraded below the OBD II threshold; the vehicle produces higher emissions and will fail an emissions test, but the reduced converter efficiency does not affect braking, steering, or any safety system; however, the customer should plan for repair because continued driving can worsen the condition, and the vehicle will fail emissions testing

C. The customer should drive at highway speed for 1 hour to regenerate the converter

D. The code is informational only and requires no action

47. A vehicle's scan tool shows the following PID data at idle: RPM 750, ECT 198°F, IAT 82°F, MAP 34 kPa, TPS 0.6V, STFT +3%, LTFT +1%, O2B1S1 switching, O2B1S2 steady at 0.65V. Which of the following is the SINGLE most meaningful data point that confirms the engine is running well?

A. The ECT reading of 198°F confirming the engine is at operating temperature

B. The MAP reading of 34 kPa indicating good manifold vacuum

C. The fuel trim values — STFT +3% and LTFT +1% — combined represent the MOST direct indicator of overall engine health because they show the PCM is making only minimal fuel corrections (well within the ±5% acceptable range), proving that air metering, fuel delivery, combustion, and exhaust sensing are all functioning correctly together

D. The upstream O2 sensor switching pattern confirming closed-loop operation

48. A vehicle's rear brake drum will not come off during a brake inspection. The technician has removed the wheel and the drum retaining clips/screws. The drum appears to be stuck. Which of the following should the technician try BEFORE resorting to aggressive removal methods?

A. Strike the drum with a large hammer to break it free from the hub

B. Pry between the drum and backing plate with a large screwdriver

C. Back off the brake shoe adjuster through the access hole in the backing plate or drum to retract the shoes away from the drum surface — worn drums develop a ridge at the outer edge of the friction surface that the shoe edges catch on; reducing the shoe spread allows the drum to clear the ridge and slide off; additionally, applying penetrating oil at the hub-to-drum interface and using the drum's threaded puller holes (if equipped) aids removal

D. Use a cutting torch to heat the drum and expand it off the hub

49. A vehicle's engine produces a brief puff of blue-gray smoke from the tailpipe ONLY when the engine is started after sitting for several hours. The smoke does not return during driving, acceleration, or deceleration. Oil consumption is minimal. Which of the following is the MOST likely cause?

A. A small amount of oil is seeping past the valve stem seals while the engine sits — the oil pools on top of the closed valve(s) during the off period; on startup, the first combustion events burn this small accumulated oil pool, producing the puff of blue-gray smoke that clears almost immediately and does not return because no additional oil accumulates while the engine is running

B. Worn piston rings that allow oil past during the low-vacuum condition of cranking

C. A leaking PCV valve that allows oil into the intake manifold overnight

D. Condensation in the exhaust system that has mixed with exhaust residue

50. A vehicle has been jump-started and driven to the shop. The battery is severely discharged (10.2 volts). The technician places the battery on a charger. After 30 minutes at 10 amps, the battery voltage has not risen above 10.5 volts and the charger's ammeter shows the battery is only accepting 2 amps. Which of the following is the correct interpretation?

A. The charger is malfunctioning and not delivering the set amperage

B. The battery has one or more internally shorted or severely sulfated cells that are preventing it from accepting a charge — a healthy battery that is deeply discharged will initially accept high current as it rebuilds chemical energy; a battery that cannot rise above 10.5V despite being on a charger for 30 minutes has a dead or shorted cell and must be replaced

C. The battery needs to be charged at a higher amperage setting to overcome the deep discharge

D. The battery requires a 24-hour slow charge before any assessment can be made

51. A vehicle's parking brake cable has been adjusted to the tightest setting but the parking brake still does not hold on a moderate incline. The rear brake shoes have been replaced recently and the drums are within specification. Which of the following is the MOST likely cause?

A. The parking brake cable has stretched beyond its adjustment range

B. The rear brake shoes were installed incorrectly with the primary and secondary shoes swapped

C. The brake shoe self-adjusters have not been set to the correct initial clearance — if the shoes are too far from the drum surface, even maximum cable travel cannot pull them tightly enough against the drum; the star wheel adjusters must be set to provide the correct initial shoe-to-drum clearance before the cable adjustment will be effective

D. The parking brake pedal mechanism has a broken ratchet that cannot hold tension

52. A vehicle's engine has a P0340 (CMP Sensor Circuit) code. The engine starts and runs but has poor performance. The technician replaces the CMP sensor and the code clears. Three weeks later, the code returns. Which of the following should the technician investigate?

A. The replacement sensor's air gap, which may be incorrect

B. The PCM, which may have an intermittent driver fault for the CMP circuit

C. The fuel system, since CMP codes can be triggered by fuel pressure irregularities

D. The sensor's reluctor ring (tone wheel) on the camshaft for a cracked or damaged tooth — a subtle crack or chip in the reluctor may produce a signal that is adequate most of the time but intermittently drops below the PCM's threshold under specific operating conditions; the new sensor reads the same damaged reluctor, and the code eventually returns; inspecting the reluctor requires removing the timing cover or valve cover depending on the engine design

53. A customer brings in a vehicle with four different brands of tires — one different brand on each corner. The vehicle has an open differential (non-AWD, non-4WD). The customer asks if this is a problem. Which of the following is the correct response?

A. On a vehicle with an open differential (2WD), four different brands of tires — if they are all the same size, speed rating, load rating, and construction type (all radial) — do NOT create a mechanical or safety hazard; the vehicle will function normally because an open differential does not require matched circumferences across axles; the technician should recommend matching tires on at least each axle for optimal handling, but the current configuration is not dangerous

B. Four different brands cause the ABS system to malfunction regardless of drivetrain type

C. The vehicle must have all four tires replaced with matching sets immediately

D. Different brands create a dangerous handling condition on all vehicles regardless of drivetrain

54. A vehicle's engine has a rhythmic clicking noise. The technician determines the noise frequency is exactly 1/3 of the crankshaft speed. Which of the following components operates at 1/3 of crankshaft speed?

A. The camshaft, which operates at half crankshaft speed

B. No standard engine component operates at exactly 1/3 crankshaft speed — this unusual ratio suggests an accessory drive component with a specific pulley diameter ratio that produces a 3:1 speed reduction, such as the A/C compressor, power steering pump, or water pump; the technician should calculate the pulley ratios or use a frequency analysis tool to identify which accessory matches the 1/3 speed relationship

C. The balance shaft, which operates at twice crankshaft speed

D. The oil pump, which operates at crankshaft speed

55. After performing a complete brake service — pads, rotors, fluid flush, and caliper hardware — the technician road tests the vehicle. The brakes stop the vehicle in a straight line with a firm pedal, but the stopping distance feels slightly longer than expected. Which of the following is the correct explanation?

A. The master cylinder was damaged during the fluid flush

B. The brake rotor surface finish is too rough from the manufacturing process

C. New brake pads require a proper bedding procedure (a series of moderate stops from moderate speed) to transfer an even layer of friction material to the rotor surface — until this transfer layer is established, the pad-to-rotor friction coefficient is lower than its designed maximum, producing slightly longer stopping distances; the brakes will achieve full performance after bedding is complete

D. The new brake hardware is too tight and restricting pad movement

Practice Exam 17: Answer Key and Full Explanations

1. D — A severely restricted air filter limits the air entering the engine while fuel delivery remains at normal levels, creating a rich air-fuel mixture. Excess unburned fuel washes the protective oil film from the cylinder walls, accelerating ring and bore wear. The increased wear allows oil to enter the combustion chamber, fouling spark plugs and sending oil vapor into the catalytic converter where it coats and poisons the catalyst substrate. This single restriction cascades into five downstream failures — each one preventable by a $15 air filter replacement.

2. A — A vehicle sitting for 14 months undergoes significant degradation across multiple systems simultaneously. Engine oil absorbs moisture through the crankcase ventilation system and loses viscosity from sitting. Coolant corrosion inhibitors deplete over time regardless of mileage. The battery self-discharges and may sulfate. Fuel oxidizes and absorbs water from condensation. The air intake can become home to rodent nests. Starting an engine without verifying these critical systems risks immediate damage — from running on degraded oil to hydrolocking from water-contaminated fuel.

3. C — The timing chain tensioner maintains chain tension through oil pressure. During aggressive deceleration, the momentary drop in engine RPM and oil pressure can briefly reduce tensioner force, allowing the chain to develop slack. The slack chain whips against the timing cover or guide surfaces for the 1–2 seconds it takes for the tensioner to re-extend and take up the slack. The noise is absent during all other conditions because steady oil pressure keeps the tensioner extended. This transient rattle is an early indicator of chain stretch and tensioner wear.

4. B — Both technicians describe legitimate manufacturer-specified procedures. Some engines (particularly those with solid/mechanical lifters and aluminum heads) specify cold adjustment because the aluminum expands significantly when hot, changing the clearance. Other engines specify hot adjustment to measure the actual running clearance. Using the wrong temperature produces incorrect valve lash, which causes either a noisy valve train (too loose) or burned valves (too tight). The manufacturer's service information — not assumption — determines the correct condition.

5. D — The radiator cap has two valves: a pressure relief valve (opens to push coolant to the reservoir when pressure exceeds the cap rating) and a vacuum valve (opens to draw coolant back from the reservoir when the system cools and creates vacuum). When the vacuum valve fails closed, coolant pushed into the reservoir during each heating cycle cannot return during cooling. Each drive cycle pumps more coolant out but never draws it back — the reservoir gradually overfills while the radiator gradually loses coolant. Replacing the cap restores the two-way transfer cycle.

6. C — Full synthetic oils contain more effective detergent and dispersant additives than conventional oils. When introduced into an engine that has been running conventional oil for an extended period, the synthetic's superior cleaning chemistry mobilizes varnish, sludge, and carbon deposits that the conventional oil left behind. These suspended contaminants darken the new oil rapidly — but this is the oil doing its job, not failing. The oil is holding contaminants in suspension (where they are removed at the next oil change) rather than allowing them to accumulate on engine surfaces.

7. A — The technician performed a definitive detonation confirmation test. Advancing ignition timing causes the spark to fire earlier in the compression stroke when cylinder pressure is higher — if detonation is the cause, the higher pressure at the moment of ignition makes the self-ignition worse, and the knock intensifies. Retarding timing moves the spark later when cylinder pressure is lower at the moment of ignition, preventing the conditions for self-ignition. The knock responding directly and predictably to timing changes conclusively identifies it as combustion-related detonation.

8. A — A maintenance-free battery uses calcium or calcium-lead alloy plates that reduce water consumption by minimizing electrolysis during charging. The sealed design eliminates the need for periodic water additions. A serviceable battery uses antimony-lead plates that consume water faster, requiring periodic electrolyte level checks and distilled water additions through removable vent caps. Serviceable batteries allow specific gravity testing with a hydrometer — a diagnostic advantage. Both types use the same lead-acid chemistry, both can fail, and both are tested with the same load or conductance test procedures.

9. B — In a duo-servo drum brake system, the primary (leading) shoe is shorter with less friction material, and the secondary (trailing) shoe is longer with more material — because the secondary shoe handles the majority of the braking force through the self-energizing (servo) action of the drum's

rotation. However, one shoe being COMPLETELY worn through while the other retains 3 mm suggests more than normal differential wear: the self-adjuster mechanism likely failed on the worn shoe's side, or the shoes were installed in the wrong positions during a previous service.

10. D — R-134a and R-12 have different thermodynamic properties. R-134a operates at approximately 10–15% higher system pressures and has slightly lower latent heat of vaporization (heat absorption per unit mass) than R-12. The condenser, evaporator, and system volume in an R-12 vehicle were sized for R-12's specific thermal characteristics. R-134a in this same hardware cannot reject heat as efficiently in the condenser and absorbs slightly less heat in the evaporator, resulting in reduced cooling capacity. Upgrading the condenser to a parallel-flow design or adding an auxiliary fan improves retrofit performance.

11. C — The PCV valve provides the only controlled escape path for crankcase blowby gases. When stuck closed, normal blowby gases accumulate with nowhere to go. Pressure builds inside the crankcase, eventually exceeding the sealing capacity of every gasket and seal — oil is forced past the valve cover gaskets, front and rear crankshaft seals, oil pan gasket, and even the dipstick tube. Additionally, the crankcase vapors that should be burned in the engine instead vent to atmosphere through the breather filter, increasing hydrocarbon emissions.

12. A — When the transmission shifts from Drive to Reverse, the engine's torque direction reverses. The drivetrain (engine, transmission, driveshaft assembly) is suspended on rubber mounts designed to absorb this torque reversal. Worn mounts with collapsed or torn rubber allow excessive drivetrain movement — the engine/transmission rocks from one direction to the other and impacts the mount stops or crossmember, producing a distinct clunk at the exact moment of torque reversal. The clunk occurs only during the Drive-to-Reverse transition because that is when the torque direction changes.

13. B — The antimicrobial treatment killed the existing mold colonies, and the cabin air filter replacement blocked new contaminants — yet the smell returned. The key missing element is the MOISTURE SOURCE. The evaporator condensate drain tube removes the water that feeds mold growth. If partially clogged, it allows standing water to remain in the HVAC case — providing a perpetual growth medium. The treatment temporarily kills the mold, but the wet environment regenerates new colonies within weeks. Clearing the drain tube eliminates the moisture that enables regrowth.

14. D — This is a temperature-dependent hydraulic seal failure. Internal transmission seals (particularly the forward clutch piston seals and servo apply seals) are made of rubber compounds that harden and shrink over time and mileage. When the transmission fluid is cold, these aged seals retain barely enough flexibility to seal against hydraulic pressure. As the fluid heats to operating temperature, the seals reach

their maximum hardened state, shrink slightly, and can no longer maintain the seal — fluid bypasses the piston seals, and the clutch packs slip.

15. C — The pedal sinking while the engine runs but holding firm with the engine off is the key diagnostic distinction. The brake booster multiplies the driver's pedal force by approximately 3–4× using engine vacuum. With the engine running, the amplified force pushes fluid against the worn master cylinder seals with enough pressure to bypass them internally. With the engine off, the driver's unaided leg force alone is insufficient to push fluid past the same worn seals — the seals can temporarily hold against the lower un-boosted pressure.

16. A — When the engine runs, oil is pressurized and circulating — it is contained within the pressurized lubrication circuit and flows continuously away from potential leak points. When the engine is shut off, oil pressure drops to zero and oil that was held in upper engine galleries drains by gravity to the lowest points in the engine. Oil pools at valve cover gaskets, oil pan gaskets, timing cover seals, and rear main seals. A gasket or seal with marginal integrity can hold against pressurized, flowing oil but cannot contain the weight of pooled, standing oil over hours.

17. B — In a rack-and-pinion steering system, the total rack travel determines the maximum steering angle. The rack's travel is divided between left and right turns by the inner tie rod lengths — equal tie rod lengths produce equal steering travel in both directions. If one tie rod is shorter than the other (from an incorrect replacement or an uneven toe adjustment), the rack reaches its internal stop sooner in one direction, limiting the turning radius on that side while allowing full travel on the other.

18. D — Electric power steering systems use high-amperage fuses (typically 40–80A) in the power distribution center. These large fuses can blow from a momentary current spike (caused by turning the wheel against a curb stop, hitting a pothole during a turn, or a brief motor overload) without any underlying permanent fault. On some vehicles, a blown EPS fuse does not illuminate a dashboard warning because the warning light circuit may be on a separate lower-amperage supply. Checking this single fuse takes 30 seconds and resolves the complaint if the fuse is blown.

19. C — This question presents a subtle but critical water pump diagnosis. The symptom — overheating during uphill/low-speed driving but normal at highway speed — points to a pump that moves adequate coolant at high RPM but insufficient coolant at low RPM. A corroded or broken impeller has reduced pumping capacity. At highway RPM, the faster-spinning impeller can still push enough coolant. At low RPM during high-load climbing, the damaged impeller cannot move sufficient coolant volume to transfer the increased combustion heat, and the engine overheats.

20. A — Winter fuel economy reduction is a multi-factor phenomenon. Winter-blend gasoline contains more butane (lower energy per gallon). Cold engines spend more time in open-loop enrichment during extended warm-up. Cold, thick oil creates more viscous drag on rotating components. Tire pressures drop ~1 psi per 10°F, increasing rolling resistance. Cold, dense air increases aerodynamic drag. Heater, defroster, heated seats, and heated mirrors add electrical load the alternator must supply. Each factor alone is small, but combined they produce 10–20% fuel economy reduction.

21. B — Brake rotor thickness variation (DTV) is a physical surface irregularity measured in thousandths of an inch. At 30 mph, the rotor turns approximately 7 revolutions per second — each revolution pushes the pad in and out at a low frequency and low energy that falls below the driver's tactile perception threshold. At 70 mph, the same rotor turns approximately 16 revolutions per second — the pulsation frequency doubles and the kinetic energy involved is much greater, amplifying the force transmitted through the caliper, knuckle, and steering linkage to a level the driver clearly feels.

22. D — The PCV system routes crankcase vapors — which contain oil mist, moisture, and combustion byproducts — through the intake manifold and past the EGR passages. A malfunctioning PCV system that flows excessive oil mist coats the intake manifold walls, EGR passages, and EGR valve with a sticky oil film that captures and holds carbon particles from normal combustion. This oily carbon buildup clogs the EGR passages far faster than normal dry carbon accumulation. Fixing the PCV system reduces the oil source that accelerates the carbon formation.

23. C — The power balance test systematically disables each cylinder to measure its individual contribution to engine output. When disabling a firing cylinder, the engine loses that cylinder's power contribution and RPM drops noticeably. When disabling cylinder 3 produces NO RPM change, it proves that cylinder was already contributing zero power — it is a dead cylinder. The cause could be no spark (coil/plug failure), no fuel (injector failure), or no compression (mechanical failure), but the test definitively confirms cylinder 3 is the source of the idle miss.

24. A — Positive terminal corrosion (white-green crusty buildup) is most commonly associated with an overcharging condition. Excessive charging voltage accelerates electrolysis inside the battery, producing more hydrogen and oxygen gas than normal. The increased gassing carries sulfuric acid vapor out of the positive terminal vent, where it condenses on the terminal, post, and cable clamp and reacts with the lead and copper to form the characteristic corrosion. Testing the charging system voltage (should be 13.5–14.8V) confirms or rules out overcharging as the cause.

25. B — Many modern engines use variable-length intake manifolds with flaps (IMRC, CMCV, or similar) that close at low RPM for velocity and open at high RPM for volume. The transition between short-runner (closed flaps) and long-runner (open flaps) modes typically occurs between 2,000 and

3,000 RPM. If the actuator motor, vacuum solenoid, or linkage sticks during transition, airflow to ALL cylinders is momentarily disrupted as the flaps hesitate between positions. This creates a brief random misfire that exists only in the narrow RPM band where the transition is commanded.

26. D — Automatic transmission seal materials (particularly Teflon, Viton, and neoprene seals on clutch pistons and servos) harden progressively with age, heat cycling, and chemical exposure. When cold, these hardened seals retain marginal elasticity — enough to seal against line pressure because the cold, thick fluid provides additional sealing assistance. As the fluid heats and thins (reducing its viscosity-based sealing contribution), and the seals reach their maximum hardened state, the combined seal-plus-fluid seal integrity falls below the threshold needed to maintain apply pressure, and the clutch packs slip.

27. C — Metal particles on the drain plug magnet combined with a noise complaint indicate active, ongoing gear or bearing wear inside the differential. The magnet captures ferrous particles from the gear and bearing surfaces as they deteriorate. Fine, powdery residue from initial break-in is expected on a new differential; distinct metallic particles, chips, or shavings on a used differential are NOT normal. The whining noise further confirms that meshing gear teeth or bearing races have surface damage that is producing both the noise and the metal debris.

28. A — During a leak-down test, compressed air is introduced into the cylinder through the spark plug hole with the piston at TDC on the compression stroke (both valves closed). The air can only escape through three paths: past the piston rings (heard at the crankcase/oil filler), past the exhaust valve (heard at the tailpipe), or past the intake valve (heard at the throttle body/air filter). Air escaping from the oil filler opening confirms the leak path is through the piston rings into the crankcase — the rings cannot seal against the cylinder wall on that cylinder.

29. D — One quart per 3,000 miles is the manufacturer's stated acceptable consumption threshold for this engine. While the customer's concern is understandable, the current consumption rate falls exactly at the manufacturer's limit. The correct professional approach is to document the rate, set a monitoring baseline, and track whether consumption is STABLE (holding at 1 quart/3,000 miles) or ACCELERATING (increasing to 1 quart/2,000, then 1,500, etc.). Stable consumption at the threshold requires monitoring; accelerating consumption requires investigation.

30. B — Both sensors are displaying normal, healthy patterns. The upstream sensor (B1S1) switching 8 times in 10 seconds (approximately 0.8 Hz) is within the normal switching rate range, confirming the sensor is responsive and the PCM is actively controlling the air-fuel ratio in closed loop. The downstream sensor (B1S2) showing a steady 0.68V (slightly rich-biased) confirms the catalytic converter is effectively storing and releasing oxygen — smoothing the exhaust gas oscillations. A failed converter would show the downstream sensor mimicking the upstream switching pattern.

31. C — Halogen headlight housings use precisely calculated reflector geometry and lens optics designed for a specific light source: a small, cylindrical tungsten filament at an exact position within the bulb. An HID arc tube produces light from a plasma arc at a different position, shape, and angle than the halogen filament. The reflector catches this mispositioned light and scatters it in uncontrolled directions — producing intense glare that blinds oncoming traffic while failing to focus sufficient light into the controlled forward beam the driver needs. The result is worse visibility despite appearing brighter.

32. A — Ceramic brake pad compounds generate brake dust that is typically lighter in color (gray or tan) compared to the dark black dust from semi-metallic pads. While ceramic pads often produce LESS total dust by weight, the lighter color contrasts sharply against dark wheel finishes, making it more visible. The customer may be seeing the same or less dust but perceiving MORE because of the color difference. If the dust is genuinely excessive, the pad quality should be evaluated — budget ceramic compounds can shed material faster than premium brands.

33. D — This vacuum gauge pattern is the textbook response of a healthy engine. At steady idle, 21 in. Hg indicates good piston ring and valve sealing. During snap throttle (wide-open), the large throttle opening equalizes manifold pressure with atmospheric — the gauge correctly drops to 0 as vacuum disappears. As the throttle snaps closed and the engine decelerates, the pistons continue pumping against the closed throttle, creating a momentary vacuum spike to 25 in. Hg that confirms excellent cylinder sealing. The gauge then settles back to the steady 21 in. Hg idle reading.

34. B — Smoke machines typically pressurize the EVAP system to 1–2 psi, which is sufficient to find most external leaks. However, the PCM's OBD II EVAP monitor uses different testing conditions — it may apply a specific vacuum level or pressure that differs from the smoke machine's output. A hairline crack in the fuel tank, a micro-porous charcoal canister, or a valve with a minimal seat imperfection may seal perfectly at 1–2 psi but leak under the specific conditions the PCM creates during its monitor. Enhanced EVAP testing at the PCM's exact test conditions may be needed.

35. C — The human nose can detect ethylene glycol odor at extraordinarily low concentrations — parts per million. A heater core seepage so minute that it produces no visible liquid, no measurable coolant loss between checks, and no windshield fogging can still emit enough vapor to produce a detectable sweet smell inside the cabin. The HVAC blower circulates cabin air across the evaporator and heater core continuously, concentrating even trace amounts of coolant vapor. This early-stage seepage often precedes a visible leak by months.

36. A — The MAF unplugged test is the definitive MAF validation procedure. When the MAF is disconnected, the PCM switches from measured airflow to a calculated airflow estimate based on RPM, MAP, IAT, and throttle position. If the engine runs BETTER on the calculated estimate than with the

MAF connected, the MAF's actual readings are less accurate than the PCM's backup calculation. This proves the MAF is the problem. Common causes include a contaminated hot wire element, a cracked sampling tube, or an internal circuit fault that distorts the airflow reading.

37. D — Adaptive cruise control systems maintain the set speed whenever the forward path is clear. When a slower vehicle ahead moves out of the sensor's detection zone, the system commands acceleration to close the gap between current speed and the set speed. The rate of this acceleration is a calibrated parameter — some systems accelerate more aggressively than others, and many offer adjustable acceleration profiles (eco, normal, sport) through the vehicle settings menu. This is designed behavior, not a malfunction.

38. B — Transmission fluid expands as it heats. The dipstick has separate markings for "cold" (ambient temperature) and "hot" (operating temperature) to account for this expansion. When checked at operating temperature, the fluid should be at the "hot" mark. A level reading between the cold and hot marks when the fluid IS hot means the fluid has not expanded to the expected volume — indicating the system is approximately half a quart low. This distinction between checking conditions is one of the most commonly confused aspects of transmission maintenance.

39. D — A rocker arm that does not move while all others operate normally has lost its actuation source. The cam lobe that pushes the lifter (which pushes the pushrod, which pushes the rocker) has either worn completely flat or the lifter/pushrod has collapsed or broken. A flat cam lobe looks like a circle instead of an egg shape — it no longer has the eccentric profile needed to push the lifter upward. The associated valve remains closed at all times, creating a dead cylinder. The ticking noise comes from the remaining clearance between components that is never taken up by cam lobe lift.

40. D — Halogen headlight bulbs use a tungsten filament enclosed in a halogen gas atmosphere. Over thousands of hours of operation, tungsten atoms evaporate from the white-hot filament and deposit on the cooler glass envelope — a process called tungsten migration. This creates a progressively darkening film on the inside of the glass that absorbs and blocks light. The filament also gets thinner and changes shape, shifting its color temperature toward yellow. The combined effect reduces light output by 20–40% before the thinned filament finally breaks and the bulb burns out.

41. A — The engine runs fine (confirmed by no drivability complaints, no DTCs, no P0128 code), which means it IS reaching operating temperature — the PCM's ECT sensor is reading correctly and the engine management system is operating normally. Many vehicles use TWO separate coolant temperature sensors: one for the PCM and one for the dashboard gauge. The gauge sender has failed in the cold-reading position, giving a false reading. If the vehicle used a single sensor for both functions, the PCM would also see cold temperature and set a P0128 code.

42. B — Each automatic transmission shift uses a dedicated accumulator to cushion the clutch engagement. The accumulator is a spring-loaded piston in a bore that absorbs hydraulic pressure gradually — like a shock absorber for the shift. When the 3-4 accumulator piston sticks in its bore (from varnish deposits, debris, or a damaged seal), it cannot move to absorb the pressure spike. The full line pressure hits the 3-4 clutch pack instantly instead of gradually, producing the harsh engagement. All other shifts feel normal because their accumulators function correctly.

43. C — A/C performance is evaluated by the temperature differential between ambient air and vent discharge. A vent temperature of 50°F in 100°F ambient conditions represents a 50°F drop, which falls at the lower boundary of the generally acceptable 35–50°F range. The system IS cooling, and the output is within expected parameters — albeit at the minimum end. A charge verification is a reasonable service recommendation, but the system is not malfunctioning. Telling the customer the system is "broken" when it is performing within specification damages credibility.

44. D — Cold power steering fluid has significantly higher viscosity than warm fluid, and overnight settling allows micro-bubbles of air that are normally entrained in the fluid to partially separate. On first startup, the thick, slightly aerated fluid flows sluggishly through the pump, creating momentary cavitation (the pump tries to move fluid faster than the thick fluid can follow). This cavitation produces the groaning or moaning noise heard during the first few steering inputs. Within 30 seconds, the fluid warms enough to flow freely and the entrained air reabsorbs, and the noise disappears.

45. A — The technician replaced the HOSE but the leak persists at the same connection point. If the new hose and new clamp are properly installed and still leak, the problem is the fitting the hose connects TO. The barbed nipple or threaded port on the intake manifold may have a crack, corrosion pit, or broken barb that prevents any hose from sealing against it. A new hose clamped to a damaged manifold fitting is like putting a new gasket on a warped surface — the gasket is fine, but the mating surface cannot seal.

46. B — A P0420 code indicates degraded catalytic converter efficiency — an emissions compliance issue, not a safety issue. The vehicle's braking, steering, suspension, and powertrain systems are completely unaffected by converter efficiency. The vehicle will produce higher tailpipe emissions and will fail emissions testing in inspection-required jurisdictions. The customer should plan for repair, as converter efficiency typically continues to decline with continued driving. The most urgent concern is whether an underlying engine condition (misfires, rich running) is damaging the converter — if so, that condition should be addressed promptly.

47. C — Of all the PID values displayed, the fuel trim values (+3% STFT, +1% LTFT) are the single most comprehensive indicator of engine health because they represent the PCM's COMBINED

assessment of air metering accuracy (MAF/MAP), fuel delivery precision (injectors, fuel pressure), combustion efficiency (compression, ignition), and exhaust analysis accuracy (O2 sensors). When fuel trims are within ±5%, every system in the fuel-air-combustion-exhaust chain is working correctly together. A single number that validates the entire system is the most powerful diagnostic data point available.

48. C — Drum brakes develop a wear ridge at the outer edge of the drum's friction surface over time. When the brake shoes wear, they spread wider. The shoe edges can catch on this ridge, preventing the drum from sliding off the hub. Before resorting to force, the technician should FIRST back off the self-adjuster through the access hole to retract the shoes inward — this pulls the shoe edges away from the drum's ridge and allows the drum to clear. Penetrating oil at the hub-to-drum interface addresses corrosion bonding. Threaded puller holes (if present) provide controlled mechanical force.

49. A — Valve stem seals sit on the valve guides and prevent oil from flowing down the guides into the combustion chambers. When the engine sits for several hours, a small amount of oil seeps past worn seals and collects in a pool on top of the closed valves. When the engine starts, the first intake stroke opens the valve, and the pooled oil drops into the cylinder and burns — producing a single puff of blue-gray smoke. Once the engine is running, continuous oil flow down the guides is minimal (it is wiped by the seal even in its worn state), and no additional smoke is visible.

50. B — A healthy deeply discharged battery will initially accept high charging current as its plates undergo the electrochemical reversal from lead sulfate back to lead dioxide and sponge lead. If a battery has been on a charger for 30 minutes and the voltage has not risen above 10.5V despite available current, one or more cells have an internal failure — either a permanent sulfation crystallization that cannot be reversed, a shorted cell from plate shedding, or a cracked cell partition. The battery cannot be recovered and must be replaced.

51. C — The parking brake cable transmits the pedal/lever force to the rear brake shoes. The cable's maximum travel is designed to accommodate the correct shoe-to-drum clearance. If the star wheel adjusters were not set to the proper initial clearance during the brake shoe installation (shoes too far from the drum), the cable must travel further to bring the shoes into contact with the drum. If the required travel exceeds the cable's maximum adjustment range, even full cable tension cannot press the shoes firmly enough against the drum to hold.

52. D — The CMP sensor was replaced (new sensor proven by code clearing initially) but the code returned after three weeks. This means the new sensor is reading the same anomaly the old sensor detected — the problem is in the signal SOURCE, not the sensor. The reluctor ring (tone wheel) on the camshaft has a physical defect — a hairline crack, a chipped tooth, or accumulated debris in a tooth gap

— that intermittently produces a signal anomaly the PCM detects as a circuit fault. A new sensor reading a damaged reluctor produces the same code.

53. A — On a two-wheel-drive vehicle with an open differential, tire brand mixing across all four corners does not create any mechanical problem. The open differential accommodates speed differences between the two driven wheels naturally, and the non-driven axle has no mechanical coupling between its two wheels. As long as all tires match in SIZE (same rolling circumference), speed rating, load rating, and construction type (all radial), the vehicle's ABS, traction control, and handling are unaffected by brand differences. Matching brands per axle is ideal for optimal handling but is not a safety requirement.

54. B — Standard engine components operate at specific ratios to the crankshaft: camshaft at 1/2 speed, oil pump and distributor at 1/2 or 1:1 speed, balance shaft at 1:1 or 2:1 speed. No standard internal engine component operates at 1/3 crankshaft speed. A 3:1 speed ratio must come from the accessory drive belt system, where pulley diameter ratios determine the speed relationship. An accessory with a pulley three times the crankshaft pulley's diameter turns at 1/3 crankshaft speed. Calculating pulley ratios or using a vibration analyzer identifies which accessory matches the noise frequency.

55. C — New brake pads fresh from the box have a uniform friction surface that has not yet developed the transfer layer needed for maximum stopping power. The bedding procedure (a series of moderate decelerations from moderate speed) generates controlled heat that transfers a thin, even layer of pad material onto the rotor surface. This transfer layer creates the correct pad-to-rotor friction interface. Until bedding is complete, the raw pad surface operates at 60–80% of its maximum friction coefficient, producing the slightly longer stopping distances the technician observes during the initial road test.