PRACTICE EXAM 10: ASE T4 BRAKES SIMULATION

1. A heavy-truck air brake system uses a relay valve at the rear axle. The signal pressure required to fully open the relay valve and produce maximum chamber pressure is approximately equal to:

A. The atmospheric pressure

B. The signal pressure delivered from the treadle valve at full pedal application

C. The compressor cut-out pressure setting

D. Half the supply reservoir pressure

2. The primary purpose of a check valve installed between the supply reservoir and the primary reservoir is to:

A. Boost the pressure delivered to the primary circuit

B. Provide a regulated pressure drop for the primary circuit

C. Prevent loss of primary reservoir pressure if a leak develops in the supply circuit

D. Enable the supply reservoir to fill the primary circuit faster

3. A driver complains of a service brake pedal that "feels like a sponge" only after the vehicle has been parked overnight. After driving 30 to 40 minutes, the pedal returns to normal feel. The MOST likely root cause is:

A. A failed master cylinder requiring replacement

B. ABS modulator valve sticking closed at startup

C. Incorrect brake fluid type contaminating the system

D. Internal flex hose delamination that opens up as fluid warms with operation

4. A heavy-truck driver reports the parking brake will not fully release even with system pressure at 120 psi and the yellow valve pushed in. The vehicle has been sitting for several days. The MOST likely cause is:

A. Frozen moisture restricting air flow to the spring chamber control ports

B. A failed compressor producing inadequate pressure

C. Worn brake shoe linings

D. Excessive wheel bearing endplay

5. A technician inspecting wheel bearings discovers a small flat spot on one tapered roller. The bearing should be:

A. Cleaned and returned to service if no other defects are present

B. Reused with new grease and seal

C. Replaced as a complete cup-and-cone matched set

D. Lightly polished and reinstalled

6. A Class 8 tractor's air system shows that the compressor unloads at 130 psi but is reloading at 95 psi. The pressure differential between cut-out and cut-in is:

A. Within normal specification

B. Excessive and indicates governor adjustment is required

C. Below normal indicating a stuck unloader

D. Acceptable only on diesel-equipped tractors

7. On a hydraulic ABS HCU, the internal accumulator stores fluid during the:

A. Reapply phase to maintain consistent pressure

B. Hold phase to prevent pressure drop

C. Compressor cycle for buffer storage

D. Pressure release phase to handle fluid exhausted from the brake circuit

8. A driver reports that the trailer service brakes apply normally but release noticeably slower than the tractor brakes. The MOST likely cause is:

A. Restriction or partial blockage in the trailer service line or service gladhand

B. Failed compressor on the tractor

C. Excessive wheel bearing endplay on the trailer

D. ABS warning lamp circuit issue

9. A heavy-truck wheel speed sensor produces an electrical pulse each time:

A. The brake pedal is depressed

B. The compressor cycles on

C. The ABS modulator opens

D. A tone ring tooth passes the sensor tip

10. A Class 6 truck experiences hard pedal complaint. Engine and steering function normally. The vacuum brake booster's diaphragm is suspected to have a small tear. The MOST reliable diagnostic test is:

A. Measure manifold vacuum at the booster inlet during pedal application

B. Pump the pedal with engine off, hold pressure, then start engine and watch for pedal drop

C. Replace the booster preventively

D. Disconnect the vacuum line and observe air flow

11. A heavy-truck air brake system's reservoirs are required by FMVSS 121 to have a combined service volume of at least:

A. Six times the combined chamber displacement

B. Eight times the combined chamber displacement

C. Twelve times the combined chamber displacement

D. Twenty times the combined chamber displacement

12. During a static air leakage test on a combination vehicle, the technician observes 7 psi loss per minute with brakes applied at 90 psi. The next inspection step should be:

A. Pressurize to 120 psi and retest

B. Replace the compressor as the source of leakage

C. Drain the system and rebuild from scratch

D. Apply soap solution at suspect joints with the system pressurized to locate the leak

13. A driver reports that the brake pedal pulsation is felt only when stopping from highway speed, not at lower speeds. On a vehicle with front disc brakes, the MOST likely cause is:

A. Rotor thickness variation that becomes more pronounced at higher rotational speeds

B. ABS activation occurring at higher speeds

C. Master cylinder internal failure

D. Power steering pump pressure variation

14. A heavy-truck spring brake chamber is being removed for service. The technician forgets to cage the spring and begins to disassemble the parking section clamp ring. The IMMEDIATE risk is:

A. Loss of brake fluid from the system

B. ABS warning lamp activation

C. Engine coolant contamination

D. Catastrophic release of 1,500 to 2,000 pounds of stored spring force

15. A driver complains that the tractor's right rear drum brake produces a high-pitched squeal during stops. After inspection, the brake is found to be in good adjustment with no contamination. The MOST likely cause is:

A. The drum is undersized for the chamber type

B. Glazed brake lining surfaces from sustained heat

C. Excessive wheel bearing endplay

D. ABS modulator valve cycling abnormally

16. The wheel seal on an oil-bath hub is designed to:

A. Allow controlled oil leakage to lubricate the wheel studs

B. Apply hydraulic pressure to the wheel bearings

C. Retain lubricant within the hub and exclude contamination from entering

D. Generate static electricity to dissipate brake heat

17. A heavy-truck brake technician is replacing brake shoes. The new shoes are observed to be approximately 3/8 inch shorter than the worn shoes being replaced. The MOST likely explanation is:

A. The new shoes are the wrong part number for the application

B. Normal manufacturing tolerance variation

C. The worn shoes had been worn from one specific direction only

D. The drum has been machined to a smaller diameter

18. A Class 5 medium-duty truck with full hydraulic brakes has a complaint of brake drag at one front wheel only. After confirming the caliper slides are free and the brake hose is intact, the technician should:

A. Replace the master cylinder

B. Replace the front rotor

C. Adjust the wheel bearings

D. Inspect the master cylinder compensation ports for blockage that could trap pressure in the affected circuit

19. The air dryer's purge valve is an electric solenoid actuated by:

A. The vehicle's ECM through an OBD signal

B. Air pressure delivered through a small line from the governor's unload signal

C. Engine vacuum during normal operation

D. The driver's brake pedal application

20. A Class 8 tractor experiences a sudden complete loss of all brake function during a downhill descent. The driver reports no warning lights illuminated before the failure. The MOST likely cause is:

A. Excessive cab temperature affecting the brake fluid

B. Loose wheel bearings on all axles

C. Brake fade from sustained service brake application generating excessive heat

D. ABS system failure

21. A technician is performing a static leakage test and finds 5 psi loss per minute on a combination vehicle with applied brakes. The result is:

A. Within the 6 psi per minute combination-vehicle applied-brake limit

B. Excessive — exceeds the 4 psi per minute combination released-brake limit

C. Acceptable for bobtail operation only

D. Grounds for compressor replacement without further diagnosis

22. A heavy-truck air dryer's cartridge has reached the end of service life. The MOST likely symptom the driver will notice is:

A. Excessive engine RPM during compressor cycling

B. Activation of the ABS warning lamp

C. Reduced engine power during acceleration

D. Increased water accumulation in reservoir drain output

23. A driver reports that the brake pedal feels normal during light application but becomes very stiff during hard application. The vehicle has a hydro-boost system. The MOST likely cause is:

A. Failed master cylinder return spring

B. Internal hydro-boost seal degradation that bypasses pressure under high load

C. Excessive caliper slide pin friction

D. Air in the hydraulic circuit

24. The federal regulation that requires ASE certification for brake inspectors is found in:

A. 49 CFR 393.1

B. 49 CFR 380.12

C. 49 CFR 396.25

D. 49 CFR 391.45

25. A heavy-truck ABS warning lamp performs a self-test at each ignition cycle. If the lamp does not illuminate during this self-test, the technician should:

A. Diagnose and repair the lamp circuit because non-functional warning is itself a violation

B. Disregard the issue if the brakes feel normal

C. Replace the ECU as the most likely cause

D. Wait for the issue to resolve at the next ignition cycle

26. A trailer manufactured in 1990 is being inspected. The trailer does not have ABS installed. Per FMVSS 121:

A. The trailer must be retrofitted with ABS to be returned to service

B. The trailer is exempt from ABS requirements only if used exclusively off-highway

C. ABS is mandatory on all trailers regardless of manufacture year

D. The trailer is exempt from ABS requirements because the FMVSS 121 ABS mandate for trailers became effective in March 1998

27. A driver reports that the brake pedal sinks slightly to the floor during sustained pedal pressure (such as during a 30-second hold at a stop light). After release, the pedal returns to normal height. The MOST likely cause is:

A. Air in the hydraulic lines

B. Master cylinder primary or secondary piston seal internal bypass

C. Failed ABS modulator

D. Excessive flex hose age

28. The power assist supplied by a hydro-boost unit comes from:

A. ABS modulator pump output

B. Engine intake manifold vacuum

C. The vehicle's power steering pump pressure

D. A dedicated electric pump on the booster

29. A Class 8 tractor's compressor cycles approximately every 2 minutes during normal highway operation with no significant brake usage. This frequency suggests:

A. A small but persistent air leak that requires constant compressor replenishment

B. Normal compressor cycling rate

C. Failure of the unloader mechanism

D. Excessive ABS modulation activity

30. A driver reports a "groaning" sound from the front of the tractor only when the brakes are first applied after the vehicle has been parked overnight. The sound disappears after the first application. The MOST likely cause is:

A. Failed wheel bearings requiring replacement

B. Rust on the rotor surface that gets cleaned off by the first brake application

C. Failed proportioning valve

D. Air in the hydraulic lines

31. A medium-duty truck's master cylinder is being replaced. To bench-bleed the new unit, the technician should:

A. Mount the cylinder in a vise and bleed it without using the return tubes

B. Pump the pedal with the cylinder installed in the vehicle

C. Skip bench bleeding for this specific application

D. Mount the cylinder in a vise, install plastic return tubes, and stroke the piston until no air bubbles return through the tubes

32. A heavy-truck brake compressor has been running continuously and system pressure has stabilized at 140 psi — above the normal cut-out setting. The MOST likely cause is:

A. A failed air dryer purge valve

B. Excessive system temperature

C. A failed governor that is not signaling the compressor to unload

D. ABS modulator cycling at high frequency

33. A driver reports that the air system warning buzzer activates during cold weather but stops once the vehicle warms up. The MOST likely cause is:

A. Frozen condensate in the air system causing pressure fluctuations

B. Failed alternator producing inadequate electrical current

C. Excessive parking brake application

D. Normal cold-weather operation requires no investigation

34. A heavy-truck air compressor is gear-driven from the engine timing train. This drive method is preferred over belt drive because:

A. Gear drive produces less heat than belt drive

B. Gear drive eliminates slippage and provides reliable torque transmission

C. Gear drive is less expensive to manufacture

D. Gear drive enables compressor disengagement during unloaded operation

35. A driver complains that the trailer brakes do not respond to the foot brake but do respond when the trailer brake hand valve is used. The MOST likely cause is:

A. Tractor protection valve closed

B. Trailer reservoir empty

C. Service line restriction or service gladhand seal failure preventing signal from reaching the trailer relay valve

D. Failed engine ECM

36. A wheel bearing inspection reveals brinelling marks on the inner race. This pattern of indentation is caused by:

A. Sustained operation with proper lubrication

B. Light corrosion that can be cleaned away

C. Manufacturing defect requiring warranty claim

D. Impact loading while the bearing was stationary, often during shipping or handling

37. A typical heavy-truck air system has reservoirs sized to hold a combined volume that supports approximately:

A. Multiple full-pressure brake applications without compressor input

B. A single emergency stop only

C. 1 hour of normal highway driving without compressor cycling

D. Air pressure for the trailer reservoir only

38. A driver reports that during heavy braking on a wet road, the brakes felt "different" — the truck stopped well, but the pedal pulsed and there was an audible ticking sound. This is consistent with:

A. A failing master cylinder

B. ABS activation during the wet-road hard stop — normal operation as designed

C. Loose wheel bearings

D. Failed ECU

39. A typical disc brake caliper's piston operates with an automatic retraction mechanism provided by:

A. The caliper return spring

B. Brake fluid residual pressure

C. The deformation of the square-cut piston seal that elastically returns the piston to its rest position

D. The wheel speed sensor's pulse signal

40. A technician is disassembling a wheel bearing for cleaning. The technician should:

A. Use compressed air to spin the bearing rapidly for visual inspection

B. Allow water from the parts washer to enter the bearing for thorough cleaning

C. Apply heat to expand the cup for removal

D. Use solvent in a tank, allowing the bearing to soak without spinning

41. A Class 8 tractor's brake adjustment shows a Type 30 chamber with applied stroke of 1-3/4 inches at 90 psi. The chamber is not marked as long-stroke. The brake is:

A. Within the 2-inch readjustment limit for Type 30 standard

B. Out of adjustment, exceeding the 1-1/2 inch limit

C. Out of adjustment, exceeding the 1-3/8 inch limit

D. Acceptable only if the chamber is identified as long-stroke

42. The internal mechanism that automatically compensates for pad wear in a hydraulic disc brake caliper is:

A. The automatic slack adjuster

B. The square-cut piston seal that maintains constant pad-to-rotor clearance regardless of pad wear

C. A separate hydraulic adjustment motor

D. The brake pad wear indicator

43. A heavy truck's parking brake has been applied for storage. The technician returns 30 days later to find the spring brakes have partially released, allowing the truck to roll slightly. The MOST likely cause is:

A. Wheel chocks failing

B. Tractor protection valve failure

C. An internal air leak in the spring brake chamber that allowed air to migrate into the parking section

D. Engine vacuum loss

44. A heavy-truck driver uses the trailer brake hand valve (trolley) to apply only the trailer brakes during a backing maneuver. This is:

A. A safety-critical operation that violates normal procedures

B. Used only in emergency situations

C. A maintenance procedure required at intervals

D. A common operational technique that uses the trailer brakes independently

45. A wheel bearing endplay measurement of 0.012 inches indicates:

A. The bearing is too loose and requires readjustment to specification

B. Normal operation

C. Excessive preload that will cause overheating

D. Acceptable only for trailer applications

46. A driver complains that the brakes feel weaker than usual, especially during repeated stops in city driving. After several minutes of cooling, the brakes return to normal performance. The MOST likely cause is:

A. Brake fluid contamination

B. Brake fade from sustained heat exceeding the friction material's effective temperature range

C. ABS interference during city driving

D. Compressor unable to maintain pressure

47. A heavy-truck ABS system uses a tone ring at each monitored wheel. Damage to a tone ring is typically the result of:

A. Normal wear over the vehicle's service life

B. Excessive wheel bearing torque

C. Impact damage or improper handling during wheel-end service

D. Normal exposure to road salt

48. The brake chamber pushrod must contact the slack adjuster at approximately 90 degrees at full application to:

A. Prevent ABS interference

B. Reduce chamber diaphragm wear

C. Maximize mechanical advantage at the S-cam producing maximum braking torque

D. Lower the compressor duty cycle

49. A driver reports a single isolated brake noise event during a normal stop — a brief metallic chirp, then silence. The brake performs normally otherwise. The MOST likely cause is:

A. Normal brake hardware seating after a recent service or pad replacement

B. Failing master cylinder

C. ABS modulator failure

D. Wheel bearing failure imminent

50. A heavy-truck air brake system on a combination vehicle uses a tractor protection valve. If the driver pulls the red dash valve, the consequence is:

A. Tractor parking brake applies; trailer continues to receive supply air

B. Trailer supply air is cut off, causing trailer spring brakes to apply through the trailer's relay emergency valve

C. Both tractor and trailer service brakes apply

D. ABS warning lamp illuminates indicating system fault

PRACTICE EXAM 10 — ANSWER KEY AND EXPLANATIONS

1. B — The signal pressure delivered from the treadle valve at full pedal application. The relay valve's design produces an output chamber pressure equal to its signal pressure input. At full pedal application, the treadle delivers maximum signal pressure to the relay, which in turn delivers that same pressure to the chambers — but with high-volume air flow from the local reservoir for fast response.

2. C — Prevent loss of primary reservoir pressure if a leak develops in the supply circuit. The check valve enforces the dual-circuit independence required by FMVSS 121. If the supply circuit develops a leak, the check valve closes to preserve primary reservoir pressure — ensuring the primary brake circuit retains capability for stopping the vehicle.

3. D — Internal flex hose delamination that opens up as fluid warms with operation. Cold-stiff hose with internal delamination produces increased compliance (sponginess) when fluid is cold. As the fluid warms during operation, the hose conforms differently and pedal feel returns to normal. This temperature-correlated symptom is the distinctive fingerprint of progressing flex hose internal delamination.

4. A — Frozen moisture restricting air flow to the spring chamber control ports. After extended parked time in cold conditions, accumulated moisture in air lines can freeze and restrict the supply path to the spring chamber control ports. Without adequate air to overcome the power spring force, the parking brake remains applied even with normal system pressure available.

5. C — Replaced as a complete cup-and-cone matched set. A flat spot on a tapered roller indicates damage that compromises the bearing's ability to roll smoothly under load. Damaged bearings must be replaced as complete cup-and-cone matched sets — running a new component against a worn surface produces accelerated wear and early failure of the new component.

6. B — Excessive and indicates governor adjustment is required. Normal compressor cycle differential (cut-out minus cut-in) is approximately 20 to 25 psi. A 35 psi differential (130 cut-out, 95 cut-in) exceeds this range and indicates the governor's hysteresis is set too wide. Extended low-pressure operation between cycles increases compressor stress and reduces braking reserve.

7. D — Pressure release phase to handle fluid exhausted from the brake circuit. During the ABS release phase, the modulator solenoid opens to release pressure at the wheel cylinder. The released fluid is stored in the HCU's internal accumulator, then pumped back to the master cylinder reservoir during the reapply phase by the electric return pump.

8. A — Restriction or partial blockage in the trailer service line or service gladhand. Slow trailer release indicates restricted air flow during the release phase. The restriction in the service line or gladhand limits the rate at which exhaust air can travel back to the tractor's exhaust port, delaying the trailer brake release.

9. D — A tone ring tooth passes the sensor tip. The wheel speed sensor is a magnetic device that generates an electrical pulse each time a tone ring tooth passes its tip. The pulse frequency is directly proportional to wheel rotational speed, providing the ABS ECU with precise wheel-by-wheel speed data.

10. B — Pump the pedal with engine off, hold pressure, then start engine and watch for pedal drop. This classic vacuum booster diagnostic test reveals whether the booster's diaphragm and chamber are functional. With reserve vacuum depleted, the pedal becomes firm; when the engine starts and supplies vacuum, a functional booster produces a clearly visible pedal drop. No pedal drop indicates booster failure.

11. C — Twelve times the combined chamber displacement. FMVSS 121 specifies that the total service reservoir volume must be at least twelve times the combined displacement of all service brake chambers. This ensures the vehicle can deliver multiple full-pressure brake applications on reserve air after a compressor failure.

12. D — Apply soap solution at suspect joints with the system pressurized to locate the leak. After a static leakage test indicates excessive loss, the next step is to identify the specific leak source. Soap solution applied to suspect joints produces visible bubbles at any leak location — a low-cost, reliable method for pinpointing the leak before any repair is attempted.

13. A — Rotor thickness variation that becomes more pronounced at higher rotational speeds. Thickness variation around the rotor produces alternating clamping force as the caliper pistons cycle with each rotation. The pulsation effect is amplified at higher rotational speeds because the alternating force occurs at higher frequency, producing the characteristic "highway-only" pulsation pattern.

14. D — Catastrophic release of 1,500 to 2,000 pounds of stored spring force. Disassembling the parking section without first caging the spring releases 1,500 to 2,000 pounds of stored spring force — a fatal hazard. Caging the spring is non-negotiable safety procedure for any spring brake chamber service, and skipping this step has caused fatal technician injuries.

15. B — Glazed brake lining surfaces from sustained heat. Glazed linings have a hard, shiny, sealed surface from sustained high-temperature exposure that produces high-pitched squealing during application. The glaze reduces friction coefficient and changes the brake's contact characteristics — the linings should be replaced and the heat source identified.

16. C — Retain lubricant within the hub and exclude contamination from entering. The wheel seal performs two simultaneous functions: it retains the hub's lubricant (oil or grease) inside the hub

cavity and excludes contamination (dirt, water, road salt) from entering. Failure of either function leads to bearing damage and shortened hub life.

17. A — The new shoes are the wrong part number for the application. Brake shoe length is determined by the chamber type and drum size combination. A 3/8-inch length difference between new and worn shoes indicates a part-number mismatch — the wrong shoes were ordered or shipped. The application should be verified against the parts catalog before installation.

18. D — Inspect the master cylinder compensation ports for blockage that could trap pressure in the affected circuit. With caliper slides confirmed free and the hose intact, the next likely cause of brake drag at one wheel is a blockage in the master cylinder compensation port for that circuit. The blocked port traps pressure in the line, preventing brake release. This diagnosis is often overlooked in single-wheel drag complaints.

19. B — Air pressure delivered through a small line from the governor's unload signal. The air dryer's purge valve is actuated by air pressure from the governor's unload signal, not by an electric solenoid. When the governor commands the compressor to unload, the same signal opens the purge valve to regenerate the desiccant. This pneumatic actuation is the simple, reliable design used in most heavy-truck systems.

20. C — Brake fade from sustained service brake application generating excessive heat. Sustained downhill braking with service brakes alone generates more heat than the foundation brakes can dissipate. The friction coefficient drops dramatically as components reach extreme temperatures, producing total or near-total loss of braking effectiveness. This is why engine retarders are critical for downhill operation.

21. A — Within the 6 psi per minute combination-vehicle applied-brake limit. CVSA allows up to 6 psi per minute leakage on a combination vehicle with service brakes applied. A measured 5 psi loss is within this allowance and is acceptable. The released-brake limit for a combination is 4 psi per minute, but this is the applied-brake test.

22. D — Increased water accumulation in reservoir drain output. When the desiccant cartridge has saturated and reached end of life, water vapor passes through to downstream components and condenses in the reservoirs. The driver typically notices excessive water during routine reservoir drain — the signature symptom of a failed or saturated air dryer.

23. B — Internal hydro-boost seal degradation that bypasses pressure under high load. Hydro-boost units develop seal degradation that allows internal bypass under high pressure load. Light pedal application is unaffected, but hard application produces a stiff pedal because the seals cannot maintain the pressure differential needed for full assist force. Internal seal replacement or unit replacement is required.

24. C — 49 CFR 396.25. This regulation defines the qualifications for a brake inspector on commercial motor vehicles. Documentation must include training records, experience, and certification — typically ASE T4 — and must be available for inspection by FMCSA enforcement.

25. A — Diagnose and repair the lamp circuit because non-functional warning is itself a violation. FMVSS 121 requires the ABS warning lamp to perform a self-test at each ignition cycle. A non-functional lamp means the driver would have no indication of an actual ABS fault — defeating the protection the regulation provides. The lamp circuit fault must be diagnosed and corrected.

26. D — The trailer is exempt from ABS requirements because the FMVSS 121 ABS mandate for trailers became effective in March 1998. Trailers manufactured before March 1, 1998, are exempt from FMVSS 121's ABS requirements. A 1990 trailer falls within this exemption and may continue in service without ABS, though many fleet operators voluntarily retrofit older equipment for safety.

27. B — Master cylinder primary or secondary piston seal internal bypass. A pedal that sinks under sustained pressure and returns to normal after release is the distinctive fingerprint of internal piston seal bypass. Fluid moves past the worn seal within the cylinder under sustained pressure but no fluid is lost from the system — the cylinder simply cannot hold position under load.

28. C — The vehicle's power steering pump pressure. Hydro-boost units use high-pressure hydraulic fluid from the power steering pump acting on an internal piston to generate brake assist force. This shared pressure source explains why hydro-boost failures often correlate with power steering symptoms — both functions depend on the same pump output.

29. A — A small but persistent air leak that requires constant compressor replenishment. Frequent compressor cycling without other obvious symptoms suggests a small but persistent leak. The leak is small enough to evade the low-air warning but consistent enough to require ongoing compressor replenishment. Locating and correcting the leak prevents progression to a larger fault.

30. B — Rust on the rotor surface that gets cleaned off by the first brake application. Light surface rust forms on rotor friction surfaces during overnight parking. The first brake application after starting produces a "groaning" sound as the rust is mechanically cleaned from the surface. The sound disappears as rotor surfaces normalize — this is a normal, harmless symptom.

31. D — Mount the cylinder in a vise, install plastic return tubes, and stroke the piston until no air bubbles return through the tubes. Bench bleeding requires the cylinder mounted in a vise with plastic return tubes connecting outlet ports back to the reservoir. Stroking the piston circulates fluid through the tubes; when no bubbles return, the trapped manufacturing air pocket has been purged and the cylinder is ready for installation.

32. C — A failed governor that is not signaling the compressor to unload. When system pressure rises above cut-out and the compressor continues to pump, the governor has failed to send the unload signal. The compressor produces excess air that elevates system pressure beyond design limits, triggering the safety relief valve and indicating the governor must be repaired or replaced.

33. A — Frozen condensate in the air system causing pressure fluctuations. In cold weather, condensate water can freeze in air lines and valves, restricting flow and producing pressure fluctuations that activate the warning buzzer. As the vehicle warms during operation, the ice melts and pressure stabilizes. This points to inadequate air drying — typically a saturated or failing air dryer cartridge.

34. B — Gear drive eliminates slippage and provides reliable torque transmission. Gear drive is preferred over belt drive because it eliminates the slippage that occurs under heavy compressor torque loads. It also provides reliable, consistent torque transmission and integrates the compressor with the engine's lubrication and cooling systems through shared engine resources.

35. C — Service line restriction or service gladhand seal failure preventing signal from reaching the trailer relay valve. The trailer brake hand valve uses a different routing than the foot brake. If the foot brake is unable to reach the trailer but the hand valve does, the fault is in the service signal path — typically a service line restriction or gladhand seal failure that blocks the foot-pedal signal but not the hand-valve signal.

36. D — Impact loading while the bearing was stationary, often during shipping or handling. Brinelling marks (a series of small indentations in the race) are caused by impact loading on a stationary bearing, most often during shipping, handling, or dropping. The bearing was damaged before installation, even though it appeared visually normal. Brinelled bearings will fail prematurely and must be replaced.

37. A — Multiple full-pressure brake applications without compressor input. FMVSS 121 reservoir sizing (12× chamber displacement) ensures that the vehicle can perform multiple full-pressure brake applications using only the stored air in the reservoirs, with no compressor input. This reserve capacity is essential for safe operation if the compressor fails during a critical maneuver.

38. B — ABS activation during the wet-road hard stop — normal operation as designed. ABS activation during a wet-road hard stop produces characteristic pedal pulsation from the modulator cycle and an audible ticking sound from the modulator solenoids. The system intervened to prevent wheel lockup, which is exactly what it is designed to do — this is normal operation, not a malfunction.

39. C — The deformation of the square-cut piston seal that elastically returns the piston to its rest position. The square-cut seal deforms slightly under pressure and elastically springs back when pressure is released, pulling the piston back into its bore. This automatic retraction maintains pad-to-rotor clearance and eliminates the need for any separate adjustment mechanism — a clever design feature unique to disc brake calipers.

40. D — Use solvent in a tank, allowing the bearing to soak without spinning. Cleaning a wheel bearing requires a solvent soak in a parts tank. Compressed air must never spin the bearing (cage explosion risk), and water from a parts washer must be excluded (corrosion). The bearing soaks until clean, then is air-dried and inspected — a deliberate, controlled process.

41. A — Within the 2-inch readjustment limit for Type 30 standard. The CVSA readjustment stroke limit for a Type 30 standard chamber is 2 inches at 90 psi applied. A measured 1-3/4 inch stroke is below this limit and within specification. The brake is in adjustment and not subject to defective-brake citation.

42. B — The square-cut piston seal that maintains constant pad-to-rotor clearance regardless of pad wear. The square-cut piston seal's elastic deformation under pressure and elastic return after release maintains a constant pad-to-rotor clearance. As pads wear thinner, the piston extends further from the bore on each application — the seal still returns it to the same position relative to the seal, maintaining clearance automatically.

43. C — An internal air leak in the spring brake chamber that allowed air to migrate into the parking section. An internal leak within the spring brake chamber can allow air to gradually migrate into the parking section over extended parked time, partially releasing the spring. This rare but recognized failure mode produces exactly the described symptom of partial parking brake release without any visible external indication.

44. D — A common operational technique that uses the trailer brakes independently. The trailer brake hand valve (often called a "trolley valve") is a normal operational tool used to apply only the trailer brakes during specific maneuvers — backing operations, slack adjustment during coupling, or controlled descent. This is standard practice and not a violation or maintenance procedure.

45. A — The bearing is too loose and requires readjustment to specification. The standard endplay specification for commercial vehicle wheel bearings is 0.001 to 0.005 inches. A reading of 0.012 inches is significantly above this range, indicating the bearing is too loose. Continued operation with excessive endplay produces hub wobble, accelerated wear, and potential safety issues — readjustment is required.

46. B — Brake fade from sustained heat exceeding the friction material's effective temperature range. Repeated stops in city driving accumulate heat in the foundation brakes faster than dissipation can occur. As friction material temperature exceeds its effective range, the coefficient of friction drops sharply — producing the described "weaker brakes" symptom that resolves once the system has cooled.

47. C — Impact damage or improper handling during wheel-end service. Tone ring damage typically results from impact during wheel-end service — dropping the assembly, striking the tone ring with a tool, or improper handling during seal or bearing service. Routine wear and exposure to road salt do not typically damage tone rings, which are protected steel components.

48. C — Maximize mechanical advantage at the S-cam producing maximum braking torque. The 90-degree geometry between pushrod and slack adjuster at full application produces maximum torque at the slack adjuster, which translates to maximum rotational force at the S-cam. As the brake wears and pushrod stroke increases, this angle changes, reducing mechanical advantage — which is why proper geometry is essential.

49. A — Normal brake hardware seating after a recent service or pad replacement. A single isolated brake noise event during normal stops, with no recurring symptoms or performance issues, is most often the result of brake hardware seating after recent service. New pads, hardware, or shoes settle into their final position during the first few stops, sometimes producing a brief metallic chirp that does not return.

50. B — Trailer supply air is cut off, causing trailer spring brakes to apply through the trailer's relay emergency valve. Pulling the red dash valve exhausts the control signal to the tractor protection valve, which closes and isolates the trailer from tractor air. Loss of supply air causes the trailer's relay emergency valve to redirect reservoir air to the spring chamber control ports, applying the trailer spring brakes — the fail-safe parking function.