

SECTION E: T5 — SUSPENSION AND STEERING SIMULATION EXAMS

Section E contains eight full-length simulation exams for the T5 — Suspension and Steering certification test. Each simulation contains 50 scored questions with a recommended completion time of 60 minutes — matching the official ASE T5 examination scored question count exactly. T5 covers the complete suspension system, steering system, wheel alignment, and wheels, tires, and hubs found on medium and heavy-duty commercial trucks — the systems responsible for ride quality, handling, directional stability, and tire wear across millions of fleet miles.

Every T5 simulation in this section delivers questions across the four official ASE domains in the precise weighting used on the actual test:

| Domain | Topic | Questions per Simulation |
|--------|-------------------------|--------------------------|
| A | Steering Systems | 18 |
| B | Suspension Systems | 14 |
| C | Wheel Alignment | 10 |
| D | Wheels, Tires, and Hubs | 8 |
| | Total | 50 |

The eight simulations together provide 400 practice questions covering the complete T5 task list. Steering systems at 36 percent and suspension systems at 28 percent together account for nearly two-thirds of every test, reflecting the central role these systems play in heavy-duty commercial truck operation, driver comfort, and component longevity. Pay particular attention to the distinction between integral hydraulic power steering (Sheppard, TRW), recirculating ball steering gear operation, drag link and tie rod geometry, leaf spring versus air ride suspension architecture, and the diagnostic patterns unique to heavy-duty truck steering and suspension service.

The questions use all five ASE question formats in proportions that match the real exam: direct questions, Technician A and Technician B questions, EXCEPT questions, LEAST likely questions, and completion questions. Suspension and steering-specific question patterns appear throughout — distinguishing wander from pull, identifying noise patterns specific to steering versus suspension components, reasoning through alignment angle relationships (caster, camber, toe, thrust angle), recognizing irregular tire wear as a diagnostic indicator, and applying TMC Recommended Practices to wheel-end service.

The content reflects current ASE T5 task list specifications, including current heavy-duty steering gear designs from Sheppard, TRW (now ZF), and Bendix, multi-leaf and parabolic-leaf rear suspensions, air ride trailing arm suspensions, electronic stability control inputs from steering position sensors, and the integration of steering and suspension components with the truck's J1939 data bus on newer applications. Where specifications or procedures vary by manufacturer or model year, questions are written to reflect the most widely applicable current practice across the medium- and heavy-duty truck industry.

Begin with Practice Exam 1 to establish a baseline of your current preparation level. T5 emphasizes diagnostic reasoning across mechanical systems where small wear conditions produce large symptom changes — a slightly worn tie rod end produces dramatic steering wander, a misaligned thrust angle produces aggressive tire wear, and improper wheel bearing adjustment shortens bearing life dramatically. Pay special attention to questions about steering wheel free play measurement, drag link inspection, kingpin wear evaluation, ride height verification, alignment angle relationships, and TMC RP 618 wheel bearing torque procedures. After completing each simulation under timed conditions, review every question against the explanations and return to Chapter 6 to address any knowledge gaps. By the time you complete Practice Exam 8, you should be consistently scoring above 75 percent on simulations across all four domains — the threshold that indicates strong readiness for the actual T5 examination.

PRACTICE EXAM 1: T5 SIMULATION

(50 QUESTIONS)

1. The primary function of the steering gear on a heavy-duty truck is to:
 - A. Provide hydraulic boost pressure to the steering linkage during normal operation
 - B. Connect the steering column directly to the front wheel spindles for control
 - C. Convert rotary input from the steering wheel into linear movement at the pitman arm
 - D. Distribute steering force evenly between the front and rear axle wheel positions

2. The most common heavy-duty truck steering gear design used on Class 8 tractors is:
 - A. Integral hydraulic power steering with recirculating ball mechanism
 - B. Rack and pinion steering with hydraulic boost during normal operation
 - C. Manual worm and roller steering without hydraulic assistance during operation
 - D. Electronic steering with no hydraulic components during normal operation

3. The pitman arm on a heavy-duty truck is connected to the:
 - A. Front wheel spindle directly through a tie rod end during normal operation
 - B. Drag link on the opposite side of the steering gear during normal operation
 - C. Steering column shaft inside the cab during normal operation
 - D. Steering gear output shaft, transmitting motion to the drag link during operation

4. Heavy-duty truck steering wheel free play specification is typically measured with the:
- A. Engine off and the wheels turned to the full lock position during measurement
 - B. Engine running at idle, wheels straight ahead, and steering pump at operating temperature
 - C. Engine off and the steering wheel held at maximum rotation during measurement
 - D. Engine running at maximum RPM and steering pump at maximum pressure
5. The drag link on a heavy-duty truck transmits motion from the:
- A. Pitman arm to the steering arm at the wheel spindle during normal operation
 - B. Steering gear directly to the front wheel spindle during normal operation
 - C. Tie rod to the steering column inside the cab during normal operation
 - D. Power steering pump to the steering gear during normal operation
6. The proper diagnostic priority when a heavy-duty truck shows a complaint of "excessive steering wheel free play" is to:
- A. Replace the steering gear assembly as the most likely failure component during service
 - B. Apply battery voltage to the steering system for diagnostic testing during service
 - C. Inspect drag link, tie rod ends, kingpin, and steering gear systematically for wear sources
 - D. Continue operation since steering wheel free play has minimal effect on vehicle safety
7. The most likely cause of a heavy-duty truck that shows hard steering during low-speed maneuvering but normal steering at highway speeds is:
- A. Worn tie rod ends affecting all steering operation conditions during normal use
 - B. Insufficient power steering pump pressure or worn pump components during operation
 - C. A failed coolant temperature sensor reading falsely cold to the engine ECM

D. Worn ring and pinion gears in the rear drive axle assembly during operation

8. The proper service action when a heavy-duty truck shows a complaint of "steering wheel returns slowly to center after turning" is to:

A. Continue operation since slow return has minimal effect on vehicle safety during operation

B. Apply battery voltage to the steering system for diagnostic testing during service

C. Replace the steering gear as the most likely failure component during service

D. Inspect kingpin condition, lubrication, and front-end alignment for binding sources

9. The most accurate description of heavy-duty truck integral power steering operation is:

A. Hydraulic pressure provides assist within the steering gear housing during operation

B. Mechanical linkage provides direct steering force without hydraulic assistance

C. Electrical motor provides steering assist controlled by the engine ECM during operation

D. Pneumatic pressure provides primary steering force during normal vehicle operation

10. The proper torque specification for heavy-duty truck pitman arm to steering gear nut is determined by:

A. Standard automotive torque specifications for similar nut diameter applications

B. Maximum torque applied that the nut can sustain without damage during installation

C. Manufacturer service information specific to the steering gear and pitman arm model

D. Visual estimation based on nut size during the installation procedures

11. The LEAST likely cause of a heavy-duty truck that shows excessive steering wheel free play is:

A. Worn tie rod ends affecting steering linkage during normal operation

- B. A failed coolant temperature sensor reading falsely cold to the engine ECM
- C. Worn drag link ends allowing excessive movement during operation
- D. Worn steering gear sector shaft bearings allowing excess movement during operation

12. The proper diagnostic procedure when a heavy-duty truck shows a complaint of "power steering fluid leaking from the steering gear input shaft seal" is to:

- A. Continue operation since minor seal leakage has minimal effect on steering operation
- B. Apply silicone sealer to the leak area to stop the leakage during the same service
- C. Apply battery voltage to the steering gear for diagnostic testing during service
- D. Inspect for shaft wear, replace the seal, and verify proper fluid level after service

13. The most accurate description of kingpin function on a heavy-duty truck steer axle is:

- A. Pivot point connecting the wheel spindle to the axle beam allowing steering rotation
- B. Fastener that holds the wheel to the spindle during normal vehicle operation
- C. Bearing that supports the wheel during normal operation conditions during service
- D. Connection between the drag link and the wheel spindle during normal operation

14. Technician A says heavy-duty truck steering systems use power steering fluid that is identical to automatic transmission fluid. Technician B says heavy-duty truck steering systems use power steering fluid specified by the manufacturer for the application. Who is correct?

- A. Both Technician A and Technician B
- B. Technician A only
- C. Technician B only
- D. Neither Technician A nor Technician B

15. The proper procedure for verifying heavy-duty truck steering wheel free play is to:

- A. Rock the wheel side to side at the steering wheel rim and measure rim travel before wheel movement
- B. Apply battery voltage to the steering system for diagnostic testing during measurement
- C. Listen for steering wheel free play with a stethoscope during normal operation
- D. Estimate free play visually using shop lighting during the inspection process

16. The maximum allowable steering wheel free play on most heavy-duty truck applications is typically:

- A. 1/8 inch measured at the steering wheel rim during inspection
- B. 6 inches measured at the steering wheel rim during inspection
- C. 12 inches measured at the steering wheel rim during inspection
- D. 2 inches measured at the steering wheel rim during inspection

17. The proper inspection procedure for heavy-duty truck tie rod ends includes:

- A. Apply battery voltage to the tie rod for diagnostic testing during service
- B. Verification of free movement, no excessive play, and intact dust boot condition
- C. Listen for tie rod end wear with a stethoscope during normal operation
- D. Replace tie rod ends as preventive maintenance regardless of condition

18. The most likely cause of a heavy-duty truck that shows steering "wander" during highway operation is:

- A. Excessive transmission fluid level above the maximum fill mark indication
- B. Worn ring and pinion gears in the rear drive axle assembly during operation
- C. Worn kingpins, tie rod ends, drag link ends, or alignment out of specification

D. A failed coolant temperature sensor reading falsely cold to the engine ECM

19. The most accurate description of heavy-duty truck multi-leaf rear suspension function is:

A. Multiple leaves provide load capacity and control axle movement during operation

B. Single leaf provides primary load support during normal operation conditions

C. Air bags provide primary load support during normal operation conditions

D. Coil springs provide primary load support during normal operation conditions

20. The proper service action when a heavy-duty truck shows a complaint of "rough ride and excessive bouncing on rough roads" is to:

A. Replace the rear axle assembly as preventive maintenance during the same service

B. Apply battery voltage to the suspension for diagnostic testing during service

C. Continue operation since rough ride has minimal effect on vehicle safety during operation

D. Inspect shock absorbers, leaf springs, U-bolts, and air ride components systematically

21. The proper torque specification for heavy-duty truck spring U-bolt nuts is determined by:

A. Manufacturer service information specific to the suspension model and U-bolt grade

B. Standard automotive torque specifications for similar fastener diameter applications

C. Maximum torque applied that the U-bolt can sustain without thread failure

D. Visual estimation based on U-bolt size during the installation procedures

22. The most likely cause of a heavy-duty truck that shows broken leaf spring center bolt failure is:

A. Worn ring and pinion gears in the rear drive axle assembly during operation

- B. A failed coolant temperature sensor reading falsely cold to the engine ECM
- C. Loose U-bolts allowing axle movement that fatigues the center bolt during operation
- D. Excessive transmission fluid level above the maximum fill mark indication

23. The proper inspection procedure for heavy-duty truck shock absorbers includes:

- A. Apply battery voltage to the shock absorber for diagnostic testing during service
- B. Verification of damping function, mounting integrity, and absence of fluid leakage
- C. Listen for shock absorber operation with a stethoscope during normal operation
- D. Replace shock absorbers as preventive maintenance regardless of condition

24. The most accurate description of heavy-duty truck air ride suspension operation is:

- A. Air bags provide load support and ride height control during operation
- B. Air bags provide steering force during normal vehicle operation conditions
- C. Air bags provide primary brake force during normal vehicle operation
- D. Air bags maintain load support and ride height through pneumatic pressure regulation

25. The proper service procedure when a heavy-duty truck air ride suspension shows the truck riding low on one side is to:

- A. Verify ride height valve operation, air pressure delivery, and air bag integrity systematically
- B. Apply battery voltage to the air ride system for diagnostic testing during service
- C. Continue operation since uneven ride height has minimal effect on operation during use
- D. Replace the entire air ride system as preventive maintenance during the same service

26. The LEAST likely cause of a heavy-duty truck that shows excessive body roll during cornering is:

- A. Worn or failed shock absorbers reducing damping during cornering events
- B. Worn anti-roll bar bushings or links allowing excessive axle movement
- C. A failed coolant temperature sensor reading falsely cold to the engine ECM
- D. Worn or failed suspension components allowing excessive axle movement during cornering

27. The proper procedure when a heavy-duty truck rear suspension shows visible damage to a leaf spring is to:

- A. Continue operation since minor leaf damage has minimal effect on suspension function
- B. Replace the damaged leaf spring with a matched component per service specifications
- C. Apply battery voltage to the spring for diagnostic testing during the service event
- D. Add additional leaves to compensate for the damaged leaf during the same service

28. The most likely cause of a heavy-duty truck rear suspension that shows premature U-bolt failure is:

- A. Improper U-bolt torque or improper installation procedures during recent service
- B. Worn ring and pinion gears in the rear drive axle assembly during operation
- C. A failed coolant temperature sensor reading falsely cold to the engine ECM
- D. Excessive transmission fluid level above the maximum fill mark indication

29. The proper diagnostic priority when a heavy-duty truck shows a complaint of "air ride suspension fails to maintain ride height during overnight parked conditions" is to:

- A. Continue operation since overnight pressure loss has minimal effect on operation
- B. Apply battery voltage to the air ride system for diagnostic testing during service
- C. Replace all air bags as preventive maintenance during the same service event

D. Verify air bag integrity, supply line condition, and ride height valve seal operation

30. The most accurate description of heavy-duty truck shock absorber function is:

A. Provides load support during normal vehicle operation conditions during service

B. Damps suspension oscillation by converting kinetic energy to heat during operation

C. Provides steering control during normal vehicle operation conditions during service

D. Provides ride height adjustment during normal vehicle operation conditions

31. The proper service action when a heavy-duty truck shows a complaint of "leaf spring squeak during normal operation" is to:

A. Continue operation since leaf squeak has minimal effect on suspension function

B. Apply battery voltage to the leaf spring for diagnostic testing during service

C. Inspect leaves for wear, lubricate per service info, and verify U-bolt torque

D. Replace the entire leaf spring assembly as preventive maintenance during service

32. The most likely cause of a heavy-duty truck that shows uneven ride height between driver and passenger sides on an air ride suspension is:

A. Failed ride height valve, damaged air bag, or leaking supply line on the affected side

B. Worn ring and pinion gears in the rear drive axle assembly during operation

C. Excessive transmission fluid level above the maximum fill mark indication

D. A failed coolant temperature sensor reading falsely cold to the engine ECM

33. The most accurate description of caster angle on a heavy-duty truck is:

A. Forward or rearward tilt of the wheel as viewed from the front during inspection

- B. Inward or outward tilt of the kingpin as viewed from the front during inspection
- C. Toe-in or toe-out angle measured at the wheel during normal alignment service
- D. Forward or rearward tilt of the kingpin as viewed from the side during inspection

34. The proper diagnostic procedure when a heavy-duty truck shows a complaint of "vehicle pulls to one side during normal driving" is to:

- A. Replace the steering gear as the most likely failure component during service
- B. Verify wheel alignment angles, tire condition, and brake balance systematically
- C. Apply battery voltage to the steering system for diagnostic testing during service
- D. Continue operation since vehicle pull has minimal effect on safety during operation

35. The most accurate description of camber angle on a heavy-duty truck is:

- A. Inward or outward tilt of the wheel as viewed from the front during inspection
- B. Forward or rearward tilt of the kingpin as viewed from the side during inspection
- C. Toe-in or toe-out angle measured at the wheel during normal alignment service
- D. Steering wheel position relative to wheel direction during normal operation

36. The most accurate description of toe angle on a heavy-duty truck is:

- A. Inward or outward tilt of the wheel as viewed from the front during inspection
- B. Forward or rearward tilt of the kingpin as viewed from the side during inspection
- C. Difference between front and rear distance measurements at the wheels in inches
- D. Steering wheel position relative to wheel direction during normal operation

37. The proper measurement procedure for heavy-duty truck wheel alignment angles is to:

- A. Apply battery voltage to the wheels for diagnostic testing during measurement
- B. Listen for alignment-related noise with a stethoscope during normal operation
- C. Estimate angles visually using shop lighting during the inspection process
- D. Use specialized alignment equipment per manufacturer service procedures

38. The most likely cause of a heavy-duty truck that shows feathered wear on the front tires is:

- A. Insufficient brake fluid level in the master cylinder reservoir during operation
- B. Improper toe setting causing tires to scrub during normal operation
- C. A failed coolant temperature sensor reading falsely cold to the engine ECM
- D. Worn ring and pinion gears in the rear drive axle assembly during operation

39. The most likely cause of a heavy-duty truck that shows wear on the inside edges of both front tires is:

- A. Excessive negative camber or improper toe setting during normal operation
- B. Worn ring and pinion gears in the rear drive axle assembly during operation
- C. A failed coolant temperature sensor reading falsely cold to the engine ECM
- D. Excessive transmission fluid level above the maximum fill mark indication

40. The proper service procedure when a heavy-duty truck shows a complaint of "vehicle pulls to one side during driving but tracks straight when hands off the steering wheel" is to:

- A. Replace the steering gear as the most likely failure component during service
- B. Apply battery voltage to the steering system for diagnostic testing during service
- C. Investigate brake balance, tire condition, and steering column wear systematically

D. Continue operation since intermittent pull has minimal effect on safety during operation

41. The proper inspection procedure for heavy-duty truck thrust angle includes:

- A. Apply battery voltage to the wheels for diagnostic testing during measurement
- B. Verification of rear axle alignment relative to vehicle centerline using alignment equipment
- C. Listen for thrust angle issues with a stethoscope during normal operation
- D. Estimate thrust angle visually using shop lighting during the inspection process

42. The LEAST likely cause of a heavy-duty truck that shows aggressive tire wear pattern on the front axle is:

- A. Worn tie rod ends allowing improper toe maintenance during normal operation
- B. Improper toe setting causing tires to scrub during normal operation events
- C. Worn kingpins affecting steer axle geometry during normal operation conditions
- D. A failed coolant temperature sensor reading falsely cold to the engine ECM

43. The proper torque procedure for heavy-duty truck wheel lug nuts during installation is:

- A. Maximum torque applied randomly across all wheel positions during installation
- B. Single-pass installation without torque measurement during procedures
- C. Torque to specification in random sequence using a calibrated wrench
- D. Torque to specification in star pattern using a calibrated wrench in stages

44. The most accurate description of heavy-duty truck tire load rating is:

- A. Maximum vehicle speed at which the tire can operate during normal operation

- B. Tire pressure rating in PSI during normal operation conditions
- C. Maximum weight the tire can safely carry at the rated inflation pressure
- D. Tire diameter specification in inches during normal operation conditions

45. The proper procedure for verifying heavy-duty truck wheel bearing endplay is to:

- A. Apply battery voltage to the wheel bearings for diagnostic testing during measurement
- B. Use a dial indicator to measure axial movement at the wheel per TMC RP 618
- C. Listen for endplay-related noise with a stethoscope at idle conditions during operation
- D. Estimate endplay visually using shop lighting during the inspection process

46. The most likely cause of a heavy-duty truck that shows premature tire wear on one wheel position only is:

- A. Wheel alignment issue, worn suspension component, or wheel bearing problem at that position
- B. Worn ring and pinion gears in the rear drive axle assembly during operation
- C. A failed coolant temperature sensor reading falsely cold to the engine ECM
- D. Excessive transmission fluid level above the maximum fill mark indication

47. The proper service procedure when a heavy-duty truck shows tire wear that indicates underinflation is:

- A. Replace the tires as preventive maintenance during the same service event
- B. Verify tire pressure, inflate to specification, and inspect for slow leak sources
- C. Apply battery voltage to the tires for diagnostic testing during service
- D. Continue operation since underinflation has minimal effect on tire wear during use

48. The LEAST likely cause of a heavy-duty truck wheel bearing wear is:

- A. Improper torque application during recent wheel bearing service procedures
- B. Contamination from failed wheel seal allowing dirt entry during operation
- C. Excessive endplay or insufficient preload at the most recent service event
- D. A failed coolant temperature sensor reading falsely cold to the engine ECM

49. Technician A says heavy-duty truck wheel lug nut torque is typically 450 to 500 ft-lbs per TMC RP 237. Technician B says heavy-duty wheel lug nut torque is typically 100 to 150 ft-lbs per TMC RP 237. Who is correct?

- A. Both Technician A and Technician B
- B. Technician B only
- C. Technician A only
- D. Neither Technician A nor Technician B

50. The proper procedure when a heavy-duty truck shows a complaint of "wheel vibration that increases with road speed" is to:

- A. Apply battery voltage to the wheel system for diagnostic testing during service
- B. Inspect for tire imbalance, wheel runout, and bearing condition systematically
- C. Continue operation since speed-related vibration has minimal effect on safety
- D. Replace all tires as preventive maintenance during the same service event

PRACTICE EXAM 1: ANSWER KEY AND EXPLANATIONS

1. C — Convert rotary input from the steering wheel into linear movement at the pitman arm. The steering gear translates the rotational motion of the steering wheel and column into the linear arc motion needed at the pitman arm to move the drag link. This conversion is the fundamental purpose of the gear; without it, steering wheel rotation could not produce wheel direction change at the road surface.
2. A — Integral hydraulic power steering with recirculating ball mechanism. Heavy-duty Class 8 tractors typically use integral hydraulic power steering gears (such as Sheppard or TRW designs) with a recirculating ball mechanism inside the gear housing. The integral design combines the steering gear and the hydraulic assist in one unit, providing the high steering force needed for heavy axle loads.
3. D — Steering gear output shaft, transmitting motion to the drag link during operation. The pitman arm is splined to the steering gear output (sector) shaft and transmits the gear's rotational motion to the drag link. As the gear rotates, the pitman arm swings in an arc, pushing or pulling the drag link to turn the steered wheels through the steering arm.
4. B — Engine running at idle, wheels straight ahead, and steering pump at operating temperature. Steering wheel free play is measured with the engine running at idle (so hydraulic assist is active), wheels straight ahead (the centered position where free play is normally evaluated), and the steering pump at operating temperature (so fluid viscosity is normal). Measurement under any other condition produces inaccurate results.
5. A — Pitman arm to the steering arm at the wheel spindle during normal operation. The drag link connects the pitman arm to the steering arm at one front wheel spindle, transmitting the gear's motion to that wheel. The other front wheel follows through the tie rod connecting both steering arms, allowing both wheels to steer in coordinated fashion.
6. C — Inspect drag link, tie rod ends, kingpin, and steering gear systematically for wear sources. Excessive steering wheel free play diagnosis requires systematic inspection of all sources: drag link ends, tie rod ends, kingpin condition, and internal steering gear wear. Each component contributes to free play; identifying the actual source guides targeted repair without unnecessary parts replacement.
7. B — Insufficient power steering pump pressure or worn pump components during operation. Hard steering at low speed (when hydraulic assist demand is highest) but normal at highway speed

(when assist demand is lower) classically indicates inadequate hydraulic boost. Worn pump components or insufficient pressure cannot deliver the assist needed during slow-speed maneuvering when steering forces are greatest.

8. D — Inspect kingpin condition, lubrication, and front-end alignment for binding sources. Slow steering wheel return to center indicates binding somewhere in the steering or front suspension system. Kingpin condition (wear, lubrication, binding) and alignment (incorrect caster reduces self-centering force) are the primary sources; systematic inspection identifies which is the actual cause.
9. A — Hydraulic pressure provides assist within the steering gear housing during operation. Integral power steering systems contain the hydraulic assist within the steering gear housing itself. The gear includes an internal piston, valve, and sector mechanism that work together; pump pressure is delivered to the gear, where the internal mechanism multiplies steering force during the application.
10. C — Manufacturer service information specific to the steering gear and pitman arm model. Pitman arm to steering gear nut torque values come from manufacturer service information specific to the gear and pitman arm model. The torque is critical because the splined connection must hold under heavy steering loads; standard automotive specifications and visual estimation are inadequate for heavy-duty applications.
11. B — A failed coolant temperature sensor reading falsely cold to the engine ECM. ECT sensor errors affect engine fuel mixture but do not affect steering wheel free play. The other choices all directly cause excessive free play through wear in the steering linkage: tie rod ends, drag link ends, and steering gear sector shaft bearings all contribute to free play when worn.
12. D — Inspect for shaft wear, replace the seal, and verify proper fluid level after service. Steering gear input shaft seal leakage requires inspection of the shaft sealing surface (worn shafts damage new seals during installation), seal replacement, and fluid level verification after service. Continuing operation with leakage causes pump damage from low fluid; sealer applications cannot reliably stop the leak.
13. A — Pivot point connecting the wheel spindle to the axle beam allowing steering rotation. The kingpin is the pivot point that connects the wheel spindle to the steer axle beam, allowing the spindle (and the wheel mounted to it) to rotate left and right for steering. Worn kingpins produce loose steering, wander, and irregular tire wear; proper kingpin condition is essential for steering geometry.
14. C — Technician B only. Heavy-duty truck steering systems use power steering fluid specified by the manufacturer for the application. While some applications use ATF (Type F or Dexron variants), others require specific power steering fluids; using incorrect fluid can damage seals and reduce service life. Service information must be consulted for each application.

15. A — Rock the wheel side to side at the steering wheel rim and measure rim travel before wheel movement. Steering wheel free play is measured by rocking the steering wheel side to side at the rim with the wheels straight ahead and observing how far the rim travels before the road wheels begin to turn. The travel at the rim is then compared to specification (typically 2 inches maximum on heavy-duty applications).
16. D — 2 inches measured at the steering wheel rim during inspection. Maximum allowable steering wheel free play on most heavy-duty truck applications is typically 2 inches measured at the steering wheel rim, with the engine running and wheels straight ahead. Free play exceeding this specification indicates wear in the steering linkage or gear that requires service for proper steering control.
17. B — Verification of free movement, no excessive play, and intact dust boot condition. Tie rod end inspection requires verification of free movement (no binding), no excessive play (axial or radial), and intact dust boot condition (preventing contamination entry). All three conditions must be acceptable; a tie rod end with any of these issues requires replacement to maintain proper steering control.
18. C — Worn kingpins, tie rod ends, drag link ends, or alignment out of specification. Steering wander during highway operation indicates the truck cannot maintain straight-line tracking, typically from worn linkage components or incorrect alignment. Each worn component allows the wheels to wander from the commanded direction; alignment problems produce continuous correction demand by the driver.
19. A — Multiple leaves provide load capacity and control axle movement during operation. Multi-leaf rear suspensions use multiple leaf springs stacked together to provide load capacity and control axle movement. Each leaf adds to the spring rate and load capacity; the multi-leaf design also provides damping through inter-leaf friction and progressive spring rate as the suspension compresses.
20. D — Inspect shock absorbers, leaf springs, U-bolts, and air ride components systematically. Rough ride and excessive bouncing diagnosis requires systematic inspection of damping (shock absorbers), springs (leaf springs), spring retention (U-bolts), and air ride components. Each subsystem affects ride quality; identifying the specific cause guides targeted repair without unnecessary parts replacement.
21. A — Manufacturer service information specific to the suspension model and U-bolt grade. Spring U-bolt nut torque values come from manufacturer service information specific to the suspension model and U-bolt grade. The torque is critical because U-bolts must clamp the axle to the leaf spring under high load conditions; insufficient torque allows axle movement that fatigues components, while excessive torque can damage threads or fasteners.
22. C — Loose U-bolts allowing axle movement that fatigues the center bolt during operation. Loose U-bolts allow the axle to shift on the leaf spring during operation, with the center bolt absorbing

the resulting forces. Repeated movement fatigues the center bolt until failure occurs. Proper U-bolt torque maintenance prevents the cyclic loading that destroys center bolts.

23. B — Verification of damping function, mounting integrity, and absence of fluid leakage. Shock absorber inspection requires verification of damping function (smooth resistance through extension and compression), mounting integrity (no broken or worn mounts), and absence of fluid leakage (which indicates internal damage). All three conditions must be acceptable for the shock to function properly.
24. D — Air bags maintain load support and ride height through pneumatic pressure regulation. Air ride suspensions use air bags as the primary load-bearing element, with pneumatic pressure regulated by ride height valves to maintain consistent ride height regardless of load. The system adjusts pressure as load changes, providing constant ride height and improved ride quality compared to leaf spring designs.
25. A — Verify ride height valve operation, air pressure delivery, and air bag integrity systematically. Air ride truck riding low on one side requires systematic verification of ride height valve operation (controls pressure to that side's bags), air pressure delivery (supply line condition, pressure adequacy), and air bag integrity (leaks, damage). Each component affects pressure on that side; systematic inspection identifies the actual cause.
26. C — A failed coolant temperature sensor reading falsely cold to the engine ECM. ECT sensor errors affect engine fuel mixture but do not affect body roll during cornering. The other choices all describe direct causes of excessive body roll: failed shock absorbers reduce damping, worn anti-roll bar components allow excessive movement, and worn suspension components compromise control of axle motion during cornering.
27. B — Replace the damaged leaf spring with a matched component per service specifications. Damaged leaf springs require replacement with matched components per service specifications because spring rate, load capacity, and dimensions must match the suspension design. Adding leaves alters spring rate; continuing operation with damaged leaves leads to progressive failure and possible suspension collapse.
28. A — Improper U-bolt torque or improper installation procedures during recent service. Premature U-bolt failure typically traces to improper torque or installation procedures during recent service. Insufficient torque allows axle movement that fatigues U-bolts; excessive torque overstresses them; improper threading damages bolts and reduces clamping force. Proper installation and torque per service specifications prevents the failure pattern.
29. D — Verify air bag integrity, supply line condition, and ride height valve seal operation. Overnight air ride pressure loss requires verification of air bag integrity (slow leaks not visible during operation), supply line condition (cracked or chafed lines), and ride height valve seal operation (worn valve seats allow slow leakage). Each component can produce slow pressure loss that becomes apparent only during extended parked conditions.

30. B — Damps suspension oscillation by converting kinetic energy to heat during operation. Shock absorbers damp suspension oscillation by forcing fluid through internal valving as the shock extends and compresses. The fluid resistance converts the kinetic energy of suspension movement into heat, dissipating the energy and stopping oscillation. Without proper damping, the springs oscillate continuously after each disturbance.
31. C — Inspect leaves for wear, lubricate per service info, and verify U-bolt torque. Leaf spring squeak typically indicates inter-leaf friction from inadequate lubrication, leaf wear, or loose U-bolts. Inspection of leaf condition, lubrication per service information, and U-bolt torque verification addresses the common causes. Continuing operation with squeaking allows progressive leaf wear and possible failure.
32. A — Failed ride height valve, damaged air bag, or leaking supply line on the affected side. Uneven ride height between sides on an air ride suspension indicates a problem affecting only the lower side. Failed ride height valve cannot maintain proper pressure on that side; damaged air bag leaks pressure; leaking supply line prevents adequate pressure delivery. Each cause affects one side specifically.
33. D — Forward or rearward tilt of the kingpin as viewed from the side during inspection. Caster angle is the forward (negative) or rearward (positive) tilt of the kingpin (or steering axis) as viewed from the side of the truck. Positive caster provides directional stability and self-centering; on heavy-duty trucks, caster is typically set positive to maintain straight-line stability under heavy axle loads.
34. B — Verify wheel alignment angles, tire condition, and brake balance systematically. Vehicle pull diagnosis requires systematic verification of wheel alignment angles (improper angles cause pull), tire condition (asymmetric tire wear or pressure causes pull), and brake balance (asymmetric braking force causes pull). Each system can independently cause pull; systematic inspection identifies the actual cause.
35. A — Inward or outward tilt of the wheel as viewed from the front during inspection. Camber angle is the inward (negative) or outward (positive) tilt of the wheel as viewed from the front. Camber affects tire contact patch; improper camber produces inside-edge or outside-edge tire wear. Heavy-duty trucks typically use slight positive camber to compensate for axle loading deflection.
36. C — Difference between front and rear distance measurements at the wheels in inches. Toe is the difference between the front and rear distances measured at the wheels — toe-in (front closer than rear) or toe-out (front wider than rear). Improper toe causes the tires to scrub during driving, producing rapid wear and feathering patterns on the tire surface.
37. D — Use specialized alignment equipment per manufacturer service procedures. Wheel alignment angles are measured using specialized alignment equipment (computerized alignment racks, laser-based systems) per manufacturer service procedures. The equipment accurately measures angles

in degrees and minutes; visual estimation cannot achieve the precision required for proper alignment.

38. B — Improper toe setting causing tires to scrub during normal operation. Feathered tire wear (alternating high-low ridges across the tread) is the classic signature of improper toe. The tires scrub sideways during driving because they are not pointing straight ahead; the scrubbing produces the diagnostic feathered pattern that points directly at toe as the cause.
39. A — Excessive negative camber or improper toe setting during normal operation. Wear on the inside edges of both front tires indicates excessive negative camber (wheels tilted inward at top, contact patch shifted inboard) or toe-out (wheels point outward, scrubbing inboard during driving). Both conditions produce concentrated wear on the inside edges; alignment correction addresses the cause.
40. C — Investigate brake balance, tire condition, and steering column wear systematically. Vehicle pull during driving but straight tracking with hands off the steering wheel indicates a steering column or steering gear issue rather than alignment or brake imbalance. Investigation focuses on column wear, gear condition, and steering wheel position relative to the steering shaft. The hands-off behavior distinguishes this from alignment-related pull.
41. B — Verification of rear axle alignment relative to vehicle centerline using alignment equipment. Thrust angle is the angle between the rear axle direction and the vehicle centerline. Verification requires alignment equipment that measures rear axle position relative to vehicle centerline; improper thrust angle causes the truck to "dog track," producing aggressive tire wear and steering complaints.
42. D — A failed coolant temperature sensor reading falsely cold to the engine ECM. ECT sensor errors affect engine fuel mixture but do not affect tire wear patterns. The other choices all describe direct causes of aggressive front-axle tire wear: worn tie rod ends affect toe maintenance, improper toe causes scrubbing, and worn kingpins compromise steer axle geometry.
43. D — Torque to specification in star pattern using a calibrated wrench in stages. Heavy-duty wheel lug nut installation uses a star pattern in stages with a calibrated torque wrench, building from initial torque to final specification across multiple passes. The pattern ensures even clamping force across all studs without distortion; random sequences and corner-first patterns produce uneven clamping that compromises wheel retention.
44. C — Maximum weight the tire can safely carry at the rated inflation pressure. Tire load rating specifies the maximum weight the tire can safely carry at the rated inflation pressure. Operating beyond load rating overstresses the tire structure, causing premature failure or catastrophic blowout. Proper tire selection matches load rating to the vehicle's axle weight requirements.
45. B — Use a dial indicator to measure axial movement at the wheel per TMC RP 618. Wheel bearing endplay is measured using a dial indicator at the wheel per TMC RP 618. The indicator displays

total axial movement when the wheel is pushed and pulled; the reading is compared to specification (typically 0.001 to 0.005 inch) to verify proper bearing adjustment.

46. A — Wheel alignment issue, worn suspension component, or wheel bearing problem at that position. Premature tire wear at one wheel position indicates a problem specific to that position. Common causes include wheel alignment issues at that wheel, worn suspension components affecting wheel position, or wheel bearing problems allowing wheel runout. Single-wheel patterns guide diagnostic focus to that location.
47. B — Verify tire pressure, inflate to specification, and inspect for slow leak sources. Tire wear indicating underinflation requires verification of current pressure, inflation to specification, and inspection for slow leak sources (valve stem condition, sidewall damage, seal issues). Without identifying the leak source, the tire will return to underinflated condition after recovery, repeating the wear pattern.
48. D — A failed coolant temperature sensor reading falsely cold to the engine ECM. ECT sensor errors affect engine fuel mixture but do not affect wheel bearing wear. The other choices all directly cause accelerated bearing wear: improper torque produces incorrect preload, contamination causes abrasive wear, and incorrect endplay or preload damages bearing surfaces.
49. C — Technician A only. TMC RP 237 establishes 450 to 500 ft-lbs as the standard heavy-duty wheel lug nut torque for most fleet applications. The 100 to 150 ft-lbs range is more typical of medium-duty or light truck applications; heavy-duty applications require the higher torque to properly load the studs and maintain wheel retention under heavy axle loads.
50. B — Inspect for tire imbalance, wheel runout, and bearing condition systematically. Wheel vibration that increases with road speed indicates a rotating mass issue at the affected wheel. Tire imbalance produces speed-dependent vibration; wheel runout produces similar symptoms; bearing problems allow wheel oscillation that creates vibration. Systematic inspection identifies the specific cause for targeted repair.