PRACTICE EXAM 13: ASE A5 BRAKES SIMULATION

Total Questions: 45 **Recommended Time:** 75 minutes **Domain Distribution:** Domain A: 19 questions | Domain B: 5 questions | Domain C: 11 questions | Domain D: 10 questions

1. A vehicle's brake system has the following symptom: the brake pedal has normal height and feel at room temperature but the pedal becomes progressively firmer and higher as the vehicle is driven. After 20 minutes of driving, the pedal applies the brakes with very little pedal travel. No warning lights. The condition reverses after the vehicle cools overnight. Which of the following is MOST likely the cause?

A. Brake fluid is boiling — vapor is increasing system pressure and raising the pedal

B. The master cylinder compensating port is gradually becoming blocked by debris that swells in brake fluid during operating temperature. The swelling blockage traps fluid in the circuit and prevents return to the reservoir, causing residual pressure to build and the brakes to drag progressively

C. The drum brake automatic adjusters are advancing with each stop — progressive adjuster advancement raises the pedal over the drive

D. Air in the system expands during heating — the expanding air raises the pedal progressively

2. A technician is replacing a rear axle seal on a vehicle with rear drum brakes. Before installing the new seal, the technician should inspect which of the following brake system component for oil contamination?

A. The rear brake line fitting — oil can wick up the brake line threads and contaminate the hydraulic fluid

B. The rear wheel cylinder dust boots and any evidence of oil inside the drum — oil from the axle seal leak may have contaminated the brake shoe linings and wheel cylinder

C. The rear ABS wheel speed sensor — axle seal oil can coat the sensor tip and reduce signal amplitude

D. The proportioning valve — oil contamination of the proportioning valve affects its split pressure calibration

3. A vehicle with disc brakes all around develops a hard spot on the right front rotor — a localized area of hardened, polished iron approximately 1 inch in diameter visible on the rotor surface. Which of the following BEST explains how hard spots form?

A. Hard spots form from localized porosity in the rotor casting — the porous areas collapse under brake heat and form dense, hard zones

B. Hard spots are caused by a localized hot spot during a severe stop — the intense localized heat converts the iron crystal structure in that area from pearlitic to martensitic. Martensitic iron is harder than normal rotor iron and has different friction and thermal properties. Resurfacing removes the hardened surface layer only if there is sufficient rotor thickness — if the hard spot is deep, the rotor must be replaced

C. Hard spots result from brake pad material depositing unevenly on the rotor surface — the pad deposit creates a hard, polished area

D. Hard spots form from rotor material that was annealed during manufacturing and then re-hardened by brake heat

4. A vehicle is being serviced and the technician discovers the left front caliper slide pin boot is torn at its caliper body end. The slide pin itself is not corroded and moves freely within the bore. The caliper is being replaced for an unrelated reason. Which of the following is the correct service recommendation?

A. Reuse the torn boot if the slide pin is not corroded — the caliper will be replaced regardless, so the boot condition is not critical

B. The replacement caliper should come with new slide pin boots — install the new boots that come with the replacement caliper on the new caliper body

C. Apply silicone sealant to the torn area of the boot to restore its sealing function

D. Order separate boot replacement kits regardless of whether the caliper comes with new boots — factory-installed boots may not be the highest quality

5. A vehicle has a brake pedal that is firm and at normal height during static testing but during a road test the pedal gradually fades over a 10-minute drive under normal light braking — not hard or repeated stops. After pulling over and letting the vehicle sit for 5 minutes, the pedal is firm and normal again. Which of the following is MOST likely the cause?

A. Brake fluid is boiling — light normal braking generates enough heat to boil the fluid gradually

B. The master cylinder cup seals are overheating from friction against the bore — the heat causes the seals to soften and bypass during extended operation

C. The brake caliper piston seals are thermally expanding during operation — the expanded seals reduce caliper clamping force

D. A front caliper piston is slowly seizing during operation — the slight dragging creates heat that gradually warms the entire front circuit. The warm fluid expands and the expanding fluid slowly pushes fluid back through the master cylinder compensating port. On recovery, the cooled, contracted fluid allows the pedal to return to normal

6. A vehicle with rear drum brakes has been diagnosed with excessive running clearance on both sides — the automatic adjusters are not advancing. Inspection shows the adjuster star wheel and lever appear intact. The technician confirms the rear brakes are adjusted correctly, then drives the vehicle in reverse and applies the brakes firmly several times. After each reverse stop, the technician checks the clearance — it has not changed. Which of the following is the MOST likely cause of the non-advancing adjuster?

A. The star wheel is advancing but immediately retracting after each reverse stop — the adjuster spring is too strong

B. The adjuster cable or lever is connected to the wrong shoe — the lever moves during reverse braking but actuates a shoe that does not drive the star wheel in the advancing direction

C. The rear drums are at maximum diameter — the shoes cannot advance because there is no more drum material to contact

D. The wheel cylinder is at full extension — the adjuster cannot advance because the wheel cylinder piston is already at its maximum stroke

7. A vehicle with a vacuum brake booster develops a condition where the brake pedal slowly drifts down under sustained foot pressure with the engine running. With the engine off and two pump strokes to exhaust booster vacuum, the pedal holds firm under sustained pressure. Which of the following does this test sequence indicate?

A. The master cylinder has failed — the pedal sinks regardless of booster state

B. The vacuum booster diaphragm has a leak — with the engine running and vacuum present, the leaking diaphragm allows pressure equalization that causes the booster output force to gradually decrease under sustained load, making the pedal sink. Without engine vacuum, the diaphragm leak cannot cause pressure equalization and the hydraulic system holds normally

C. The vacuum check valve has failed — vacuum is escaping during the pedal hold and the booster assist is being lost gradually

D. The master cylinder primary piston is sticking — with booster assist, the piston moves further and then sticks in an overextended position

8. A vehicle with disc brakes all around has a right rear caliper with a dual-piston design. After pad replacement, the technician notices the right rear brake drags noticeably. Both pistons retract individually when tested by hand. The slide pins are free. Opening the right rear bleeder screw releases the drag immediately. Which of the following is MOST likely the cause?

A. A seized right rear caliper piston seal preventing retraction

B. The right rear flexible brake hose has an internal one-way restriction — application pressure passes freely but return flow is restricted, holding residual pressure in the caliper after the pedal is released

C. The right rear caliper bracket is bent — it is holding the caliper against the rotor mechanically

D. The master cylinder compensating port is partially blocked — residual pressure is retained specifically in the right rear circuit

9. A vehicle's brake system has been diagnosed with vapor lock — brake fluid has reached boiling point during extended downhill braking. Which of the following is the correct sequence of events that leads from fluid boiling to pedal fade?

A. Boiling fluid increases viscosity — the thicker fluid cannot flow through the circuit quickly enough to generate adequate pressure

B. Boiling fluid vaporizes into a gas — the gas bubble is compressible. When the brake pedal is applied, the applied force compresses the gas bubble rather than transmitting pressure to the caliper pistons — the pedal falls through without generating clamping force

C. Boiling fluid expands and pushes the caliper pistons fully outward — the pistons cannot retract after expansion, creating continuous drag

D. Boiling fluid destroys the master cylinder cup seals — the compromised seals cannot maintain pressure after the fluid reaches boiling point

10. A vehicle's left front ABS wheel speed sensor is being replaced. The replacement sensor is a passive (inductive) type. The technician installs the new sensor and measures resistance across the

sensor terminals — the reading is 1,150 ohms. The specification is 950 to 1,400 ohms. The sensor air gap is set to specification. Which of the following should the technician do NEXT?

A. Replace the sensor — 1,150 ohms is within specification but passive sensors should read exactly 1,000 ohms for correct ABS function

B. No further resistance testing is needed — 1,150 ohms is within specification. Verify sensor signal accuracy using scan tool live data during a low-speed test drive before returning the vehicle

C. Adjust the sensor air gap closer to the tone ring to lower the resistance reading toward the middle of the specification range

D. Replace the sensor wiring harness — within-specification resistance at the sensor terminals with a new sensor indicates the harness is adding resistance to the circuit

11. A vehicle with a single-piston floating front caliper has a complaint of the car pulling to the left during braking. The technician confirms the left front caliper slide pins are free and the left front piston extends and retracts normally. The right front caliper slide pins are also free and the right front piston retracts normally — however, when the technician manually extends the right front piston by applying brake pressure, the piston does not extend as far as the left front piston for the same pedal input. The right front pad is noticeably thicker than the left. Which of the following is MOST likely the cause?

A. The right front flexible brake hose has a partial internal restriction limiting pressure delivery to the right front caliper

B. The right front caliper piston bore diameter is smaller than the left — generating less force at equal pressure

C. The right front master cylinder outlet port is partially blocked

D. The right front brake pad compound has a higher friction coefficient — less extension is needed to generate equal force

12. A vehicle with rear drum brakes has been in service for 80,000 miles with the original brake shoes. The rear drums measure within maximum diameter. The lining is at 2.5mm — just above the 2mm minimum. During inspection, the technician notices the shoe lining is starting to separate from the shoe table at the edges on both rear shoes. Which of the following is the correct recommendation?

A. The shoes are above minimum thickness — return them to service and schedule replacement at the next service

B. Replace both rear brake shoes — lining separation from the shoe table is a structural failure that will worsen under heat and brake application stress regardless of remaining lining thickness. A delaminating lining can separate during a hard stop

C. Apply bonding adhesive to the separated edges and clamp overnight before returning to service

D. Replace only the shoe with the most separation — the other shoe can remain in service until the next inspection

13. A vehicle equipped with ESC and TCS has a DTC for the throttle position sensor signal out of range stored in the ESC/TCS module. The TCS warning light is on. The engine is running normally and the ECM shows no TCS-related DTCs. Which of the following BEST explains why the ESC/TCS module has a TPS DTC?

A. The ECM and ESC/TCS module share the same TPS sensor — if either module detects a fault the other module also stores the code

B. The ESC/TCS module receives throttle position data through the vehicle data network to coordinate its torque reduction requests with the ECM. If the TPS data on the network is out of the module's expected range, the ESC/TCS module stores a DTC for the received signal — indicating a network data quality issue rather than the sensor itself failing

C. The TPS directly controls TCS activation — when TPS signal is out of range the TCS incorrectly activates

D. The ESC module uses TPS data to calculate the vehicle's intended acceleration — a TPS fault disables ESC completely

14. A vehicle with ABS and electronic parking brake develops a condition where the EPB will not release after being applied. The EPB motor is heard running when the release is commanded — the motor runs briefly then stops without releasing the caliper. No DTCs are stored for the EPB motor circuit. The rear caliper slides freely and the rear pads are at adequate thickness. Which of the following is MOST likely the cause?

A. The EPB motor is running in the wrong direction — it is applying more force rather than releasing

B. The EPB caliper internal drive mechanism (ball screw or thread mechanism) has seized — the motor runs but cannot convert rotational motion to linear piston retraction

C. The EPB actuator motor brushes are worn — the motor runs briefly from stored momentum then stops

D. The rear brake pads are not the correct specification — incorrect pads prevent the EPB mechanism from completing its release travel

15. A technician is performing a road test after a complete brake overhaul. During moderate highway driving, the technician notices a rhythmic thumping from the right rear every 1.5 seconds. The thumping does not change with braking application or release — it is present at constant speed. No brake-related symptoms are present. Which of the following MOST likely explains this finding?

A. Right rear rotor lateral runout contacting the brake pad during each rotation

B. A right rear wheel bearing defect causing rhythmic noise at a rate corresponding to wheel rotation

C. The right rear automatic adjuster advancing at highway speed and periodically contacting the drum

D. Right rear caliper piston cycling from a stuck bleeder screw creating a rhythmic hydraulic pulsation

16. A vehicle with front disc and rear drum brakes has a brake pedal that feels normal at low deceleration rates but becomes spongy under hard braking from highway speed. The pedal firms up after pumping. No ABS activation occurs during the hard stops. Which of the following is MOST likely the cause?

A. Air trapped in the ABS HCU is released into the circuit only during high-pressure hard-stop events

B. The front flexible brake hoses are expanding under the high pressure of hard braking — the hose expansion adds compressibility to the circuit, creating the spongy feel that disappears after pumping moves fluid into the expanded hoses

C. The master cylinder primary cup seal is marginal — it seals adequately at low pressure but bypasses under high pressure hard-stop force

D. The brake fluid has high moisture content — the moisture vaporizes under the heat of hard braking

17. A vehicle's brake system has a residual pressure check valve in the rear circuit outlet of the master cylinder. The check valve has failed in the open position — it no longer maintains any residual pressure in the rear circuit. Which of the following symptoms would MOST likely result?

A. Rear brake lockup — without residual pressure limitation the rear circuit receives excessive pressure

B. Rear brake drag — without the check valve venting function the rear circuit retains full application pressure after release

C. A slightly longer rear brake pedal travel or delayed rear brake engagement — the wheel cylinder cups must reseat against the bore walls from their relaxed position before hydraulic pressure can begin building, requiring more initial fluid volume displacement before pressure rises

D. Master cylinder failure — the check valve failure allows the rear circuit to backfeed into the primary master cylinder piston

18. A vehicle has a combination valve that has been reported to illuminate the brake warning light intermittently under hard cornering. The pressure differential valve is the suspected cause. Which of the following BEST explains how hard cornering could trigger the pressure differential valve warning switch?

A. During hard cornering, centrifugal force physically displaces the pressure differential valve spool toward the outside of the turn

B. During hard cornering, dynamic weight transfer and lateral forces alter the distribution of braking force between the front and outer versus inner wheels — this can briefly create a minor pressure imbalance between the two hydraulic circuits that displaces the pressure differential valve spool enough to contact the warning switch

C. Hard cornering generates heat that temporarily expands the pressure differential valve bore — the expanded bore allows the spool to contact the switch

D. Cornering forces cause the brake fluid to slosh within the reservoir — the sloshing fluid activates the float switch simultaneously with the pressure differential valve

19. A vehicle is brought in with all four brake pads worn to metal-to-metal contact. The customer reports hearing loud grinding during every stop. All four rotors are deeply scored. A complete brake system overhaul is being performed. Before replacing pads and rotors, which of the following brake system components must also be inspected that are most often overlooked after metal-to-metal pad contact?

A. The proportioning valve — metal debris from the worn pads contaminates the proportioning valve

B. The master cylinder — metal-to-metal contact generates excessive heat that boils the brake fluid and damages master cylinder cup seals

C. The flexible brake hoses — metal-to-metal contact sometimes damages hose routing brackets, pinching the hoses

D. The caliper piston face and boot condition, and wheel cylinder boots if equipped — metal-to-metal contact generates extreme heat that can damage the caliper dust boots and piston seals from the thermal exposure. Damaged boots allow contamination into the bore

20. A vehicle with an ESC system is being diagnosed after the ESC warning light came on. The technician retrieves a DTC for implausible signal from the steering angle sensor. During diagnosis, the technician confirms the SAS wiring and connector are intact. The scan tool shows the SAS reading steady 0 degrees during a slow, tight left turn in a parking lot. Which of the following is the correct service action?

A. Replace the steering angle sensor — a steady 0-degree reading during an obvious turning maneuver confirms sensor internal failure

B. Perform a steering angle sensor zero-point calibration first — if the SAS was never calibrated after a prior service, it may be frozen at 0 degrees regardless of steering input because it has no valid reference point

C. Inspect the steering column for binding — a mechanically seized steering column would cause the sensor to read 0 degrees despite normal wheel-level turning

D. Replace the ESC module — the 0-degree reading indicates the module is not processing SAS input correctly

21. A vehicle is equipped with full four-channel ABS. During a road test, the ABS activates correctly during a hard stop on dry pavement. After the stop, the ABS warning light illuminates and stays on. A scan tool shows a DTC for ABS pump motor — run time exceeded. Which of the following BEST explains this condition?

A. The ABS pump motor failed during the hard stop — it overloaded and burned out

B. The ABS system ran the pump motor for longer than its designed continuous run time during the extended hard stop event — the module stores this DTC to indicate the pump motor approached or exceeded its thermal limit. The light will extinguish and the DTC can be cleared after the pump motor cools. If the DTC does not return under normal use, no further service is required

C. The ABS hard stop caused a hydraulic leak that required extended pump run time to maintain circuit pressure — find and repair the leak before clearing the DTC

D. The scan tool DTC indicates the pump relay contacts have welded closed from the high current draw during the hard stop

22. A vehicle with rear drum brakes has a complaint of the rear drums being very difficult to remove during routine service — they are seized to the hub/axle flange. No emergency brake cable is engaged and the shoes are backed off completely. Which of the following is the MOST appropriate technique to remove a severely rust-seized drum?

A. Use an air chisel at the drum-to-hub seam to cut the rust bond

B. Apply penetrating oil to the drum-to-hub seam and allow it to soak overnight, then use a rubber mallet or drum puller to break the rust bond. Use the jack-screw holes in the drum flange if present. Never use excessive heat on a drum that will be reused — heat can distort the drum and alter its metallurgy

C. Weld a puller plate to the drum flange and apply hydraulic force

D. Drive the vehicle slowly with the parking brake applied — the friction will generate heat that breaks the rust bond

23. A vehicle with four-channel ABS has a condition where the ABS activates at all four wheels simultaneously during every light brake application in a parking lot. The activation is brief and then stops. The ABS warning light is not on and no DTCs are stored. The wheel speed sensors all read correctly at speed. Which of the following MOST likely explains the low-speed, low-pressure ABS activation?

A. The master cylinder relief valve is failing — it is releasing hydraulic pressure during light applications and triggering ABS

B. The ABS self-test is cycling the solenoid valves during the first low-speed stop after each ignition-on event — this is a normal design feature on some vehicles and occurs only once per drive cycle

C. Brake fluid air is displacing at low pressure and causing simultaneous wheel speed signal loss

D. The brake pedal position switch is sending a false signal to the ABS module during light applications

24. A vehicle with rear disc brakes is being serviced. During caliper removal, the technician applies the brake pedal to push the piston out of the bore before removing the caliper. The piston extends to approximately 1 inch beyond the caliper face before the caliper is removed. After caliper removal, the piston slips completely out of the bore and falls to the floor. Which of the following should the technician do?

A. Reinstall the piston into the bore, install the new pads, and bleed the caliper — the piston is undamaged and can be reused

B. Inspect the piston and bore for scratches or contamination from the floor. If undamaged, clean thoroughly, inspect the piston seal and boot, and reinstall with fresh brake fluid as lubricant. If damaged, replace the caliper

C. Replace the caliper — any piston that has left the bore has been contaminated and cannot be safely reinstalled

D. Reinstall the piston and add additional bleeder passes — the seal was not damaged by the piston exit

25. A vehicle with front disc and rear drum brakes has both circuits of the dual master cylinder at correct fluid level. The front circuit reservoir section is normal. The rear reservoir section is overfull — above the maximum line. The technician did not add fluid and no service has been performed. Which of the following MOST likely explains the overfull rear section?

A. The rear proportioning valve is back-feeding fluid from the front circuit into the rear section

B. The rear drum brake self-adjusters have retracted the shoes — the retracted shoes allowed the wheel cylinder pistons to move inward, displacing fluid upward into the rear reservoir section

C. The rear wheel cylinders are leaking fluid that is being redirected to the reservoir through a failed check valve

D. The rear flexible brake hoses have internal restrictions — trapped pressure is forcing fluid backward into the reservoir

26. A vehicle with four disc brakes and ABS is road tested after a complete brake service. During one hard stop, the ABS activates and the vehicle pulls to the right during the ABS event. The vehicle tracks straight during all non-ABS stops. No pulling occurs before or after ABS activation. Which of the following is MOST likely the cause?

A. The left front ABS modulation is releasing too much pressure — the left front loses braking force disproportionately during ABS cycling

B. The right front ABS solenoid valve has a restriction — during ABS modulation it cycles slower than the left front, leaving more pressure at the right front and causing right pull

C. Tire tread depth is different between left and right front — during ABS modulation the lower-tread tire grips less and the vehicle pulls toward the higher-traction side

D. The front proportioning valve is affecting ABS pressure distribution during modulation

27. A vehicle with a tandem master cylinder has been sitting for several years with moisture-contaminated brake fluid. Upon inspection, the technician finds both front calipers are seized — pistons completely immobile. Both rear wheel cylinders are also seized. The brake lines appear intact. Which of the following represents the MOST complete and correct service approach?

A. Flush the fluid and replace the caliper and wheel cylinder seals — the seized components can be rebuilt in place

B. Replace the master cylinder, both front calipers, both rear wheel cylinders, all flexible brake hoses (which degrade from long-term moisture exposure), flush and bleed the complete system with fresh fluid, and inspect all rigid lines for internal corrosion

C. Replace only the seized calipers and wheel cylinders — the master cylinder and brake lines are not affected by moisture contamination

D. Flush the system with fresh fluid and attempt to free the seized pistons with repeated pedal applications before replacing any components

28. A vehicle has a brake warning light that comes on when the brakes are applied firmly and extinguishes when the pedal is released. The parking brake is confirmed released and the fluid level is correct. Which of the following is MOST likely the cause?

A. The brake pedal position switch is sending a signal to the warning light circuit during firm pedal application

B. The pressure differential valve spool is marginally displaced from center — firm brake application creates enough circuit pressure imbalance to move the spool further into contact with the warning switch. When the pedal is released, pressure equalizes and the spool returns to center, extinguishing the light

C. The master cylinder primary cup seal is bypassing during high-pressure application — the bypass triggers the warning circuit

D. The vacuum booster is consuming vacuum during firm application — the vacuum drop activates a vacuum warning circuit connected to the brake warning light

29. A vehicle with electronic parking brake develops a DTC for EPB motor stall — the motor ran but could not complete the application stroke. The rear pads are at 4mm and the caliper slides freely. The EPB motor is confirmed to operate. Which of the following is MOST likely the cause?

A. A software fault in the EPB module caused the application stroke to be incorrectly measured — update the module software

B. The EPB caliper piston ball-screw or thread drive mechanism is seized — the motor runs but the mechanical drive cannot extend the piston to complete the application

C. The rear brake pads are too new — fresh pads have a different compressibility that prevents the motor from completing its application stroke

D. The EPB motor current limit was reached before application was complete — increase the current limit through scan tool parameter adjustment

30. A vehicle has a brake pedal that is exactly at the correct height but has significantly more travel than normal before braking begins — there is a long soft section at the top of the pedal stroke before the brakes begin to engage. Which of the following MOST likely explains this combination of correct height but excessive initial travel?

A. Air in the hydraulic circuit — air compresses during the initial soft travel before fluid pressure can build

B. Worn brake pads — the pistons are extended further from the bore to compensate for pad wear, requiring more fluid volume before pressure builds

C. The master cylinder pushrod free play is excessive — the pedal must travel through the extended free play gap before the pushrod contacts the master cylinder piston. During this free play travel no hydraulic pressure develops

D. A failed vacuum booster — without assist the pedal travels through the booster dead band before hydraulic force builds

31. A vehicle is brought in for an inspection before a long road trip. The customer is towing a fully loaded trailer for the first time with this vehicle. The vehicle is rated for trailer towing. Which of the following brake system inspection point is MOST critical to address given the planned towing use?

A. The ABS module calibration — towing changes vehicle dynamics that require ABS recalibration

B. The brake fluid condition and boiling point — towing a heavy trailer on grades significantly increases brake heat generation. Degraded fluid with high moisture content is at elevated risk of vapor lock under towing heat loads compared to fresh fluid

C. The front caliper slide pin condition — towing shifts weight to the rear, reducing front caliper load and making slide pin condition more critical

D. The parking brake cable tension — the loaded trailer increases the force required to hold the vehicle on inclines and the cables must be at specification

32. A vehicle with ABS and TCS has a condition where the ABS and TCS both function normally during individual diagnostic tests but the vehicle has a complaint of occasional unexpected loss of drive traction at highway speed without any warning lights. The customer describes the engine briefly cutting power for less than one second during steady-state highway cruising. Which of the following is MOST likely the cause?

A. The TCS system is activating from an intermittent wheel speed signal variation — a brief TCS activation applies a brief engine torque reduction that the customer feels as power loss. No DTC stores because the torque reduction event is within normal TCS operational parameters

B. The ABS is activating from a wheel speed sensor intermittent fault and commanding engine reduction through the ECM

C. The fuel system is causing the brief power loss — the brake system is not involved

D. The ESC is detecting brief yaw from highway road irregularities and reducing torque unnecessarily

33. A technician discovers that the brake fluid in a vehicle's master cylinder reservoir is a murky brown color with visible particulate matter suspended in it. The brake system has no leaks and the pedal feels normal. Which of the following is the correct service recommendation?

A. The fluid discoloration is from normal oxidation — no service is required unless the moisture content exceeds 2%

B. The murky brown color with particulate matter indicates severely degraded fluid and possible internal rubber component breakdown — flush the complete system, inspect the master cylinder, caliper seals, and flexible hoses for deterioration, and replace any degraded components

C. Add fresh fluid to dilute the contaminated fluid — the dilution will restore normal fluid color and reduce particulate concentration

D. Replace only the master cylinder — the reservoir is the contamination source and the rest of the system is clean

34. A vehicle with rear drum brakes has a condition of rear brake grab during the first brake application of each drive. After the first application, all subsequent stops are perfectly normal. The rear brake components are within specification. The wheel cylinders and lines are intact. Which of the following MOST likely explains the single first-application grab?

A. The automatic adjusters are too tight — the first application brings the shoes into contact before hydraulic pressure fully develops

B. A film of condensation between the brake shoe lining and drum surface during the overnight cooling period creates a temporarily higher-than-normal static friction coefficient on initial contact. The first application abrades the condensation off and normalizes friction

C. The vacuum booster applies maximum assist on the first application of each drive cycle before regulating to normal assist

D. Residual brake fluid pressure from the previous drive cycle is still present in the rear circuit and causes the first application to deliver higher-than-normal pressure

35. A vehicle's ABS module stores a DTC for the ABS pump motor relay — specifically indicating the relay contacts are welded closed and the pump is running continuously. The ABS warning light is on. The technician can hear the pump motor running at all times even with the ignition off. Which of the following is the correct immediate action?

A. Clear the DTC and road test — welded relay contacts are transient conditions that reset after the ignition is cycled

B. Replace the ABS module — the module is commanding the relay to remain closed

C. Disconnect the ABS pump motor relay immediately — a continuously running pump motor can overheat and fail, and the continuous current draw will drain the battery. Identify and replace the failed relay, then verify no ABS module fault commanded the continuous run before returning to service

D. Add brake fluid — the continuously running pump indicates a hydraulic circuit loss that the pump is attempting to compensate for

36. A vehicle with a Hydro-Boost brake system is brought in with a complaint of a groan or moan when the brakes are applied during low-speed parking maneuvers. The power steering pump belt is intact and the power steering fluid level is correct. The steering itself is quiet. Which of the following is MOST likely the cause?

A. A failing power steering pump — pump wear causes cavitation during simultaneous steering and braking demand

B. The Hydro-Boost accumulator has lost its nitrogen pre-charge — the depleted accumulator allows hydraulic fluid to cavitate during low-speed brake applications

C. Low power steering fluid — the fluid level is reading correct but the fluid is aerated from a small leak cycling air in and out of the system

D. The Hydro-Boost input spool valve is sticking — during brake application the spool does not move smoothly through its range, creating a pressure fluctuation that is heard as a groan

37. A vehicle has a diagonally-split master cylinder. After a collision that damaged only the left rear corner of the vehicle, the customer reports reduced braking effectiveness. Inspection reveals the left rear brake line is cracked and has lost fluid. Which wheels are affected by this failure?

A. Left rear only — only the wheel at the point of impact loses braking

B. Right front and left rear — these two wheels share the diagonal circuit that includes the left rear

C. Left front and right rear — the diagonal opposite from the impact point was affected by hydraulic pressure redistribution

D. Left front and left rear — both wheels on the left side share a circuit in diagonal-split systems

38. A vehicle with four-wheel disc brakes has a complaint of a metallic grinding noise from all four wheels during very light, gentle braking at low speeds. The noise does not occur without braking. All four sets of brake pads are at 6mm — well above minimum. Rotor surfaces are smooth. Which of the following is MOST likely the cause?

A. All four calipers are dragging — the pads are in continuous contact with the rotors

B. The brake pad wear indicator tabs are contacting all four rotors simultaneously

C. The anti-rattle clips or shims on all four calipers have become displaced — the metallic hardware is contacting the rotors during the slight pad movement caused by light braking input

D. The master cylinder residual pressure check valves have failed — holding pads against rotors at all four wheels

39. A technician is asked to install a set of drilled and slotted rotors on a performance vehicle. During installation, the technician notices the new rotors are marked with directional rotation arrows. Which of the following explains the purpose of directional rotor markings and what happens if they are installed on the wrong side?

A. Directional markings indicate which face of the rotor faces outward — installing them reversed exposes the wrong face to the brake pad

B. Directional rotor vanes are angled to pump air through the rotor for cooling as the rotor rotates in a specific direction. If installed on the wrong side, the rotor rotates in the reverse direction relative to its vane geometry — the vanes pump air inward instead of outward, dramatically reducing rotor cooling efficiency and increasing operating temperature

C. Directional markings indicate the rotor was balanced in a specific orientation — installing on the wrong side reverses the balance and causes vibration

D. The direction markings are for manufacturing reference only — no functional consequence results from installation on either side

40. A vehicle with ABS is tested after a wheel speed sensor service. During a road test at 45 mph, the technician performs a moderate stop. The scan tool shows the following during the stop: Left front decelerates from 45 to 0 mph over 4.2 seconds. Right front decelerates from 45 to 0 mph over 4.2 seconds. Left rear decelerates from 45 to 0 mph over 4.2 seconds. Right rear decelerates from 45 to 0 mph over 4.3 seconds. No ABS activation occurred. Which of the following BEST describes the significance of the right rear being 0.1 second slower?

A. The right rear wheel speed sensor is failing — replace it immediately

B. A 0.1-second difference in deceleration time is within normal variation for wheel speed sensor readings during a moderate stop — this minor variation is not significant and does not indicate a sensor or brake fault

C. The right rear brake is generating less braking force than the other three — the caliper requires service

D. The right rear tire has lower inflation pressure than the other three — the larger contact patch is creating less deceleration

41. A customer reports their vehicle with drum rear brakes makes a tapping or rattling sound from the rear when driving over bumps — not related to braking. The noise stops when the brakes are lightly applied. Which of the following MOST likely explains this noise?

A. Loose rear wheel lug nuts — the wheel rattles on the studs when driving over bumps and the brake application compresses the wheel against the drum

B. A loose or broken brake shoe hold-down spring or retainer — the shoe is moving freely within the drum over bumps. Light brake application brings the shoe into firm contact with the drum, stopping the movement and the noise

C. A broken rear axle bearing — the broken bearing rattles with road input and momentarily loads up during brake application, stopping the noise

D. The rear drum is loose on the axle flange — road bumps cause the drum to rattle and brake application presses the drum firmly against the shoes, stopping the movement

42. A vehicle with ESC is brought in after the ESC warning light came on following a very hard ABS stop from highway speed. A scan tool shows a DTC for lateral accelerometer signal out of range — high. No physical damage to the sensor is found. The sensor wiring is intact. Which of the following MOST likely explains the DTC occurring after an extreme braking event?

A. The hard braking event mechanically shifted the lateral accelerometer out of its mounting position — its output is now incorrect

B. During the extreme braking event, the rapid vehicle deceleration created a brief inertial loading on the lateral accelerometer that exceeded its calibrated measurement range — the module stored the out-of-range DTC. Clearing the DTC and verifying current sensor function during normal maneuvers may resolve the issue if the sensor is undamaged

C. The hard braking event vaporized brake fluid in the hydraulic circuit — the pressure spike from vapor collapse damaged the accelerometer

D. The ABS activation during the extreme stop caused vibration frequencies that disrupted the accelerometer's internal MEMS structure permanently

43. A vehicle is being diagnosed for a complaint of the brake pedal slowly sinking to the floor under sustained pressure. The pedal hold test confirms the sink. The technician opens each bleeder screw one at a time while holding the pedal under pressure. Opening the left rear bleeder causes the pedal to immediately become firm and hold. Opening any of the other three bleeders has no effect on the pedal sink. Which of the following BEST explains why opening only the left rear bleeder resolves the pedal sink?

A. Air is trapped in the left rear caliper — releasing it through the open bleeder allows the circuit to pressurize correctly

B. Opening the left rear bleeder creates back pressure in the left rear circuit — the back pressure prevents the master cylinder cup seal from bypassing in that circuit's direction. The pedal becoming firm confirms the master cylinder bypass is occurring specifically in the circuit served by the left rear bleeder

C. The left rear flexible hose has a one-way restriction — opening the bleeder bypasses the restriction and allows the circuit to hold pressure

D. The left rear wheel cylinder cup seal is failing — opening the bleeder releases the bypassing fluid and temporarily restores system pressure

44. A vehicle with anti-lock brakes is being used for driver training at a skid school. The instructor disables the ABS using a service tool to allow the students to experience wheel lockup. After the training session, the ABS is re-enabled using the service tool. Before returning the vehicle to normal fleet service, which of the following is the MOST important post-training check?

A. Replace all four brake pads — training session hard stops always wear pads to minimum thickness

B. Check tire condition for flat spots from lockup events during the training session — flat-spotted tires cause vibration and reduced braking performance and must be replaced before the vehicle returns to fleet service

C. Perform a complete brake system inspection including fluid condition, pad and rotor wear measurement, caliper and hose condition, and confirm ABS self-test passes before returning to service — the multiple lockup events and hard stops of a training session represent significantly accelerated wear

D. Verify the service tool correctly re-enabled the ABS — confirm the ABS warning light extinguishes after engine start and the system self-test passes

45. A vehicle has been in service for 120,000 miles with no documented brake fluid replacement. The brake system is being completely overhauled — all pads, rotors, drums, shoes, and calipers are being replaced. The technician asks whether to also replace the master cylinder and wheel cylinders as part of the comprehensive overhaul. Which of the following represents the MOST professional recommendation?

A. No — master cylinders and wheel cylinders rarely need replacement and should only be replaced on confirmed failure

B. Yes — replace all rubber-containing components including master cylinder, all flexible hoses, and wheel cylinders. At 120,000 miles with no fluid replacement, the brake fluid has absorbed moisture and the rubber cup seals and flexible hose liners have degraded from years of moisture-laden fluid exposure. Replacing these components simultaneously with the comprehensive overhaul prevents early re-failure and ensures the overhauled system provides maximum service life

C. Replace the master cylinder only — wheel cylinders are more durable than master cylinders

D. Replace only the wheel cylinders — master cylinders last longer because they operate at lower temperatures than wheel cylinders

PRACTICE EXAM 13: ANSWER KEY AND EXPLANATIONS

1. B. Compensating port gradually blocked by swelling debris — A compensating port that becomes progressively blocked during vehicle operation traps hydraulic fluid in the circuit. As the vehicle is driven and components warm, normal thermal expansion would be compensated by fluid returning through the compensating port to the reservoir. With the port blocked, expanding fluid has no return path — residual pressure builds progressively in the circuit, dragging the brakes and raising the pedal. After cooling overnight, the obstruction relaxes and the system returns to normal.

2. B. Rear wheel cylinder boots and evidence of oil inside the drum — The axle seal failure allows gear oil to migrate along the axle shaft into the rear brake drum assembly. Oil contamination of the brake shoe linings is the primary concern — oil-contaminated linings cannot be decontaminated and must be replaced. The wheel cylinder dust boots should be inspected for oil contamination — oil wicking behind the boots will attack the cup seals. Finding oil residue inside the drum confirms the shoes require replacement.

3. B. Severe localized heat converts iron from pearlitic to martensitic structure — Hard spots develop when a localized area of rotor iron is heated to a temperature high enough to convert its crystalline structure from soft pearlitic iron to harder martensitic iron. This typically occurs during a single extreme brake event — a panic stop or prolonged heavy braking — where a localized hot spot develops. The converted zone has different hardness, thermal expansion, and friction characteristics than the surrounding iron. Resurfacing may remove a shallow hard spot; deep conversion requires rotor replacement.

4. B. Install new slide pin boots that come with the replacement caliper — When replacing a caliper, the replacement should come with all necessary hardware including new slide pin boots. New boots should always be installed on the new caliper — they provide the moisture and contamination protection that preserves slide pin function. Reusing the old torn boot or attempting to repair it with sealant on a new caliper is inconsistent with professional brake service standards.

5. D. Dragging caliper generating progressive heat causing fluid expansion and pedal rise — A caliper piston that is beginning to seize creates continuous drag that generates heat proportional to the drag force and vehicle speed — even during light normal braking. Over 10 minutes the heat builds progressively in the affected circuit — the warming fluid expands, pushing fluid back through the compensating port and effectively reducing the distance the pistons must travel to engage. The pedal height rises progressively. After a 5-minute stop, heat dissipates, fluid contracts, and pedal returns to normal.

6. B. Adjuster lever connected to wrong shoe — movement does not drive star wheel in advancing direction — A self-adjuster lever that is connected to the incorrect shoe still moves during reverse braking but its movement does not advance the star wheel in the correct direction.

The lever may be pulling rather than pushing the star wheel, or may not be engaging the teeth at all from the incorrect position. This is a common installation error with duo-servo drum brakes where the two shoes and their associated hardware are specific to their respective positions.

7. B. Vacuum booster diaphragm leak — with vacuum present, leaking diaphragm allows pressure equalization under sustained load — With the engine running and vacuum present, a leaking booster diaphragm allows atmospheric air to slowly migrate from the rear chamber through the leak into the front vacuum chamber — gradually reducing the pressure differential across the diaphragm. As the pressure differential decreases, the assist force decreases — the driver must supply more pedal force and the pedal drops. With no engine vacuum available (engine off, vacuum exhausted), the hydraulic system is tested independently and the intact cup seals hold the pedal firm.

8. B. Right rear flexible brake hose with internal one-way restriction — The bleeder screw test is the critical data point: drag that releases immediately when the bleeder is opened confirms the drag is hydraulic — residual pressure is trapped in the caliper. The hose allows application pressure to pass inward freely but restricts return flow — trapping pressure in the caliper after the pedal is released. Opening the bleeder provides an alternate path for the trapped pressure to escape, releasing the drag. Replace the right rear flexible brake hose.

9. B. Vaporized fluid is compressible — applied force compresses gas rather than transmitting pressure — Hydraulic brake systems function because liquid is essentially incompressible — any force applied to the pedal transmits directly and immediately to the caliper piston. When brake fluid boils, it vaporizes to a gas. Gas is compressible — when the pedal is depressed, the force compresses the gas bubble rather than moving the caliper piston. The pedal falls through with minimal resistance and the caliper piston receives little or no force — complete braking loss until the vapor condenses.

10. B. Within specification — verify signal with scan tool live data during test drive — A resistance measurement of 1,150 ohms within the 950 to 1,400 ohm specification confirms the sensor's coil integrity. Resistance alone confirms electrical continuity of the coil but does not confirm the sensor generates correct AC voltage signals at speed. A scan tool confirming consistent, accurate wheel speed data during a low-speed test drive verifies the complete sensor installation before returning the vehicle.

11. A. Right front flexible brake hose has a partial internal restriction — The diagnostic evidence is that the right front piston does not extend as far as the left for the same pedal input — and the right front pad is thicker, indicating the right front has been doing less braking work. A partial internal restriction in the right front flexible hose limits hydraulic pressure delivery to the right front caliper — the caliper receives less pressure per pedal stroke, generates less clamping force, and the pad wears slower. The left front receives full pressure and does proportionally more work, causing pull toward the left.

12. B. Replace both rear shoes — lining separation is a structural failure regardless of remaining thickness — Lining separation from the shoe table is not a thickness issue — it is a structural bond failure. The lining is no longer securely attached to the shoe web. During a hard stop, the cyclic stress and heat can cause the separated section to peel away completely. A detached lining can jam the wheel rotation catastrophically. Replace both shoes as a matched set regardless of remaining lining thickness.

13. B. ESC/TCS module receives TPS data through the vehicle data network — out-of-range received data triggers module DTC — Modern vehicle systems communicate through the CAN data network. The ESC/TCS module receives throttle position data from the ECM via the network to coordinate its torque reduction requests. If the TPS data as received by the ESC module is outside its expected range — possibly from a network communication quality issue — the ESC module stores a DTC for the received signal quality, not for the sensor itself. The ECM shows no fault because the sensor signal is correct; the issue is how that data arrives at the ESC module.

14. B. EPB caliper internal drive mechanism seized — The EPB motor converting rotary motion to linear piston motion uses an internal ball-screw or threaded mechanism. If this mechanism seizes from corrosion, worn components, or lack of lubrication, the motor runs normally but cannot complete the mechanical conversion to piston retraction. The motor stops when it reaches its stall current limit — the DTC is stored because the piston travel sensor confirms incomplete release despite motor operation. Caliper replacement or rebuild is required.

15. B. Right rear wheel bearing defect — A rhythmic noise from one wheel position that occurs at constant speed unrelated to brake application or release and maintains a frequency proportional to wheel rotation rate (approximately 1.5 seconds at the vehicle's highway speed corresponds to the wheel's rotation period at that speed) is characteristic of a wheel bearing defect. The complete brake overhaul just performed has no components that would create this type of constant-speed speed-dependent noise without brake involvement.

16. B. Front flexible brake hoses expanding under high pressure — Rubber flexible brake hoses have a small amount of expansion compliance under pressure. Under the high pressure of hard braking from highway speed, this expansion becomes measurable — adding a compressible volume to the circuit that mimics the feel of air in the system. At lower brake pressure during gentle stops, the expansion is minimal. Pumping the pedal moves fluid into the expanded hose volume and restores firm feel. Replacing the flexible hoses with new units — or upgrading to stainless braided hoses — eliminates the compliance-induced spongy pedal.

17. C. Slightly longer pedal travel before rear brake engagement — The residual pressure check valve in drum brake circuits retains 5 to 20 psi in the wheel cylinder circuit at all times. This small residual pressure keeps the wheel cylinder cup seal lips lightly pressed against the bore walls — maintaining seal contact and preventing air from being drawn in past the seals. With the valve failed open, all residual pressure is lost when the brakes are released. On the next application, the cup seals must first seat against the bore walls (requiring some initial fluid volume) before pressure

can build — this adds a small but noticeable amount of pedal travel before the rear brakes begin to engage.

18. B. Dynamic weight transfer and lateral forces during hard cornering create brief circuit pressure imbalance — During aggressive cornering under braking, the lateral and longitudinal weight transfer creates unequal loading across the four braking surfaces. This unequal loading briefly creates slightly different hydraulic pressures between the two circuits — enough to momentarily displace a pressure differential valve spool that is already marginally off-center. If the spool is already near the switch contact point, this cornering-induced pressure variation pushes it into contact with the warning switch, illuminating the light briefly.

19. D. Caliper dust boots and piston seals, wheel cylinder boots — Metal-to-metal brake contact generates extreme heat at the pad-rotor interface — heat that conducts directly into the caliper body and piston. This sustained extreme heat can damage the caliper dust boots (causing splitting or collapse), degrade the piston seals, and damage wheel cylinder boots on drum brake-equipped vehicles. These rubber components are often overlooked during brake overhauls focused on friction surfaces. Damaged boots allow moisture and contamination into the bore — causing early re-failure of new components.

20. A. Replace the steering angle sensor — A steering angle sensor reading steady 0 degrees during a confirmed turning maneuver has failed internally — it is not tracking the steering wheel rotation. A zero-point calibration cannot correct a sensor that is completely unresponsive to steering input. Calibration sets the straight-ahead reference point — it does not repair a sensor that fails to follow steering changes. Internal sensor failure producing a fixed 0-degree output regardless of input requires sensor replacement.

21. B. Pump motor exceeded continuous run time threshold during extended hard stop — DTC clears after cooling — An extended ABS-activating stop from highway speed can require the pump motor to run continuously for longer than its designed thermal duty cycle. The module monitors pump run time and stores a DTC when the threshold is exceeded to protect the motor from overheating. After the pump cools, the system returns to normal function. If the DTC does not return under normal driving conditions, no further service is required — the event was a thermal limit boundary event rather than a component failure.

22. B. Penetrating oil soak, rubber mallet or drum puller, use jack-screw holes if available — Rust bonding between the drum pilot bore and the hub/axle flange is extremely common. The correct approach is penetrating oil infiltration to break the rust bond, followed by impact force from a rubber mallet at the drum flange edge or a drum-specific puller using the threaded jack-screw holes in the drum flange (provided specifically for this purpose on many drums). Heat should be avoided on drums being reused due to the risk of thermal distortion that permanently alters the drum geometry.

23. B. Normal ABS self-test cycling solenoid valves on first low-speed stop after ignition-on — Some ABS systems perform a solenoid valve function test during the first low-speed brake application after each ignition-on event. This test briefly cycles the solenoid valves — producing a brief sensation similar to ABS activation (brief pedal pulse) and occurring consistently at parking lot speeds on the first stop. It occurs once per drive cycle, not on subsequent stops. No DTC stores because it is an intentional self-test function, not a fault.

24. B. Inspect piston and bore, clean thoroughly, reinstall if undamaged — A caliper piston that falls from the bore should be inspected for scratches, scoring, or contamination from floor contact. If the piston and bore are undamaged and clean, the piston can be reinstalled with fresh brake fluid as lubricant, the seal inspected for damage, and a new dust boot installed. If the piston or bore shows damage from the fall, the caliper must be replaced. The decision is based on the condition of the components after inspection, not automatically on the fact that the piston exited the bore.

25. B. Rear drum brake shoes have retracted — wheel cylinder pistons moved inward — fluid displaced upward — This is a common finding during routine service. As the automatic adjusters are backed off to facilitate drum removal, or as the shoes naturally settle between services, the wheel cylinder pistons move inward — the fluid they were occupying is displaced upward into the rear reservoir section. The front section is unaffected because the front disc brake pistons have not been retracted. The overfull rear section indicates the rear shoes need adjustment or backing off was excessive.

26. B. Right front ABS solenoid cycling slower than left front — During ABS modulation, each wheel's solenoid valve cycles to release and restore pressure. If the right front solenoid has a restriction or degraded response time, it cycles more slowly — holding pressure at the right front longer during each modulation cycle. More pressure at the right front means more braking force on the right, pulling the vehicle right during ABS activation. This does not affect non-ABS stops where the solenoid remains open and full circuit pressure reaches both front wheels equally.

27. B. Replace master cylinder, calipers, wheel cylinders, all flexible hoses — flush and bleed — inspect rigid lines — After years of moisture-laden fluid exposure in a static system, virtually all rubber-containing components are compromised. A comprehensive restoration requires replacement of all components with rubber seals and flexible hose liners. Rigid brake lines should be inspected for internal corrosion — contaminated fluid corrodes steel lines from the inside. Only after all compromised components are replaced and the system is fully flushed with fresh fluid can the system be considered safely restored.

28. B. Pressure differential valve spool marginally displaced — firm application creates pressure imbalance that moves spool further into switch contact — A pressure differential valve spool that is already slightly off-center — from a previous partial circuit fault or bleed procedure imbalance — may not be displaced far enough to contact the warning switch under normal braking. During firm brake application, the hydraulic pressure in both circuits rises — but

any minor circuit differences in flow restriction or component response create a brief pressure imbalance that displaces the partially-off-center spool into contact with the switch. Pedal release equalizes pressure and the spool returns.

29. B. Ball-screw or thread drive mechanism seized — The EPB motor stall DTC occurs when the motor's current draw reaches its stall limit — meaning the motor is receiving current but cannot complete its rotation. With the motor confirmed operational and the caliper sliding freely, the mechanical drive mechanism inside the caliper is the fault location. A seized ball-screw or threaded piston drive cannot convert motor rotation into piston travel — the motor stalls against the mechanical resistance. Caliper replacement or specialized rebuild is required.

30. C. Excessive master cylinder pushrod free play — The master cylinder pushrod free play is the intentional gap between the end of the pushrod and the master cylinder primary piston. This gap ensures the compensating port remains unblocked at rest. Excessive free play — from incorrect adjustment or component wear — requires the pedal to travel further before the pushrod contacts the piston. During this excessive free play distance, the pedal moves easily but no hydraulic pressure is generated. The pedal is at normal height because it is in its correct rest position, but effective travel before braking begins is substantially increased.

31. B. Brake fluid condition and boiling point — towing increases brake heat load significantly — Towing a heavy trailer on grades dramatically increases the energy the brake system must absorb. On downhill grades, the trailer's additional mass requires more braking force and more brake heat dissipation than normal solo vehicle braking. Brake fluid with elevated moisture content has a significantly lower wet boiling point than fresh fluid — the risk of vapor lock during extended towing in hilly terrain is substantially higher with degraded fluid. Fresh, high-boiling-point fluid is the most critical preparation for heavy towing use.

32. A. TCS activating from intermittent wheel speed signal variation — brief torque reduction felt as power loss — When TCS detects a wheel speed differential indicating drive wheel spin, it commands a brief engine torque reduction through the ECM. If a wheel speed sensor generates a brief erratic signal at highway speed, TCS interprets the signal variation as wheelspin and briefly reduces torque. The event is short enough and within normal TCS operational parameters that no DTC stores. The customer feels the torque reduction as a brief power interruption. A wheel speed sensor tone ring with minor roughness or debris is the most common cause.

33. B. Severely degraded fluid with particulate — flush system and inspect all rubber components — Murky brown fluid with visible particulate matter indicates brake fluid that has gone far beyond normal oxidation discoloration. The particulate matter may be debris from deteriorating rubber seals — master cylinder cups, caliper piston seals, or flexible hose liners. A complete system flush addresses the fluid condition, but if the particulate is from rubber degradation, the source components must be identified and replaced. Flexible hoses are a common source of rubber particle contamination in severely degraded systems.

34. B. Condensation on drum surface creating temporarily higher static friction on first cold application — Overnight cooling allows condensation to deposit a film of moisture between the shoe lining and drum contact surface. On the initial brake application, the shoe engages the drum through this moisture film — the wet friction coefficient of the lining is initially higher than the normal dry friction coefficient. This produces a single-event grab. The friction immediately abrads the moisture away and all subsequent applications are normal dry-friction events.

35. C. Disconnect the ABS pump motor relay immediately — replace the failed relay — A continuously running ABS pump motor is an emergency — the pump motor is not rated for continuous operation and will overheat and fail within minutes. Additionally, continuous current draw will drain the vehicle's battery. The immediate action is to disconnect the welded relay to stop the motor. Replace the relay, then verify the ABS module was not commanding the relay to remain closed (which would weld a new relay immediately). If the module commanded the continuous run, the module also requires replacement.

36. D. Hydro-Boost input spool valve sticking — The Hydro-Boost input spool valve modulates high-pressure power steering fluid into the boost chamber during brake application. A spool valve that is sticky or resistant in its bore does not move smoothly — it creates intermittent pressure fluctuations as it sticks and releases during application. At low speeds during parking maneuvers where demand on the Hydro-Boost is highest and the power steering pump is at lower rpm, the pressure fluctuations from the sticking spool valve are audible as a groan or moan.

37. B. Right front and left rear — diagonal circuit including left rear — In a diagonally-split master cylinder, the circuits are arranged: left front + right rear (Circuit 1) and right front + left rear (Circuit 2). The left rear belongs to Circuit 2 — which also serves the right front. With the left rear brake line cracked and Circuit 2 losing fluid, both the left rear and right front lose hydraulic braking capability. The surviving Circuit 1 — left front and right rear — provides partial braking through those two diagonal wheels.

38. C. Anti-rattle clips or shims displaced — metallic hardware contacting rotors during light braking — Anti-rattle clips and pad shims are designed to prevent brake noise by maintaining spring tension on the pads and isolating metallic components from resonating against each other. When these components are displaced from their correct positions — possibly during a previous service — they can allow the metallic hardware to contact the rotor face during the slight pad movement caused by light braking input. The metallic contact produces the grinding noise that stops when heavier clamping force holds everything firmly.

39. B. Directional vanes pump air through rotor for cooling — reversed installation dramatically reduces cooling efficiency — Ventilated rotors with angled internal vanes are designed to pump air radially outward through the rotor as it rotates. The vane angle is optimized for the rotor's normal rotation direction — drawing cool air inward from the hat area and expelling it outward at the rotor periphery. Installing a directional rotor on the wrong side reverses the rotor's rotation relative to its vane geometry — the vanes now attempt to pump air inward rather than

outward. The resulting reversal of airflow dramatically reduces rotor cooling, increasing operating temperature and accelerating wear.

40. B. 0.1-second deceleration difference is within normal variation — no significant finding — A 0.1-second difference in deceleration time from 45 mph to 0 over approximately 4.2 seconds represents approximately a 2.4% variation. Wheel speed sensor measurements, tire compliance, and slight brake force variations produce variations of this magnitude under normal conditions. This minor difference does not indicate a sensor fault, brake drag, or component failure. No further investigation is warranted based on this data alone.

41. B. Loose or broken shoe hold-down spring or retainer — shoe moving freely over bumps — A brake shoe that is not firmly retained to the backing plate by its hold-down spring and retainer can move freely within the drum clearance when subjected to road vibration from bumps. The loose shoe rattles against the drum and backing plate. When the brakes are lightly applied, hydraulic pressure firmly seats the shoe against the drum — eliminating the free movement and the associated noise. This distinguishes a mechanical hold-down issue from a wheel bearing or axle problem.

42. B. Extreme braking deceleration briefly exceeded accelerometer's calibrated measurement range — A lateral accelerometer is calibrated for a specific measurement range — typically ±1g to ±2g laterally. An extreme braking event creates very high longitudinal deceleration (3 to 5g in a maximum ABS stop) — while primarily longitudinal, a vehicle with any yaw or asymmetric braking during the extreme stop also generates lateral accelerations that can briefly exceed the sensor's rated measurement range. Clearing the DTC and verifying normal sensor function in all axes during normal maneuvers determines whether the sensor was permanently damaged or simply logged a transient out-of-range event.

43. B. Master cylinder bypass — opened bleeder creates back pressure that overcomes bypassing seal — This is the definitive master cylinder bypass diagnostic test result. When opening a single bleeder screw resolves pedal sink, it confirms the master cylinder is internally bypassing. The opened bleeder creates a back pressure in that circuit that exceeds the bypass rate of the failing cup seal — the increased resistance temporarily stops the internal fluid migration past the seal and holds the pedal. The fix is always master cylinder replacement — not additional bleeding.

44. C. Comprehensive brake system inspection before returning to service — A vehicle used for driver training with intentional wheel lockup events has experienced dramatically accelerated brake component wear in a short period. Multiple lockup events from various speeds generate extreme heat, accelerate pad and rotor wear, stress hydraulic components, and wear tires. A complete brake inspection — pad and rotor measurement, fluid condition, caliper and hose inspection — and a confirmed passing ABS self-test are required before the vehicle is safe to return to normal service.

45. B. Replace all rubber-containing components simultaneously with comprehensive overhaul — At 120,000 miles with no fluid replacement, the master cylinder cup seals have been exposed to moisture-saturated fluid for the vehicle's entire service life. The flexible hose liners have similarly degraded. Replacing the friction components while leaving aging seals and hoses in service risks early re-failure that negates the investment in the comprehensive overhaul. Replacing all rubber-containing components simultaneously during a comprehensive overhaul maximizes system reliability and service life.