PRACTICE EXAM 5: ASE T4 BRAKES SIMULATION

1. A Class 8 tractor's air system is functioning correctly and delivering full pressure to all circuits. The compressor is unloaded, and the governor is signaling unload. The air dryer's purge valve should be:

A. Continuously cycling open and closed every few seconds

B. Open, allowing accumulated moisture and oil to exhaust to atmosphere

C. Closed to preserve system pressure during the unloaded state

D. Regulated by the tractor protection valve independently

2. The force produced at a caliper piston with 5 square inches of surface area at a hydraulic pressure of 800 psi is approximately:

A. 400 pounds

B. 1,600 pounds

C. 4,000 pounds

D. 8,000 pounds

3. Which of the following components contains a nitrogen-charged accumulator as a backup pressure source?

A. A hydro-boost power assist unit

B. A standard vacuum booster

C. A conventional S-cam brake chamber

D. An ABS modulator valve

4. A wheel seal is being installed at a heavy-truck hub. All of the following are correct installation practices EXCEPT:

A. Use a seal driver that matches the seal's outside diameter

B. Install the seal squarely without cocking

C. Apply a small amount of the hub lubricant to the sealing lip

D. Tap directly on the rubber sealing lip to ensure firm seating

5. The LEAST likely cause of excessive air loss at the brake chamber during static leakage testing is:

A. A torn chamber service diaphragm

B. A fully charged supply reservoir at cut-out pressure

C. A ruptured air supply fitting at the chamber inlet

D. A compromised boot at the pushrod exit

6. A driver reports that the service brake pedal feels firm initially but "bleeds off" slowly over approximately 30 seconds when held under moderate pressure. On a medium-duty hydraulic-braked truck with no visible external fluid leak, the MOST likely cause is:

A. Air in the hydraulic lines from recent service

B. A collapsed front flex hose restricting fluid return

C. Internal bypass past a worn master cylinder piston seal

D. Contaminated brake fluid with excessive moisture content

7. The FMVSS 121 compliance requirement for stopping distance is tied to:

A. Vehicle loaded weight and initial speed at test

B. Ambient temperature at the test location

C. Driver reaction time during the test

D. The color coding of the dash control valves

8. A technician observes that the air dryer heater element consumes 2 to 3 amps at 12 volts when energized. Using Ohm's Law principles, the approximate resistance of a functional heater element is:

A. 100 to 150 ohms

B. 20 to 30 ohms

C. 15 to 20 ohms

D. 4 to 6 ohms

9. A new brake chamber is installed on a drive axle. After installation, the slack adjuster is adjusted to specification, but the technician notes that applied pushrod stroke measures only 1 inch at 90 psi. All of the following are acceptable explanations EXCEPT:

A. New shoes were just installed and are fresh

B. The drum has recently been machined

C. The brake was adjusted closer to the drum than typical running clearance

D. The chamber is internally defective with insufficient diaphragm travel

10. Two technicians discuss trailer ABS diagnostics. Technician A says a trailer ABS ECU can typically store fault codes even after the tractor has disconnected. Technician B says a trailer ABS fault will illuminate only the tractor's ABS warning lamp, never an independent trailer lamp. Who is correct?

A. Technician A only

B. Technician B only

C. Both Technician A and Technician B

D. Neither Technician A nor Technician B

11. The brake compressor on a typical Class 8 tractor has a displacement of approximately:

A. 3 to 5 CFM at 1,250 RPM

B. 40 to 50 CFM at 1,250 RPM

C. 13 to 18 CFM at 1,250 RPM

D. 75 to 100 CFM at 1,250 RPM

12. The purpose of the pressure protection valve in a heavy-truck air accessory circuit is to:

A. Boost pressure above the governor cut-out setting

B. Isolate the accessory circuit if primary pressure drops below the opening threshold

C. Distribute equal pressure between primary and secondary circuits

D. Regulate the compressor's cut-out setting based on ambient temperature

13. A driver complains that service brake response at the trailer feels delayed compared to the tractor. The MOST likely explanation is:

A. A failed compressor on the tractor

B. A failed trailer reservoir drain valve

C. A cross-coupled gladhand connection at the tractor-trailer interface

D. Deterioration of the service gladhand seal restricting air flow

14. On a dual-circuit master cylinder, the primary and secondary pistons are mechanically linked through:

A. A hydraulic coupling where the primary circuit's pressure acts on the secondary piston

B. A mechanical rod connecting the two pistons directly

C. A return spring common to both circuits

D. An electronic solenoid coordinating their movement

15. A wheel bearing adjustment procedure calls for the bearing to be pre-seated with 200 lb-ft of torque while rotating, then backed off completely. The NEXT step is to:

A. Apply final torque of 200 lb-ft and verify by dial indicator

B. Install the cotter pin at the pre-seating torque

C. Re-tighten to approximately 50 lb-ft while rotating to establish the measurement baseline

D. Back off the adjusting nut an additional 1/4 turn before final measurement

16. A heavy-truck brake drum has worn to the extent that the inner diameter exceeds the stamped maximum discard dimension by 0.005 inches. The drum:

A. Can be machined to remove the worn surface and returned to service

B. Must be replaced because it no longer meets structural safety requirements

C. Is still within acceptable tolerance per most manufacturers

D. Can be returned to service with new shoes having slightly thicker linings

17. The LEAST likely symptom associated with a seized caliper slide pin on a front disc brake is:

A. Uneven pad wear — one pad wears faster than the other on the same caliper

B. Brake pull during application

C. Pedal pulsation during braking

D. Sudden loss of all hydraulic fluid from the master cylinder

18. A driver reports that during a hard brake application the ABS warning lamp briefly flashes and he felt pedal pulsation. When he let off the pedal, the warning lamp extinguished and has not come back on. This situation indicates:

A. Normal ABS activation during a panic stop — the ABS cycled and returned to standby

B. A serious fault that requires immediate scan tool diagnosis before driving

C. A failed wheel speed sensor that should be replaced

D. A master cylinder internal leak causing pressure spikes

19. An air-braked heavy truck is parked on a 5% grade overnight with the parking brake applied. The driver returns 12 hours later and notes the truck has not rolled. This indicates:

A. The service brakes are holding the vehicle

B. The tractor protection valve is still open

C. The low-air warning has failed to activate

D. The spring brake chambers are mechanically holding the foundation brakes applied through stored spring force

20. Two technicians are discussing heavy-truck brake lining materials. Technician A says semi-metallic friction material is rarely used because it produces excessive rotor wear. Technician B says semi-metallic compounds offer higher heat capacity and are common on medium-duty commercial applications. Who is correct?

A. Technician A only

B. Technician B only

C. Both Technician A and Technician B

D. Neither Technician A nor Technician B

21. Which of the following is NOT a typical cause of ABS warning lamp illumination on a heavy-truck tractor?

A. A failed wheel speed sensor

B. Excessive air gap between sensor and tone ring

C. A faulty ABS ECU

D. Low engine oil pressure warning activated simultaneously

22. The primary advantage of a cassette-style wheel seal over a conventional spring-loaded single-lip seal is:

A. Lower material cost at purchase

B. Easier removal with common hand tools

C. Integrated wear sleeve ensuring optimal seal-to-sleeve geometry

D. Compatibility with sealed unitized hub designs only

23. A driver's pre-trip inspection includes listening for air leaks with the engine off after system pressure has stabilized. The driver reports hearing a continuous hissing at the rear of the cab near the frame. The MOST likely source is:

A. A leaking tractor protection valve or relay valve in that area

B. Normal air dryer purge cycle sounds

C. Compressor discharge line turbulence

D. The ABS ECU's internal cooling fan

24. During a disc brake service, the technician finds that one brake pad is worn down to the backing plate while the opposite pad in the same caliper has approximately 6 mm of material remaining. This distinctive wear pattern indicates:

A. Normal asymmetric wear expected on floating calipers

B. A failed proportioning valve

C. Contamination of the friction material

D. A seized caliper slide pin preventing the caliper from floating properly

25. The typical pre-load torque applied to the outer wheel bearing during the initial seating step of the TMC RP 618 procedure is approximately:

A. 50 lb-ft while stationary

B. 200 lb-ft while rotating the hub

C. 500 lb-ft without rotation

D. 1,000 lb-ft until rotation stops

26. A heavy-truck supply reservoir is also referred to as the:

A. Primary reservoir

B. Emergency reservoir

C. Wet tank

D. Dry tank

27. When the treadle valve is partially applied at approximately 50% pedal pressure, the valve's self-lapping design:

A. Holds the commanded pressure constant as long as pedal position is maintained

B. Cycles pressure up and down at 3 to 7 times per second

C. Exhausts all delivery air to atmosphere

D. Disables the secondary circuit temporarily

28. All of the following are part of a standard hydraulic brake system's combination valve EXCEPT:

A. Pressure-differential switch for dual-circuit warning

B. Metering valve for front disc hold-off

C. Proportioning valve for rear brake pressure limiting

D. Electronic solenoid modulator for ABS pressure reduction

29. A heavy-truck air brake inspection reveals that a Type 16 chamber has an applied stroke of 1-7/8 inches at 90 psi. This brake is:

A. Within the 2-inch standard stroke limit

B. Out of adjustment — exceeds the 1-3/4 inch limit for Type 16

C. Within specification only if the chamber is a long-stroke version

D. Unable to be assessed without the chamber identification markings

30. A Class 6 truck uses a front hydraulic disc brake system with floating calipers. Over a single wheel's service life, the caliper slide pins should be:

A. Cleaned, inspected, and re-lubricated at each pad replacement

B. Replaced entirely whenever pads are replaced

C. Lubricated only if slide motion appears stiff

D. Left alone to avoid contaminating the caliper with grease

31. A hydro-boost unit's nitrogen-charged accumulator loses its charge. The MOST likely symptom experienced by the driver is:

A. Complete loss of power assist during normal driving

B. Reduced brake fluid level in the reservoir

C. Loss of reserve assist after engine shutdown

D. Immediate activation of the ABS warning lamp

32. A Class 5 truck uses an air-hydraulic actuator (booster) rather than an air-over-hydraulic system. In this architecture:

A. The driver's pedal directly operates an air treadle valve without touching the hydraulic circuit

B. Air alone provides all wheel-end braking force

C. The hydraulic circuit is replaced entirely by pneumatic wheel cylinders

D. Air pressure actuates a hydraulic master cylinder, with air assist supplementing pedal effort

33. Which of the following is NOT one of the three operational phases of an ABS control cycle?

A. Pressure release phase

B. Pressure shunt phase routing fluid back to the reservoir

C. Pressure hold phase

D. Pressure reapply phase

34. A typical heavy-truck air brake system's service reservoir capacity is required under FMVSS 121 to be at least:

A. Twelve times the combined displacement of all service brake chambers

B. Three times the compressor displacement per minute

C. Equal to the trailer reservoir capacity

D. 25 gallons regardless of vehicle size

35. A driver reports that the brake pedal feels firm but travels very low to the floor on every stop. The MOST likely cause on a hydraulic-braked Class 6 truck with rear drum brakes is:

A. Air in the hydraulic lines from recent service

B. A failed master cylinder with internal seal bypass

C. Rear drum brakes out of adjustment — shoes too far from drum

D. A seized caliper piston on the front axle

36. When a vacuum brake booster's diaphragm develops a small tear:

A. The vacuum chamber pressurizes above atmospheric

B. Engine idle speed rises

C. Engine vacuum supply to the intake manifold is lost

D. Booster assist force is reduced because the pressure differential cannot be maintained

37. The most accurate tool for verifying wheel bearing endplay after adjustment is a:

A. Torque wrench set to bearing adjustment specification

B. Dial indicator mounted to read axial hub movement

C. Feeler gauge inserted between the hub and spindle

D. Pressure gauge at the hub oil fill port

38. On a combination vehicle, if the driver pulls the yellow dash valve but leaves the red valve pushed in, the result is:

A. Tractor spring brakes apply; trailer spring brakes stay released

B. Both tractor and trailer spring brakes apply

C. Trailer spring brakes apply; tractor spring brakes stay released

D. Neither tractor nor trailer spring brakes apply

39. The primary safety concern during spring brake chamber service is that:

A. The chamber contains pressurized hydraulic fluid

B. The chamber body can be struck by the vehicle's driveline

C. The power spring stores 1,500 to 2,000 pounds of potentially dangerous stored energy

D. The chamber generates heat during normal operation

40. All of the following are correct statements about the heavy-truck air compressor EXCEPT:

A. The compressor is typically driven by a gear off the engine's timing train

B. Lubrication is supplied by pressurized engine oil through an external line

C. Cooling is typically shared with the engine's coolant circulation

D. The compressor disengages its drive when the governor signals unload

41. A combination vehicle is tested for air leakage with service brakes applied at 90 psi. The test shows 7 psi loss per minute. Under CVSA standards, this result is:

A. Acceptable — within the 6 psi allowance for combinations

B. Exceeds the 6 psi per minute allowable limit for combination vehicles applied

C. Acceptable for bobtail operation but not combinations

D. Grounds for immediate vehicle destruction

42. A heavy-truck ABS ECU communicates with the engine ECM, the transmission ECU, and other vehicle systems over the:

A. J1939 serial data bus

B. Hydraulic pressure bus

C. Mechanical camshaft link

D. Compressor supply line

43. The LEAST likely cause of a brake warning lamp illuminating on the dash of a medium-duty hydraulic-braked truck is:

A. Low brake fluid level in the reservoir

B. Pressure-differential switch detecting circuit imbalance

C. ABS modulator valve cycling during normal driving

D. Parking brake switch activated with parking brake applied

44. A technician adjusting a manual slack adjuster finds that the adjusting hex turns freely without any resistance or feedback. This indicates:

A. Normal operation — some slack adjusters have no resistance

B. The slack adjuster is properly lubricated with grease

C. Correct fit against the camshaft splines

D. Internal failure of the worm gear — the slack adjuster should be replaced

45. The maximum operating temperature specification for a typical heavy-truck wheel bearing grease (NLGI GC-LB) is approximately:

A. 150°F

B. 300°F or higher

C. 90°F

D. 500°F

46. A properly functioning air brake governor should have a typical cut-in to cut-out differential pressure of approximately:

A. 20 to 25 psi

B. 40 to 50 psi

C. 5 to 10 psi

D. 60 to 75 psi

47. A heavy-truck technician is replacing brake shoes on a drive axle. The shoes are replaced as an axle-matched set because:

A. It is mandated by federal law for every shoe replacement

B. Only one shoe per wheel is available from most parts suppliers

C. Unmatched shoes produce uneven braking torque and brake pull

D. Manufacturer warranty requires whole-set replacement

48. On a modern hydraulic ABS system, the hydraulic control unit (HCU) typically contains all of the following components EXCEPT:

A. Modulator solenoid valves for each controlled wheel

B. Engine intake manifold vacuum port

C. Internal fluid accumulator

D. Electric return pump for fluid return to the reservoir

49. The function of the double-check valve at the trailer supply line is to:

A. Select between multiple air sources and allow the higher-pressure source to pass through

B. Reduce trailer brake response time by providing a secondary air channel

C. Limit trailer reservoir pressure to 100 psi maximum

D. Regulate ABS signal transmission between tractor and trailer

50. A driver requests a brake inspection because the vehicle's pedal "just feels strange." During the inspection, the technician confirms that pedal feel is normal and all tests pass. The correct next step is to:

A. Replace the master cylinder as a precaution

B. Discharge the driver with no action and mark the work order "no problem found"

C. Perform a diagnostic road test to recreate the condition and obtain more specific observations from the driver

D. Replace both front flex hoses preventively

PRACTICE EXAM 5 — ANSWER KEY AND EXPLANATIONS

1. B — Open, allowing accumulated moisture and oil to exhaust to atmosphere. When the governor signals the compressor to unload, it simultaneously signals the air dryer's purge valve to open. This expels the accumulated moisture and oil from the desiccant bed back to atmosphere using a small volume of stored dry air that flows backward through the desiccant.

2. C — 4,000 pounds. Force equals pressure times area: 800 psi × 5 sq in = 4,000 pounds. This is the clamping force delivered to the brake pad through a single caliper piston under the specified conditions. Larger piston areas produce proportionally greater force for the same hydraulic pressure, which is how hydraulic systems multiply driver pedal effort into the clamping force required to stop a loaded truck.

3. A — A hydro-boost power assist unit. Hydro-boost systems include an integral nitrogen-charged accumulator that stores pressurized fluid during normal operation. When the engine is shut off and the power steering pump stops, the accumulator's stored pressure provides 1 to 3 reserve power-assisted stops before the driver must switch to direct mechanical pedal effort.

4. D — Tap directly on the rubber sealing lip to ensure firm seating. The seal driver must contact only the seal's outer metal case, never the rubber sealing lip, which would be deformed or destroyed by driver force. Incorrect driver contact is one of the most common causes of seal failure shortly after installation.

5. B — A fully charged supply reservoir at cut-out pressure. This is a normal healthy system condition, not a source of excessive air loss. The other three options all represent actual air leak pathways: torn diaphragms, ruptured fittings, and compromised pushrod boots all allow air to escape from the chamber during the test.

6. C — Internal bypass past a worn master cylinder piston seal. A firm initial pedal that progressively drops under steady pressure with no external leak is the classic fingerprint of internal bypass. Fluid moves past the worn piston seal within the master cylinder, producing the characteristic "bleeds off" symptom while fluid remains in the system.

7. A — Vehicle loaded weight and initial speed at test. FMVSS 121 establishes stopping distance requirements based on the vehicle's loaded weight configuration and the initial test speed. These specifications define the maximum allowable distance for a compliant vehicle to come to a complete stop under test conditions.

8. D — 4 to 6 ohms. Using Ohm's Law (R = V/I), at 12 volts and 2 to 3 amps draw, the resistance calculates to 4 to 6 ohms. This range is typical of air dryer heater elements and is useful for diagnostic resistance measurement when a heater element is suspected of failure.

9. D — The chamber is internally defective with insufficient diaphragm travel. A manufacturing defect producing insufficient diaphragm travel would typically cause the stroke to be inadequate across all installations. The other three options explain a short applied stroke as a normal result of tight brake setup with fresh components and ample friction material contacting a newly machined drum.

10. A — Technician A only. Technician A is correct — trailer ABS ECUs retain fault codes in memory regardless of tractor connection status, allowing diagnosis at any time. Technician B is wrong because trailers manufactured after FMVSS 121's extension have an independent ABS warning lamp mounted on the trailer itself, typically visible through the driver's mirrors.

11. C — 13 to 18 CFM at 1,250 RPM. Typical Class 8 tractor air compressors have a displacement in the range of 13 to 18 cubic feet per minute at 1,250 RPM. This range provides adequate reserve capacity to meet FMVSS 121 buildup time requirements while supporting normal in-service demand.

12. B — Isolate the accessory circuit if primary pressure drops below the opening threshold. The pressure protection valve closes when upstream pressure falls below its opening threshold (typically 60 to 80 psi), isolating non-essential accessories like air suspension, horns, and cab accessories. This preserves remaining air pressure for the braking system's primary function during a fault condition.

13. D — Deterioration of the service gladhand seal restricting air flow. A degraded or partially obstructed service (blue) gladhand seal restricts the signal air flow from the tractor to the trailer, delaying the trailer brake response. The symptom correlates specifically to trailer service application lag with normal tractor response.

14. A — A hydraulic coupling where the primary circuit's pressure acts on the secondary piston. In a dual-circuit master cylinder, the primary piston is driven mechanically by the pushrod, and the hydraulic pressure built in the primary circuit acts on the secondary piston's face to drive it forward. This pneumatic-like relay ensures both circuits apply together under normal conditions, with the primary piloting the secondary.

15. C — Re-tighten to approximately 50 lb-ft while rotating to establish the measurement baseline. After the initial 200 lb-ft pre-seating and complete back-off, the TMC RP 618 procedure calls for re-tightening to approximately 50 lb-ft while rotating the hub. This establishes the measurement baseline, after which the adjusting nut is backed off the specified amount to achieve the final 0.001 to 0.005 inch endplay.

16. B — Must be replaced because it no longer meets structural safety requirements. Exceeding the stamped maximum discard diameter by any amount means the drum has lost too much thermal mass and structural integrity to safely return to service. Machining is not an option once the discard limit is exceeded — the drum must be scrapped.

17. D — Sudden loss of all hydraulic fluid from the master cylinder. A seized slide pin is a mechanical problem with the caliper's ability to float — it does not cause hydraulic fluid loss. The other three options are all typical consequences of restricted caliper movement and uneven pad loading at the affected wheel.

18. A — Normal ABS activation during a panic stop — the ABS cycled and returned to standby. The described behavior — brief warning lamp flash, pedal pulsation during a hard stop, lamp extinguishing when released — matches normal ABS activation during a panic stop event. The system cycled as designed and returned to standby monitoring with no fault stored.

19. D — The spring brake chambers are mechanically holding the foundation brakes applied through stored spring force. Spring brakes store 1,500 to 2,000 pounds of mechanical force per chamber through preloaded power springs. When control air is released (parking brake applied), the springs extend and apply the foundation brakes through purely mechanical force, holding the vehicle indefinitely without needing air pressure.

20. B — Technician B only. Technician A is wrong — semi-metallic friction material is common on medium-duty commercial applications for its heat capacity and load tolerance. Technician B is correct — semi-metallic compounds offer higher heat capacity and better high-load performance, which is why they are widely specified for commercial vehicles despite producing slightly more rotor and drum wear than organic compounds.

21. D — Low engine oil pressure warning activated simultaneously. Low engine oil pressure is an engine management issue unrelated to ABS function. The other three options all directly trigger ABS warning lamp illumination because they represent actual ABS-circuit faults that the ECU detects and reports.

22. C — Integrated wear sleeve ensuring optimal seal-to-sleeve geometry. Cassette-style unitized seals combine the sealing element and wear sleeve into a single pre-assembled unit. This factory-set geometry between the lip and sleeve eliminates installation errors that would otherwise compromise seal performance when the two components are fitted separately.

23. A — A leaking tractor protection valve or relay valve in that area. The tractor protection valve and rear axle relay valve are typically mounted near the rear of the cab or at the frame rail, where a continuous audible hiss during pre-trip inspection commonly points to internal leakage at those components. Identifying the sound location narrows the diagnostic path to components in that specific area.

24. D — A seized caliper slide pin preventing the caliper from floating properly. When a slide pin seizes, the caliper cannot float inboard as the inner pad wears, so the outer pad never contacts the rotor with full force. The result is drastic wear disparity between the two pads on the same caliper — one pad wears rapidly while the other remains nearly new.

25. B — 200 lb-ft while rotating the hub. The TMC RP 618 procedure specifies approximately 200 lb-ft of torque on the adjusting nut while rotating the hub during initial pre-seating. This seats the bearings fully against their races, expels excess grease, and ensures all assembly clearances are eliminated before the adjustment continues.

26. C — Wet tank. The supply reservoir is historically called the "wet tank" because it traditionally accumulated most of the moisture that condensed from hot discharge air. On systems with a fully functional air dryer, the supply reservoir remains much drier and primarily serves as a pressure buffer between the dryer and the downstream primary and secondary reservoirs.

27. A — Holds the commanded pressure constant as long as pedal position is maintained. The treadle valve's self-lapping design automatically balances delivery pressure against pedal position, closing the inlet when the commanded pressure is reached and holding it steady. This smooth graduated application is essential for controlled braking under varying road conditions.

28. D — Electronic solenoid modulator for ABS pressure reduction. Combination valves integrate three hydraulic functions: pressure-differential warning, front-disc metering, and rear-brake proportioning. ABS modulator solenoids are housed in a separate hydraulic control unit (HCU) and are not part of the combination valve assembly.

29. B — Out of adjustment — exceeds the 1-3/4 inch limit for Type 16. The CVSA readjustment stroke limit for a Type 16 standard chamber is 1-3/4 inches at 90 psi applied. A measured stroke of 1-7/8 inches exceeds this limit, placing the brake out of adjustment and counting as a defective brake for OOS assessment.

30. A — Cleaned, inspected, and re-lubricated at each pad replacement. Caliper slide pins must be cleaned, inspected for corrosion or scoring, and re-lubricated with approved silicone-based brake grease at every pad replacement. Routine maintenance prevents slide pin seizure, which is a leading cause of uneven pad wear and brake pull in the field.

31. C — Loss of reserve assist after engine shutdown. The nitrogen-charged accumulator provides reserve pressure for 1 to 3 assisted stops after engine shutdown. When it loses its charge, normal operation with the engine running continues to function (primary source still works), but the reserve assist capability is lost — the first pedal application feels normal, then subsequent applications become progressively harder.

32. D — Air pressure actuates a hydraulic master cylinder, with air assist supplementing pedal effort. In an air-hydraulic actuator, the driver operates the hydraulic master cylinder directly while air

pressure supplements pedal force through the actuator's air-side chamber. This differs from full air-over-hydraulic architecture (where an air treadle valve is the driver's primary interface).

33. B — Pressure shunt phase routing fluid back to the reservoir. ABS operates in three phases: pressure release, pressure hold, and pressure reapply. The "shunt phase routing fluid back to the reservoir" is not a named operational phase — it describes an internal mechanism in hydraulic ABS HCUs but is not one of the three control phases of the cycle.

34. A — Twelve times the combined displacement of all service brake chambers. FMVSS 121 requires that total service reservoir volume on an air-braked tractor be at least twelve times the combined displacement of all service brake chambers. This ensures adequate reserve air for multiple full-pressure applications even if the compressor fails during operation.

35. C — Rear drum brakes out of adjustment — shoes too far from drum. A firm pedal with low pedal height on a hydraulic drum-brake vehicle indicates the shoes are sitting too far from the drums. Excessive wheel cylinder piston travel is required before shoe-to-drum contact occurs, producing low pedal height even though no air is in the system.

36. D — Booster assist force is reduced because the pressure differential cannot be maintained. A torn diaphragm allows atmospheric air to leak from the control chamber into the vacuum chamber, reducing the pressure differential that generates assist force. The result is partial or total loss of booster assistance and a harder pedal.

37. B — Dial indicator mounted to read axial hub movement. The specified endplay range for commercial vehicle wheel bearings is 0.001 to 0.005 inches — far too small to be verified by any method other than a dial indicator. The indicator is mounted to a fixed reference and reads axial hub movement as the hub is pushed and pulled along the spindle axis.

38. A — Tractor spring brakes apply; trailer spring brakes stay released. Pulling the yellow dash valve exhausts air from the tractor's drive-axle spring brake chambers, applying the tractor parking brake. The red valve (pushed in) continues supplying air to the trailer through the TPV, keeping the trailer spring brakes released — the two parking brake circuits operate independently.

39. C — The power spring stores 1,500 to 2,000 pounds of potentially dangerous stored energy. The power spring inside a spring brake chamber stores 1,500 to 2,000 pounds of preloaded force that can be released catastrophically during improper disassembly. This stored energy has caused fatal injuries to technicians who cut, drilled, or disassembled chambers without proper caging procedures.

40. D — The compressor disengages its drive when the governor signals unload. The compressor continues to rotate mechanically because it is gear-driven off the engine's timing train and cannot be disengaged. When the governor signals unload, the unloader mechanism holds the inlet valves open so the compressor rotates without actually compressing air — but the physical drive connection remains engaged.

41. B — Exceeds the 6 psi per minute allowable limit for combination vehicles applied. CVSA specifies 6 psi per minute as the upper limit for a combination vehicle with service brakes applied. A 7 psi loss exceeds this threshold and represents unacceptable leakage that must be located and repaired before the vehicle returns to service.

42. A — J1939 serial data bus. The J1939 serial data bus is the standard heavy-truck communication protocol linking the ABS ECU to the engine ECM, transmission ECU, and other vehicle systems. This communication enables integrated functions like ATC engine torque reduction commands and ESC vehicle-level interventions across multiple subsystems.

43. C — ABS modulator valve cycling during normal driving. ABS modulator valves cycle only during active ABS events, not during normal driving, and their cycling does not illuminate the dash brake warning lamp. The other three options all activate the brake warning lamp through their respective switches or circuits.

44. D — Internal failure of the worm gear — the slack adjuster should be replaced. A slack adjuster's adjusting hex should provide firm resistance as the worm engages the gear that rotates the camshaft. Free rotation with no resistance indicates internal failure — most commonly stripped threads on the worm or broken gear teeth — and the slack adjuster must be replaced rather than adjusted.

45. B — 300°F or higher. Heavy-truck wheel bearing grease specified to NLGI GC-LB standards is typically rated for sustained operation at 300°F and higher, with some formulations extending to 500°F or more. This temperature capability is essential because heat transfers from the brake foundation to the bearings during sustained braking.

46. A — 20 to 25 psi. Typical governor differential between cut-in and cut-out pressures is approximately 20 to 25 psi. For example, a system with 125 psi cut-out typically has cut-in at approximately 100 to 105 psi. This differential balances compressor duty cycle against adequate reserve pressure for service demands.

47. C — Unmatched shoes produce uneven braking torque and brake pull. Brake shoes must be replaced as an axle-matched set because mismatched shoes produce different braking torque between the two wheels on the axle. This imbalance causes brake pull during application and accelerated wear, and is one of the reasons DOT inspection can fail a vehicle.

48. B — Engine intake manifold vacuum port. Hydraulic ABS HCUs contain hydraulic components — modulator solenoids, internal accumulators, and return pumps — and operate entirely in the hydraulic domain. There is no intake manifold vacuum connection to a hydraulic ABS HCU, which distinguishes it from vacuum-boosted brake systems.

49. A — Select between multiple air sources and allow the higher-pressure source to pass through. The double-check valve's shuttle automatically seals against the lower-pressure inlet and passes

the higher-pressure source through the outlet. This selection function allows the trailer supply line to route the highest available air pressure regardless of which source is currently online.

50. C — Perform a diagnostic road test to recreate the condition and obtain more specific observations from the driver. Vague complaints like "pedal feels strange" require more specific observation before diagnosis can proceed. A diagnostic road test with the driver may recreate the condition under specific circumstances (speed, load, temperature) and narrow the scope of the symptom before any component replacement is considered.