PRACTICE EXAM 5: RED SEAL TRUCK AND TRANSPORT MECHANIC SIMULATION (135 QUESTIONS)

1. A technician is assigned to perform brake work on a truck that was recently used to haul asbestos-containing building materials. Visible dust is present on the brake components and undercarriage. Before beginning work, what is the technician's primary concern?

A. The dust will contaminate the new brake linings reducing their friction coefficient and shortening their effective service life

B. The dust may contain asbestos fibres that pose a serious inhalation health hazard requiring specific containment and cleanup procedures before any work begins

C. The dust will damage the compressed air tools used during the brake job by clogging the air motor intake filters and oilers

D. The dust residue will prevent the new brake components from seating properly against the drum surface during the break-in period

2. A shop foreman assigns a first-year apprentice to perform an unsupervised diesel particulate filter cleaning using a pneumatic cleaning station. The apprentice has never operated this equipment. According to workplace safety practices, what should happen before the apprentice begins?

A. The apprentice should read the equipment manufacturer's manual independently and proceed with the cleaning once the manual has been reviewed

B. The foreman should observe the apprentice during the first five minutes of operation and then leave the apprentice to complete the task alone

C. The apprentice should ask a more experienced apprentice to demonstrate the procedure since journeyperson supervision is only required for engine work

D. The foreman must ensure the apprentice receives proper instruction and demonstration on the equipment's operation and safety procedures before using it

3. A technician is performing a cooling system pressure test using a hand-pump tester. The system holds pressure for 10 minutes with no drop. However, the technician notices the upper radiator hose is bulging excessively under the test pressure. What does this indicate?

A. The radiator cap spring is too strong and is over-pressurizing the cooling system beyond the hose's design pressure rating during the test

B. The test pump gauge is reading lower than the actual pressure being applied and the hose is being subjected to higher pressure than intended

C. The upper radiator hose has deteriorated internally and has weakened to the point where it cannot safely handle normal system operating pressure

D. The radiator has a partial blockage that causes the pressure to concentrate in the upper hose rather than distributing evenly throughout the system

4. A technician needs to verify the accuracy of a torque wrench before using it for a critical fastener application. What is the proper method for verifying torque wrench accuracy?

A. Have the torque wrench calibrated against a known standard by a qualified calibration service or verify it against a calibrated master torque tool

B. Apply the torque wrench to a known bolt size and compare the stretch of the bolt against the manufacturer's published stretch specifications

C. Tighten a fastener to the click point and then verify with a second torque wrench — if both click at the same setting the first wrench is accurate

D. Check the torque wrench serial number against the manufacturer's recall database to verify no calibration advisories have been issued for that unit

5. A truck has been parked inside the shop overnight with the engine off. In the morning, the technician starts the engine to move the truck outside. Within 30 seconds of starting, another technician complains of headache and dizziness. What is the immediate action?

A. Open the shop's overhead doors slightly to allow some ventilation while the truck idles and warms up before driving it outside

B. Shut the engine off immediately and open all shop doors to ventilate the space — carbon monoxide from the exhaust is accumulating in the enclosed building

C. Move the truck outside quickly while the other technician steps into the office area until the exhaust dissipates from the main shop floor

D. Check the truck's exhaust system for a leak that is producing higher-than-normal carbon monoxide concentrations requiring catalytic converter repair

6. A fleet maintenance shop is implementing a formal preventive maintenance program. Which documentation element is most critical for demonstrating regulatory compliance during a commercial vehicle safety audit?

A. Photographs of each vehicle taken before and after every PM service to provide visual evidence of the work performed on each component

B. A spreadsheet tracking the total labour hours spent on each vehicle to demonstrate adequate maintenance attention and technician allocation

C. Copies of all parts invoices organized by vehicle unit number to prove that OEM-quality replacement parts were used for every repair

D. Complete signed inspection reports for each PM service detailing the items inspected, measurements taken, defects found, and corrective actions performed

7. A technician is disposing of waste oil filters from a fleet of diesel trucks. According to Canadian environmental regulations, how must used oil filters be handled?

A. Drain the filters for 24 hours in a warm environment and then dispose of them in the regular shop waste dumpster as general solid waste material

B. Crush the filters in an oil filter crusher and collect the expressed oil in the waste oil tank — the crushed metal casings go to scrap metal recycling

C. Return the used filters to the filter supplier who is legally required to accept and recycle all used oil filter elements sold under their brand name

D. Store the filters uncrushed in a sealed container and arrange pickup by a licensed hazardous waste hauler for proper processing at an approved facility

8. A technician discovers that a truck's steering tie rod end is severely worn during a PM inspection. The fleet manager authorizes the repair. Before removing the old tie rod end, what measurement must the technician take to minimize the need for a post-repair alignment?

A. The toe angle of both steer tires measured with a laser alignment tool before any components are disconnected from the steering linkage

B. The turning radius of both steer wheels at full lock to verify the Ackermann geometry is correct before disturbing the tie rod adjustment

C. The exposed thread length or the overall length from the adjusting sleeve to the tie rod end centreline so the new end can be installed at the same position

D. The torque on the tie rod end castle nut to ensure the replacement end is tightened to the same specification as the original factory-installed component

9. A heavy-duty diesel engine has a fuel knock that is most noticeable during cold starts and light load operation. The fuel meets the minimum cetane specification. A scan tool shows that the injection timing is retarded 2 degrees from the base calibration. What is the most likely reason the ECM has retarded the timing?

A. The engine has a fault code for the turbocharger position sensor and the ECM retards timing to protect the turbocharger from overspeed damage

B. The coolant temperature sensor is reading falsely high causing the ECM to apply a warm-engine timing strategy during the cold operating condition

C. The engine oil temperature is above specification and the ECM retards timing to reduce the combustion temperature and protect the oil from further degradation

D. The ECM has applied a timing retard as part of the aftertreatment regeneration or emissions strategy — retarded timing raises exhaust temperature for DPF regeneration

10. A diesel engine equipped with unit injectors has one injector that is not firing. The ECM commands the injector and the scan tool shows the commanded pulse width is normal. A noid light connected to the injector harness connector does not flash when that cylinder fires. What does this indicate?

A. The injector solenoid coil has an open circuit that prevents the ECM from controlling fuel delivery to that cylinder through the injector driver

B. The ECM driver circuit for that injector has an open or high-resistance fault preventing the activation signal from reaching the injector connector

C. The injector mechanical components have seized internally and the ECM has automatically disabled the driver circuit to protect itself from overload

D. The camshaft lobe for that injector has worn flat and the injector plunger is not being actuated even though the electrical signal is being sent correctly

11. A heavy-duty diesel engine has been overhauled and during initial startup the oil pressure reads zero on the gauge. The engine is immediately shut down. What should the technician check first before assuming the oil pump has failed?

A. Whether the oil pump was primed before startup — an unprimed pump may take several seconds to build pressure and the engine should not be started without pre-lubrication

B. The oil pressure sending unit electrical connector for a disconnection during the overhaul that would cause a false zero reading on the gauge

C. The oil filter for a collapsed element that is blocking oil flow from the pump to the main gallery and preventing pressure from building downstream

D. The crankshaft main bearing clearances for an error during reassembly that created excessive clearance allowing the oil to bypass before building pressure

12. An engine oil sample shows 0.5% fuel dilution — the oil viscosity has dropped below the minimum specification for the grade. The engine has 8,000 km on the current oil change. What is the most likely cause?

A. The oil drain interval is too long for the ambient operating conditions and the fuel dilution is a normal accumulation from standard combustion blow-by

B. The engine idle time percentage is excessive and the prolonged low-temperature operation causes incomplete combustion that washes fuel past the rings

C. A leaking fuel injector is allowing liquid fuel to enter the combustion chamber where it washes past the piston rings and accumulates in the crankcase oil

D. The fuel return line check valve has failed allowing fuel to siphon from the tank into the crankcase through the injector fuel gallery while the engine is off

13. A truck's diesel engine produces visible white smoke from the exhaust that persists even after the engine reaches full operating temperature. The smoke has a sweet odour. Coolant level has dropped noticeably since the last PM service. What does this combination of symptoms confirm?

A. The fuel system has a contamination problem with water-laden diesel fuel causing incomplete combustion and the steam-like white exhaust appearance

B. The engine is operating in a lean condition due to a turbocharger wastegate stuck open which reduces air density and causes unburned fuel to appear white

C. The catalytic converter or DOC has failed and is not oxidizing hydrocarbons which exit the tailpipe as unburned white fuel vapour regardless of engine temperature

D. Coolant is entering the combustion chamber through a failed head gasket, cracked head, or cracked liner and is being vaporized in the exhaust as white steam

14. A common rail diesel engine intermittently loses power during highway driving. The scan tool shows the fuel rail pressure drops from the commanded 1,600 bar to approximately 1,100 bar during the power loss events. The transfer pump pressure is stable. Between events, the system operates normally. What is the most likely cause?

A. The fuel rail pressure relief valve is intermittently opening at a lower pressure than its specification allowing rail pressure to bleed off temporarily

B. An injector has an intermittent internal leak that periodically allows excessive fuel to return from the rail faster than the high-pressure pump can replace it

C. The high-pressure pump drive coupling has a worn spline that periodically slips under load reducing the pump's effective displacement momentarily

D. The fuel temperature is fluctuating and the resulting density changes cause the ECM's fuel metering calculation to underfuel the high-pressure pump intermittently

15. A technician is troubleshooting a heavy-duty diesel engine that cranks normally but will not start. There is no smoke from the exhaust during cranking. The scan tool shows 0 RPM during cranking even though the engine is clearly rotating. What sensor fault would produce this symptom?

A. The crankshaft position sensor has failed — the ECM cannot determine engine position or speed and will not command fuel injection without this signal

B. The camshaft position sensor has failed — the ECM cannot determine the correct firing order and disables all injector output to prevent engine damage

C. The intake manifold pressure sensor has failed reading maximum boost which causes the ECM to calculate that the engine is already running and not cranking

D. The coolant temperature sensor has failed reading extremely high temperature causing the ECM to activate an overheat protection shutdown during cranking

16. A turbocharged diesel engine has low power but no black smoke. The turbocharger appears to function correctly with no unusual noise. Boost pressure at full load reads 20 kPa below specification. The intake tract from the turbocharger to the intake manifold has been pressure-tested and shows no leaks. What should be checked next?

A. The exhaust backpressure for a plugged DPF or catalytic converter that reduces the exhaust energy available to drive the turbocharger turbine wheel

B. The fuel injectors for a lean condition that reduces the combustion energy available to produce exhaust gas for the turbocharger turbine wheel

C. The exhaust manifold gaskets for internal leaks that divert exhaust gas away from the turbine inlet reducing the energy available to drive the turbocharger

D. The air filter restriction indicator because a partially restricted filter reduces the air volume available to the compressor inlet lowering the achievable boost pressure

17. An EGR-equipped diesel engine has a persistent low coolant level complaint. No external leaks are found and the engine oil is clean. The EGR cooler has been pressure-tested and passed. Where else could the coolant be going?

A. The turbocharger coolant drain line has a restriction that causes coolant to back up and overflow through the turbocharger bearing housing into the exhaust stream

B. The charge air cooler on some engines has coolant passages for intake air cooling — a leak in this cooler would consume coolant through the intake tract without visible smoke

C. The cab heater core has a very slow seep that drips onto the cab floor insulation where it evaporates from the heater blower's airflow without leaving a visible puddle

D. The coolant is being consumed through microscopic head gasket porosity that allows small amounts of coolant to enter combustion chambers without producing visible white smoke

18. A heavy-duty diesel engine has a consistent misfire on cylinder number 2. The injector has been replaced, the valve lash has been verified, and a compression test shows all cylinders within specification. What should the technician investigate next?

A. The fuel supply line to the number 2 injector for a restriction that limits the fuel volume available to the injector during the injection event at higher engine loads

B. The injector calibration code entry in the ECM for cylinder 2 — if the code was not updated after the injector replacement, the ECM may be commanding incorrect fuel delivery

C. The glow plug on cylinder 2 for a failure that prevents adequate combustion chamber preheating during cold operation causing a consistent misfire at all temperatures

D. The camshaft position sensor for a timing error that specifically affects the injection event on cylinder 2 by shifting the signal phase for that cylinder's firing position

19. A truck driver reports that the engine oil pressure warning lamp flickers briefly at idle when the engine is at operating temperature but the oil level is correct. What is the earliest and most cost-effective diagnostic step?

A. Verify the oil pressure with a mechanical test gauge installed at the main gallery to determine if the low pressure is real or a false indication from the sending unit

B. Replace the oil pressure sending unit immediately since flickering at idle is the classic symptom of a failing sending unit with worn internal contacts

C. Perform an engine oil analysis to check for bearing metals since low oil pressure at hot idle typically indicates worn main and rod bearing clearances

D. Change the engine oil to a higher viscosity grade to increase the oil film thickness and resolve the low-pressure indication at idle operating temperature

20. A diesel engine equipped with a VGT turbocharger has a fault code for VGT over-speed. The engine is derated. What condition could cause the turbocharger to overspeed?

A. A restricted exhaust system downstream of the turbocharger that creates backpressure forcing more exhaust energy through the turbine than the wastegate can control

B. An air intake restriction upstream of the compressor that reduces the compressor's aerodynamic load allowing the turbine to accelerate beyond its design speed limit

C. The VGT actuator has failed in the closed-vane position accelerating the exhaust gas velocity across the turbine and driving the shaft speed beyond the design maximum

D. The intercooler has developed an internal restriction that increases the backpressure on the compressor side forcing the turbocharger to spin faster to overcome the resistance

21. A heavy-duty diesel engine is consuming one litre of coolant per 1,000 km. There are no visible external leaks, the engine oil is clean, and the exhaust shows no white smoke under any operating condition. What test would be most effective at locating the source?

A. A radiator cap pressure test to verify the cap holds the correct pressure and is not releasing coolant through the overflow tube during normal operation

B. A fluorescent dye test — add UV-reactive dye to the coolant, operate the vehicle normally, then inspect all components with a UV lamp for dye traces

C. An exhaust gas analyzer test at the coolant surge tank opening to detect combustion gases that indicate a head gasket breach or cylinder head crack

D. A cooling system endoscope inspection inserted through the radiator fill neck to visually examine the internal surfaces of the radiator and heater core for corrosion

22. A technician is setting the injector height (protrusion) on a mechanically actuated electronic unit injector (MEUI). The specification calls for 0.5 mm protrusion above the cylinder head surface. What is the consequence of setting the injector 0.3 mm too high?

A. The injector will overfuel that cylinder because the increased protrusion advances the mechanical injection timing producing more fuel per stroke

B. The injector tip will contact the piston crown during engine operation causing mechanical damage to both the injector nozzle tip and the piston combustion bowl

C. The injector rocker arm will have excessive preload causing accelerated wear on the rocker arm bushing, shaft, and the injector follower contact surface

D. The cylinder will have reduced compression because the injector protrusion displaces combustion chamber volume and lowers the effective compression ratio

23. A truck's engine has a high idle speed complaint — the engine idles at 900 RPM instead of the specified 700 RPM. There are no active fault codes. The accelerator pedal position sensor reads 0% at idle. What should be checked?

A. The idle speed parameter in the ECM calibration — it may have been reprogrammed, or an idle speed bump feature (for PTO or A/C) may be active without the operator realizing it

B. The engine cooling fan clutch for a failed thermal coupling that is locked on creating an additional load that the ECM compensates for by raising the idle speed

C. The turbocharger VGT actuator for a stuck-closed position that restricts exhaust flow and causes the ECM to raise idle speed to prevent the engine from stalling

D. The intake manifold temperature sensor for a false cold reading that triggers the ECM's cold-start idle strategy even though the engine is at full operating temperature

24. A heavy-duty diesel engine has excessive exhaust backpressure. The DPF has been recently cleaned and the differential pressure reading across the DPF is normal. What other exhaust system component could cause elevated backpressure?

A. The exhaust manifold gaskets for internal leaks that allow air to enter the exhaust stream and register as increased pressure on the backpressure sensor

B. The upstream NOx sensor for a signal error that causes the ECM to calculate a false backpressure value from the incorrect exhaust composition data

C. The DOC catalyst for a melted or collapsed substrate that physically blocks exhaust flow through the aftertreatment system upstream of the DPF inlet

D. The SCR catalyst for a contamination buildup from excessive DEF crystallization that creates a physical restriction in the exhaust path downstream of the DPF

25. A diesel engine cranks and starts but immediately stalls when the key is released from the start position to the run position. The engine runs normally as long as the key is held in the start position. What is the most likely cause?

A. The starter motor is providing a ground path for the fuel injection system that is lost when the starter disengages and the key moves to the run position

B. The batteries drop below the ECM's minimum operating voltage during cranking and recover when the starter stops drawing current but the ECM has already shut down

C. The ignition switch has a faulty run position contact — it provides power in the start position but loses the circuit that powers the ECM or fuel system in the run position

D. The fuel transfer pump is powered through a relay that activates only in the start position and does not receive its run-position signal from the oil pressure switch circuit

26. A heavy-duty diesel engine equipped with EGR has developed a persistent rough idle over the past 10,000 km. The intake manifold has been removed and significant carbon buildup is found coating the intake ports and valves. What caused this carbon accumulation?

A. The air filter has been allowing fine particulate matter past its media which carbonizes on the hot intake valve surfaces during normal combustion cycles

B. The EGR system introduces exhaust gas (containing soot and hydrocarbons) into the intake tract where these particles accumulate as carbon deposits on the cooler intake surfaces

C. The turbocharger compressor seal has failed allowing engine oil to enter the intake stream where it bakes onto the intake port surfaces from the heat of compression

D. The crankcase ventilation system is routing excessive oil vapour into the intake manifold where it combines with intake air moisture and forms a sticky carbon residue

27. A truck's coolant system uses a supplemental coolant additive (SCA) to protect wet cylinder liners from cavitation erosion. An SCA test strip shows the SCA concentration is three times the recommended level. What problem can this over-concentration cause?

A. Excessive SCA concentration causes additive dropout — the surplus chemicals precipitate as gel and solids that plug the radiator, heater core, and oil cooler passages

B. The high SCA level neutralizes the antifreeze component reducing the coolant's freeze point protection and creating a risk of engine block damage in cold weather

C. The over-concentrated SCA reacts with the thermostat wax element causing the thermostat to open at a lower temperature than specification resulting in overcooling

D. Excessive SCA creates a chemical reaction with the rubber cooling system hoses that softens and degrades the hose material leading to premature hose failure and leaks

28. A common rail diesel engine has a diagnostic code indicating the fuel metering unit is operating at its maximum duty cycle but the rail pressure is still 100 bar below commanded pressure at full load. Transfer pump pressure is correct. What does this indicate?

A. The high-pressure pump's internal components are worn beyond their volumetric efficiency limit — the pump cannot deliver enough fuel even at maximum metering valve opening

B. The fuel rail pressure sensor has drifted and is reading 100 bar lower than the actual pressure which is actually at the correct commanded level during full load operation

C. The engine ECM software calibration needs an update to adjust the metering unit duty cycle range to accommodate the normal wear characteristics of the high-pressure pump

D. The fuel temperature has exceeded the compensation range of the ECM's density correction algorithm causing an apparent shortfall between commanded and actual rail pressure

29. A diesel engine is being tested for exhaust manifold leaks. The technician feels around each exhaust port connection while the engine runs at idle. At cylinder 5, the technician detects a slight pulse of hot exhaust gas. Rather than simply retorquing the manifold bolts, what underlying condition should the technician investigate?

A. The exhaust manifold may be cracked between cylinders 4 and 5 and the crack opens under thermal expansion allowing gas to escape at the port gasket sealing surface

B. The manifold bolt holes in the cylinder head may have pulled threads from previous over-torquing and the bolts can no longer achieve adequate clamping force on the gasket

C. The exhaust manifold may be warped from thermal cycling and the flat sealing surface no longer conforms to the cylinder head face allowing gas to escape at cylinder 5

D. All of these conditions could cause a persistent exhaust leak at a single port — the manifold should be removed and both the manifold and head surfaces inspected

30. A truck's air system build-up time from 0 to 690 kPa (100 psi) with the engine at governed RPM is 5 minutes. The regulatory maximum is typically 3 minutes. The compressor is relatively new and was replaced 20,000 km ago. What should be checked first?

A. The air dryer for a stuck-open purge valve that is continuously venting air to atmosphere during the entire build-up test preventing the system from reaching pressure

B. The air system for leaks — even small leaks distributed across the system can add enough cumulative air loss to significantly extend the build-up time beyond specification

C. The compressor intake for a restricted filter or collapsed hose that limits the air volume entering the compressor cylinder during each intake stroke reducing output

D. The governor cut-in setting for an incorrect adjustment that triggers the compressor to unload prematurely before the system reaches the full 690 kPa test endpoint

31. A truck's spring brakes release normally when the parking brake valve is pushed in, but the service brakes produce very little stopping force when the brake pedal is depressed. Air pressure reads normal on both gauges. What is the most likely cause?

A. The brake shoe return springs have seized in the retracted position preventing the shoes from contacting the drum surface during service brake application events

B. The relay valves are functioning in bypass mode directing reduced pressure to the service chambers due to contaminated internal pistons and seats sticking intermittently

C. Both front and rear brake chambers are functioning correctly but the brake linings have glazed and lost their friction coefficient from a previous overheating event

D. The foot valve's internal piston seals have failed and the valve is not delivering adequate application pressure to the relay valves despite showing normal reservoir pressure

32. A driver notices that when the parking brake valve (yellow diamond) is pulled out, the truck stops but the air gauge on the secondary circuit drops to zero. The primary circuit gauge remains at full pressure. What does this indicate?

A. The spring brakes are being supplied from the secondary circuit — pulling the parking brake valve exhausts the secondary reservoir pressure to apply the springs

B. The secondary circuit has a massive leak that coincidentally manifests only when the parking brake is applied creating a false association with the parking brake function

C. The parking brake valve has crossed internal ports connecting the spring brake exhaust to the secondary circuit rather than the spring brake supply circuit

D. The ABS system is automatically depleting the secondary circuit when the parking brake is applied to prevent the front service brakes from activating simultaneously

33. An air brake system has a slow pressure leak. The leak rate is 21 kPa (3 psi) per minute with the brakes released and 35 kPa (5 psi) per minute with the brakes applied. The tractor-trailer combination specification allows 14 kPa (2 psi) released and 28 kPa (4 psi) applied. This combination fails both tests. What is the most efficient diagnostic approach?

A. Disconnect the trailer gladhands from the tractor and retest the tractor alone — then test the trailer alone to determine which unit contains the leak or if both are leaking

B. Replace all brake chamber diaphragms on both the tractor and trailer since the combination fails both tests and the diaphragms are the most common leak source

C. Perform a soap bubble test on every fitting, valve, and chamber on both the tractor and trailer simultaneously to find all leak sources in a single comprehensive inspection

D. Install an air flow meter on the primary and secondary circuits individually to measure the precise leak rate from each circuit and pinpoint the leaking reservoir system

34. A tractor-trailer combination has ABS on both the tractor and trailer. During a hard braking event on wet pavement, the tractor ABS activates normally on the drive axle but the trailer wheels lock up. The trailer ABS lamp was off before the event. What could cause the trailer ABS to fail during operation?

A. The trailer ABS power supply voltage dropped below the minimum operating threshold during the heavy brake application event due to connector resistance under increased current draw

B. The trailer ABS is designed to activate only after the tractor ABS has fully modulated its own axle pressures creating a sequential activation delay that allows initial trailer lockup

C. The trailer relay valve is delivering higher pressure than the tractor foot valve commands because the relay valve crack pressure has drifted upward from contamination and wear

D. The trailer ABS wheel speed sensors lost signal during the hard braking event because the tone rings iced over from road spray and the sensors could not read the wheel speed

35. A truck has had its air dryer desiccant cartridge replaced. After replacement, the technician notices that the purge cycle produces a significantly shorter burst than before the replacement. The old cartridge was heavily contaminated with oil. What should the technician check?

A. The air dryer purge valve for contamination from the old saturated cartridge that may have deposited oil residue on the valve seat reducing its opening capacity

B. The governor signal line for a restriction that delays the unload signal and shortens the purge cycle because the governor cannot respond quickly enough to pressure changes

C. The new desiccant cartridge for correct part number — an incorrect cartridge may have a different purge orifice size or internal configuration than the OEM specification requires

D. Both the purge valve for contamination from the old cartridge and the new cartridge for correct part number — either condition could produce a shortened purge cycle

36. A truck's automatic slack adjuster on the left front steer axle brake has been manually adjusted three times in the past month. Each time it falls out of adjustment within a few hundred kilometres. The drum, linings, hardware, and air chamber have all been inspected and found to be in acceptable condition. What is the most likely cause?

A. The automatic slack adjuster itself has failed internally and is not maintaining its adjustment — it must be replaced rather than repeatedly manually adjusted

B. The S-cam shaft bushings are excessively worn allowing the cam to shift axially during brake applications which changes the effective pushrod stroke measurement

C. The brake chamber pushrod clevis pin hole has elongated from wear changing the effective geometry between the chamber and the adjuster arm during operation

D. The drum has an out-of-round condition that is within the visual inspection tolerance but creates enough variation to cycle the adjuster through its range during every wheel rotation

37. A truck equipped with disc brakes on all axle positions has a brake pedal that feels firm with good stopping power but produces a rhythmic pulsation in the pedal during every stop. What is the most likely cause?

A. The ABS modulators are cycling unnecessarily during every brake application because the wheel speed sensor signals are erratic from contaminated tone rings

B. The brake pad friction material has transferred unevenly to the rotor surface creating high and low friction areas that produce pulsation during each revolution

C. One or more brake rotors have excessive lateral runout or thickness variation causing the caliper pistons to pulsate as the rotor's high and low spots rotate through the pads

D. The brake pad backing plates have delaminated from the friction material causing the pads to vibrate between the caliper pistons and the rotor surface during application

38. A trailer's emergency (spring) brakes apply automatically during a tractor-trailer separation on the highway. The trailer comes to a stop safely. Why did the spring brakes apply?

A. The trailer ABS module detected the separation through a loss of CAN bus communication with the tractor and commanded the spring brakes to apply as an emergency response

B. The loss of supply air pressure from the tractor (through the severed red gladhand line) caused the spring brake chambers to exhaust their hold-off pressure allowing the springs to apply

C. The trailer's inertia sensor detected the sudden deceleration from the separation event and activated the spring brake solenoid to apply the emergency brakes immediately

D. The trailer relay valve detected the loss of service line pressure (through the severed blue gladhand) and responded by sending full reservoir pressure to the spring brake chambers

39. A brake drum has been machined and returned to service. After 5,000 km, the driver reports a pulsation during braking that was not present immediately after the machining. What has most likely occurred?

A. The brake linings have worn unevenly due to a contamination defect in the lining material that was not visible during the initial installation inspection

B. The drum has developed brake judder from heat checking on the machined surface that has created raised areas disrupting the smooth contact between lining and drum

C. The brake shoe return springs have weakened from the heat generated during the 5,000 km of service and are no longer retracting the shoes evenly from the drum surface

D. The drum has developed hard spots (heat-hardened areas) from uneven heating during braking that resist wear differently than the surrounding material creating high spots

40. A truck's air pressure builds to the governor cut-out setting normally, but the low-air-pressure warning buzzer activates intermittently during highway driving with no brake application. The air gauges show normal pressure during the buzzer events. What is the most likely cause?

A. The low-pressure warning switch has a faulty electrical connection or the switch itself is malfunctioning and activating at a higher pressure than its calibrated threshold

B. The air system has pressure fluctuations at the switch location caused by compressor pulsation that momentarily dips below the switch threshold during unloading transitions

C. The ABS system is consuming small amounts of air during normal highway modulation cycles that briefly reduce the pressure below the warning switch activation threshold

D. The alternator voltage fluctuations during highway driving are affecting the warning buzzer's electronic circuit causing false activation unrelated to actual air pressure conditions

41. A heavy-duty truck has its brake drums removed for inspection. The technician finds that the brake shoe lining material is separating from the shoe table (the metal backing plate) on two shoes. What is this condition called and what caused it?

A. Lining glazing — caused by repeated light brake applications that polish the lining surface until it separates from the adhesive bond with the shoe table

B. Lining fade — caused by excessive brake temperatures that exceed the lining material's thermal capacity and soften the bond between the lining and the shoe table

C. Lining delamination — caused by excessive heat, moisture contamination, or adhesive failure that breaks the bond between the friction material and the metal shoe table

D. Lining scoring — caused by foreign material trapped between the lining and drum that creates groove patterns which undermine the lining-to-table adhesive from the friction surface

42. A trailer equipped with disc brakes has a pad wear indicator sensor. The sensor illuminates a lamp on the trailer when the pad thickness reaches minimum specification. The lamp is currently illuminated. How should the technician verify the lamp indication before replacing the pads?

A. Use the scan tool to read the trailer ABS module's pad wear data parameter and compare it to the physical measurement of the remaining pad thickness at all wheel positions

B. Physically measure the pad thickness at each wheel position with a measuring tool to confirm the wear indicator lamp is reporting an accurate condition across all trailer brake positions

C. Check the pad wear sensor wiring for a short circuit that could be grounding the lamp circuit and producing a false indication of minimum pad thickness on the trailer

D. Compare the trailer's total mileage since the last pad change to the manufacturer's expected pad life specification to determine if the wear rate is within the normal service range

43. A truck's brake system has a dual-circuit foot valve. During testing, the technician discovers that depressing the brake pedal produces normal pressure delivery from the primary circuit but zero delivery from the secondary circuit. The secondary reservoir pressure is at full cut-out. What has failed?

A. The secondary piston or its seals inside the dual foot valve have failed — the piston cannot build pressure in the secondary delivery circuit despite having adequate supply pressure

B. The secondary circuit relay valve is stuck in the exhaust position dumping all delivered pressure to atmosphere before it reaches the front brake chambers on the secondary circuit

C. The one-way check valve between the supply tank and the secondary reservoir has failed in the closed position preventing the reservoir from receiving any air from the compressor

D. The ABS modulator valves on the front axle are stuck in the release position exhausting all secondary circuit delivery pressure before it reaches the brake chambers on the front wheels

44. A tractor-trailer is descending a long grade. The driver has been using the engine retarder and applying the service brakes intermittently. After approximately 8 km of descent, the driver notices that the brake pedal travels further before the brakes begin to engage. What is the most likely explanation?

A. The brake drums have expanded from heat causing the shoes to be further from the drum surface and requiring additional pushrod stroke to bring the linings into contact

B. The air reservoirs have depleted from the repeated brake applications and the compressor has not been able to fully recover between applications during the continuous descent

C. The automatic slack adjusters have over-adjusted from the heat expansion and when the drums cool they will leave the shoes too tight against the drum surface causing drag

D. The increased pedal travel indicates brake drum expansion from repeated braking heat — the drums grow in diameter and the linings must travel further to contact the larger drum surface

45. A loaded truck must stop at the bottom of a steep downhill grade. The driver applies the brakes firmly and feels ABS activation on the rear axle. What is the appropriate driver response?

A. Release the brake pedal completely and pump it rapidly to manually control the braking force rather than allowing the ABS to modulate the rear axle brake pressure

B. Shift the transmission to the lowest possible gear immediately to maximize engine braking and reduce the reliance on the service brakes for the remaining stopping distance

C. Maintain firm steady pressure on the brake pedal and allow the ABS system to modulate the rear brake pressure while maintaining maximum braking on the non-ABS-activated axles

D. Apply the parking brake (yellow diamond) partially to supplement the service brake force with the spring brake mechanical force on the rear axle drive wheels

46. A truck has a combination of drum brakes on the rear drive axles and disc brakes on the front steer axle. During a brake inspection, the technician notices that the front disc brake pads have worn significantly faster than the rear drum brake linings. Is this normal?

A. This wear pattern is abnormal and indicates the front brakes are doing more work than they should — the proportioning valve should be checked for a front bias condition

B. This is a normal characteristic because disc brakes generally wear faster than drum brakes due to the constant light contact between the pads and rotor even when brakes are not applied

C. This wear pattern is abnormal and indicates the rear drum brake automatic slack adjusters are not maintaining proper adjustment causing the front brakes to compensate excessively

D. This is a normal characteristic because the front axle disc brakes are designed to provide more braking force than the rear drums since the vehicle's weight shifts forward during braking

47. A truck's 24-volt starting system uses two 12-volt batteries in series. After replacing both batteries, the starter turns extremely fast and the engine starts instantly. However, the dash voltmeter reads 28.8 volts with the engine running. What is the concern?

A. The voltage regulator is set for 24-volt operation and 28.8 volts is within the normal charging range for a 24-volt system — no action is required

B. The alternator is overcharging the batteries which will cause electrolyte boiling, excessive gassing, and shortened battery life if not corrected immediately

C. The new batteries have a lower internal resistance than the old batteries which causes the alternator to produce a higher voltage temporarily during the break-in period

D. The engine is running above its governed RPM which causes the alternator to exceed its rated voltage output until the governor stabilizes the engine speed

48. A truck's scan tool shows a J1939 CAN bus fault — SPN 639, FMI 9 (abnormal update rate). Multiple modules report this fault simultaneously. The engine runs normally but the instrument cluster gauges are erratic. What is the most probable cause?

A. A CAN bus backbone issue such as a damaged wire, corroded splice, or loose connector that is degrading signal quality and causing intermittent data errors across all modules

B. The engine ECM is broadcasting data at an incorrect rate due to a software fault that floods the bus with messages and disrupts communication for all other modules

C. The instrument cluster has a failed internal CAN transceiver that is loading the bus down and affecting communication quality for all modules connected to the same bus segment

D. An aftermarket device (GPS tracker, telematics unit, or alarm system) has been connected to the CAN bus and is injecting non-standard messages that corrupt the data bus timing

49. A truck's right headlamp is significantly brighter than the left headlamp. Both bulbs are the same type and wattage. Voltage measured at the right headlamp socket is 12.4 volts and at the left is 12.3 volts. What should the technician investigate?

A. The headlamp reflector on the left side for discolouration or haze that reduces the apparent brightness even though the bulb is receiving adequate voltage for normal operation

B. The left headlamp bulb for a darkened or discoloured glass envelope that reduces light output even though the filament is intact and drawing the correct current at rated voltage

C. The right headlamp for an incorrect bulb type that appears brighter than the standard specification creating the perception that the left side is dimmer by comparison

D. The headlamp switch for uneven internal contact resistance that delivers different current levels to the left and right headlamp circuits despite showing similar voltage readings

50. A truck's engine cooling fan does not disengage when the engine reaches operating temperature. The fan runs continuously at full speed. The fan is controlled by a viscous (thermal) fan clutch. What is the most likely cause?

A. The coolant temperature sensor is reading falsely hot causing the ECM to command the fan to stay engaged even though the engine has not reached the engagement threshold

B. The fan clutch has failed in the engaged (locked) position — the internal silicone fluid coupling or the thermal spring mechanism has seized allowing no slippage between the drive and the fan

C. The engine thermostat is stuck closed causing the engine to overheat rapidly which correctly signals the fan clutch to remain engaged continuously to prevent further overheating

D. The fan clutch drive belt is too tight creating enough friction to prevent the clutch from disengaging even when the thermal element is commanding the clutch to release and freewheel

51. A truck's turn signal indicator on the dash illuminates steadily (does not flash) when the turn signal lever is activated. The exterior turn signal lamps do not illuminate at all. The flasher module is good and the fuse is intact. What is the most likely cause?

A. An open circuit in the wiring between the flasher module and the turn signal lamps — power reaches the flasher but cannot pass through to the lamps to complete the circuit

B. The turn signal switch inside the column has a shorted internal contact that bypasses the flasher module and sends continuous power to the indicator lamp only

C. The body controller has entered a fault mode where it illuminates the dash indicator as a warning but disables the exterior lamp output to prevent a short circuit from causing damage

D. The ground circuit for the exterior turn signal lamps is open — without a ground return path, no current flows through the lamps but the dash indicator still illuminates through its own ground

52. A truck equipped with a multiplexed body electrical system has intermittent failures of various accessories — the windshield wipers, interior lights, and horn all fail at different times for no apparent reason. No fault codes are stored in any module. What should be investigated?

A. The fuse panel for loose fuse connections that create intermittent power supply interruptions to different circuits as the vehicle vibrates during driving conditions

B. The headlamp switch for an internal failure that disrupts the body controller's command input causing it to randomly disable different output circuits in a protective response

C. The battery terminal connections for intermittent high-resistance faults that cause voltage drops during varying load conditions affecting different circuits at different times

D. The body controller module's power supply and ground connections for intermittent faults that cause the module to reset briefly and lose its output states for various accessory circuits

53. A heavy-duty truck's alternator is producing a high-pitched whining noise that increases with engine RPM. The alternator output voltage and amperage test normal. The drive belt is tight and properly aligned. What is the most likely source of the noise?

A. The alternator field winding insulation has partially failed creating an internal electrical arcing noise that produces a frequency proportional to the rotor rotational speed

B. The alternator voltage regulator is oscillating between charge and no-charge states at a high frequency creating an audible electromagnetic hum from the field coil rapid cycling

C. The alternator front or rear bearing is beginning to fail — the worn bearing produces a whining noise proportional to shaft speed while the electrical output remains normal until the bearing seizes

D. The alternator stator laminations have loosened and are vibrating at the electrical frequency of the three-phase output creating an audible hum that increases with alternator rotational speed

54. A truck's starter solenoid engages (audible click) but the starter motor does not crank the engine. The battery voltage reads 12.6 volts at rest. During the start attempt, the voltage drops to 11.8 volts. What is the most likely cause?

A. The solenoid internal contact disc is burned or pitted and cannot pass the high current needed to operate the starter motor despite the plunger engaging and producing the click sound

B. The starter motor armature is seized from internal corrosion or debris preventing it from rotating even though the solenoid is successfully connecting the motor to battery power

C. The battery has adequate voltage but insufficient CCA capacity to supply the current demand of the starter motor causing the voltage to drop and the motor to stall immediately

D. The flywheel ring gear has a damaged tooth at the current engagement position that prevents the starter drive gear from meshing and rotating the engine's crankshaft assembly

55. A truck's aftermarket accessory (a roof-mounted LED light bar) causes the AM radio to produce static noise whenever the light bar is turned on. What is the most likely cause of this interference?

A. The LED light bar driver circuit is not properly shielded and radiates electromagnetic interference (EMI) that the AM radio antenna picks up as static on nearby frequencies

B. The LED light bar is drawing excessive current that creates voltage fluctuations on the vehicle's power bus which the radio amplifier interprets as audio signal interference

C. The LED light bar is connected to the same fused circuit as the radio and the shared circuit creates a conducted interference path between the two electrical devices directly

D. The LED light bar produces radio-frequency emissions from its rapid switching power supply that the AM radio antenna receives as broadband static noise across the AM frequency range

56. A truck's fuel gauge reads full regardless of the actual fuel level. The gauge reads full even when the tank is known to be nearly empty. The fuel sending unit is a variable-resistance type where full = high resistance and empty = low resistance. What is the most likely fault?

A. The fuel sending unit float has sunk to the bottom of the tank from fuel saturation causing it to always read the empty position which the gauge inverts and displays as full

B. The signal wire between the sending unit and the gauge (or ECM) has an open circuit — the ECM reads the full 5-volt reference unloaded which corresponds to full tank on this system

C. The fuel gauge stepper motor has failed in the full position and is mechanically stuck regardless of the signal voltage it receives from the sending unit or body controller

D. The sending unit ground wire has an open circuit eliminating the ground return path — the ECM sees maximum voltage on the signal wire which it interprets as full on this high-resistance-full system

57. A truck equipped with a keyless ignition system (push-button start) cranks but will not start. The security indicator lamp on the dash flashes rapidly. What does this indicate?

A. The vehicle's immobilizer system is not recognizing the key fob and is preventing the ECM from enabling the fuel injection system even though the starter circuit is not immobilizer-controlled

B. The key fob battery has died and the wireless signal is too weak for the receiver to authenticate the fob at the normal operating range inside the cab during the start attempt

C. The engine has a mechanical fault that prevents starting and the immobilizer system is flashing the security lamp as a secondary notification that the engine did not start successfully

D. The push-button start module has an internal fault that sends the crank signal but does not simultaneously send the run signal to the ECM causing the engine to crank without fuel injection

58. A truck's tachometer reads 200 RPM higher than the actual engine speed as verified by a scan tool connected to the engine ECM. The engine operates normally at the correct speed. What is the most likely cause?

A. The crankshaft position sensor has a worn reluctor tooth that produces an extra pulse per revolution causing the ECM to calculate and broadcast a higher engine speed on the CAN bus

B. The instrument cluster is receiving the correct CAN bus data but the tachometer stepper motor has a calibration error that displays a higher reading than the received data indicates

C. The tachometer gauge in the instrument cluster has a calibration error or the cluster software is misinterpreting the engine speed data received from the CAN bus data stream

D. The engine ECM is broadcasting the engine speed in a different data format than the instrument cluster expects causing a mathematical conversion error in the displayed RPM value

59. A truck's heated windshield system does not function. The system uses electrically conductive elements embedded in the windshield glass that heat the glass surface when powered. The fuse is good and the switch appears to function (the indicator lamp illuminates). What should be checked next?

A. The windshield temperature sensor that prevents the system from activating above a certain ambient temperature to avoid unnecessary glass heating during warm weather

B. The relay or power module that switches the high-current supply to the windshield heating elements — the switch activates the indicator but the relay delivers the actual heating current

C. The vehicle speed sensor because the heated windshield system is programmed to activate only above a minimum vehicle speed to prevent overloading the electrical system at idle

D. The defroster ductwork for a damper that must close before the windshield heating elements activate to prevent the heated glass from being cooled by the defroster airflow simultaneously

60. A truck's backup alarm (reverse warning beeper) does not sound when the transmission is shifted into reverse. The reverse lamps illuminate normally. What is the most likely cause?

A. The reverse lamp switch on the transmission has a partial failure that provides voltage to the lamps but not to the backup alarm circuit due to separate internal contacts for each function

B. The backup alarm is powered through its own fuse or circuit separate from the reverse lamps and this dedicated fuse has blown or the dedicated wiring has an open circuit somewhere

C. The body controller has disabled the backup alarm output due to a software fault while maintaining the reverse lamp function through an independent output circuit on the controller

D. The backup alarm unit has failed internally — the reverse lamp circuit confirms the switch and wiring are providing the reverse-gear signal but the alarm unit itself is not producing sound

61. A truck has a parasitic battery drain that is measured at 500 milliamps with all systems off. The specification allows 50 milliamps. The technician discovers that disconnecting the alternator B+ wire reduces the draw to 45 milliamps. What component in the alternator is causing the drain?

A. One or more rectifier diodes in the alternator have failed in the shorted (forward-biased) condition allowing current to flow backward from the battery through the stator windings to ground

B. The voltage regulator is stuck in the full-field position and is continuously energizing the rotor field coil even with the engine off drawing current from the battery through the field circuit

C. The alternator drive bearing has seized and is creating a mechanical drag on the engine that the ECM compensates for by drawing additional current from the battery to maintain idle speed

D. The alternator output terminal has a high-resistance connection that creates a heat-generating resistance path drawing current continuously from the battery even when the engine is not running

62. A technician is testing a truck's glow plug system. The glow plug control module commands the glow plugs on for 15 seconds during a cold start. Using a clamp-on ammeter around the glow plug harness, the technician measures 60 amps. The system has six glow plugs, each rated at 12 amps. What is the expected total current draw for six properly functioning glow plugs?

A. 24 amps — each pair of glow plugs is wired in series reducing the individual current draw by half for each plug in the paired configuration

B. 72 amps — each glow plug draws 12 amps and the six plugs wired in parallel produce a total circuit draw of 72 amps at the rated voltage

C. 60 amps — the measured reading matches a condition where five of six glow plugs are functioning correctly and one has failed open reducing the total by 12 amps

D. 48 amps — the glow plug control module reduces voltage to each plug to extend element life which proportionally reduces the current draw per plug below the rated value

63. A truck's starter motor spins freely (high-pitched whine) when the ignition is turned to the start position but the engine does not crank. What is the most likely mechanical cause?

A. The flywheel ring gear teeth are severely worn or damaged at the engagement point and the starter drive gear cannot mesh with the flywheel to transmit cranking torque

B. The starter drive (Bendix mechanism or solenoid-actuated drive gear) is not engaging properly — the drive gear spins but fails to extend into mesh with the flywheel ring gear

C. The starter motor armature bearing has seized and the motor is spinning on its own bearing surfaces rather than transmitting torque through the gear train to the flywheel

D. The engine crankshaft has seized and the starter motor cannot overcome the mechanical resistance so the overrunning clutch in the starter drive slips to protect the motor from damage

64. A truck's CAN bus system has a terminating resistor failure. One of the two 120-ohm resistors has increased to 300 ohms due to thermal damage. What effect will this have on CAN bus communication?

A. The bus will function normally because the terminating resistors only serve to drain static charge from the wires and do not affect signal quality during active communication

B. All modules will set communication fault codes immediately and the vehicle will not start because the CAN bus requires exactly 60 ohms termination to function correctly

C. The bus will experience intermittent signal reflection and data corruption because the impedance mismatch causes partial signal reflection at the damaged terminator's location

D. The increased resistance will cause the CAN bus data rate to decrease proportionally slowing all module communication by the same percentage as the resistance increase value

65. A truck's engine ECM has a fault code for the accelerator pedal position sensor — SPN 91, FMI 2 (erratic/intermittent). The engine intermittently surges at idle and sometimes does not respond to pedal input during driving. What should be inspected?

A. The accelerator pedal position sensor connector, harness, and the sensor itself for a damaged wire, corroded connector, or worn sensor element that produces an inconsistent signal

B. The engine idle validation switch for a failure that conflicts with the pedal position sensor signal causing the ECM to receive contradictory idle and acceleration commands simultaneously

C. The throttle body actuator motor for a mechanical binding condition that prevents it from responding to the ECM's commands based on the pedal position sensor input signal

D. The cruise control module for a fault that intermittently sends speed maintain commands to the ECM overriding the accelerator pedal position sensor's input during normal driving operation

66. A truck's battery equalizer on a 24-volt system with a 12-volt tap has failed. The 12-volt accessories (radio, interior lights, USB chargers) operate at reduced brightness and the radio resets frequently. What is the battery equalizer's function?

A. It converts the 24-volt system voltage to a stable 12-volt supply for accessories by maintaining equal charge across both batteries and providing a mid-point voltage tap

B. It protects the 12-volt accessories from the 24-volt system voltage spikes by filtering the power supply through a voltage regulation circuit separate from the main charging system

C. It maintains both batteries at equal state of charge by transferring energy from the stronger battery to the weaker battery preventing uneven discharge and extending battery life equally

D. It provides a separate 12-volt charging circuit from the alternator that is independent of the 24-volt starting system ensuring the accessories receive a dedicated regulated power supply

67. A truck equipped with LED headlamps has one headlamp that flickers intermittently during driving. The flickering is random and does not correlate with engine RPM or vehicle speed. The LED headlamp assembly was replaced recently. What should be checked?

A. The headlamp mounting bolts for proper tightness because a loose headlamp assembly can create intermittent contact at the electrical connector from vibration during driving

B. The headlamp connector for proper seating and pin tension — a connector that is not fully locked or has spread terminals creates an intermittent connection that manifests as flickering

C. The alternator output for AC ripple voltage that is interfering with the LED driver circuit inside the headlamp assembly causing it to lose its regulated power supply intermittently

D. The body controller output driver circuit for the affected headlamp for a thermal fault that causes the driver to reduce current output intermittently as it cycles through its overload protection

68. A truck's electric window motor on the driver side operates very slowly in both directions. The technician measures voltage at the motor connector and reads 12.4 volts in both up and down. Current draw reads 15 amps. The rated current draw for the motor is 8 amps. What does the elevated current draw with normal voltage indicate?

A. The window motor is drawing excessive current due to increased internal resistance from worn brushes, a binding armature, or a failing field winding that increases the motor's mechanical load

B. The window regulator mechanism is binding or the window glass is misaligned in its channel creating excessive mechanical resistance that forces the motor to draw more current to overcome

C. The power supply fuse for the window circuit is undersized and is partially restricting current flow which the motor compensates for by drawing additional current from the circuit ground path

D. The motor ground circuit has excessive resistance that creates a voltage drop requiring the motor to draw more current to produce the same mechanical output with the reduced effective voltage

69. A heavy-duty manual transmission produces a whining noise that changes pitch with vehicle speed but does not change when different gears are selected. The noise is present in all forward gears and neutral with the clutch engaged. What is the most likely source?

A. A worn synchronizer ring on the most frequently used gear that has spread its wear characteristics to the adjacent gear positions through debris contamination

B. The transmission oil level is low causing the gear teeth to run partially dry and produce a whining noise from insufficient lubricant film at the gear mesh contact points

C. The transmission output shaft bearing is failing and produces a speed-dependent whine because it rotates proportionally to vehicle speed regardless of which gear is selected

D. A worn countershaft gear set that produces noise at all gear positions because the countershaft gears mesh continuously whenever the input shaft is spinning from the engine

70. A truck's clutch pedal free play measures 10 mm. The specification calls for 15 to 25 mm. What is the consequence of operating with insufficient clutch pedal free play?

A. The engine will stall when the clutch pedal is released because the disc cannot fully engage with the flywheel and transmit the engine's full torque output

B. The transmission will grind when shifting because insufficient free play prevents the clutch from fully disengaging when the pedal is depressed by the driver

C. The clutch will slip under load because the release bearing is in constant contact with the pressure plate fingers partially disengaging the clutch at all times

D. The clutch disc hub splines will wear prematurely because the reduced free play causes the disc to oscillate on the input shaft during normal clutch engagement cycles

71. A truck with an Allison automatic transmission shifts from first to second gear normally but flares (engine RPM increases momentarily before second gear engages) during the second-to-third shift. All other shifts are normal. What is the most likely cause?

A. The torque converter lockup clutch is engaging prematurely during the second-to-third shift creating a momentary disconnect between the engine and the transmission gear train

B. The clutch pack that applies for third gear is slipping momentarily during engagement — either from worn clutch plates, a weak apply piston seal, or low apply pressure for that specific clutch

C. The transmission fluid level is slightly overfilled which causes aeration during the second-to-third shift due to the specific fluid dynamics at that gear change speed and flow rate

D. The engine ECM is not reducing engine torque quickly enough during the second-to-third shift allowing the engine RPM to flare before the clutch pack fully engages and absorbs the torque

72. A truck's driveshaft has been removed for U-joint replacement. During disassembly, the technician notices that one of the bearing caps on the original U-joint was dry — no needle bearings were visible and the cap cavity was packed with rust. What does this indicate?

A. The U-joint seal on that bearing cap failed long ago allowing moisture to enter and grease to escape — the needle bearings corroded away and the journal operated metal-to-metal on rust debris

B. The U-joint was manufactured with a defective bearing cap that was never loaded with needle bearings from the factory and the joint has been operating on the journal surface alone

C. The grease fitting for that bearing cap was blocked and the lubrication interval was too long causing the grease to dry out and the needle bearings to disintegrate from dry friction wear

D. The driveshaft was previously repaired with a remanufactured U-joint that used pressed-in needle bearing cups instead of loose needles and the pressed cup corroded and disintegrated

73. A drive axle has been rebuilt with new differential side gears and spider gears. After reassembly, the axle produces a clicking noise during tight turns at low speed. The backlash between the ring gear and pinion is within specification. What is the most likely cause?

A. The new side gear thrust washers were not installed or are an incorrect thickness allowing the side gears to contact the differential case during rotation under load

B. The differential cross shaft pin lock bolt was not tightened to specification and the cross shaft is shifting in the case creating a clicking noise during the differential action of turning

C. The new spider gears were manufactured with an incorrect tooth count that does not match the side gears creating an interference fit during the differential rotation of low-speed turns

D. The spider gear preload shims are too thick preventing the gears from meshing properly with the side gears during the speed differential that occurs between left and right wheels in turns

74. A truck equipped with a 10-speed automated manual transmission (AMT) has a complaint that the transmission will not shift into tenth gear (overdrive). All other gears engage normally including ninth gear (direct drive). What is the most likely cause?

A. The splitter valve solenoid has failed in a position that prevents the high-split engagement needed to combine the range and splitter positions required for tenth gear selection

B. The engine ECM is limiting the transmission to ninth gear because a derate condition has been triggered by an emission system fault that restricts the maximum vehicle speed

C. The overdrive gear set inside the auxiliary section has excessive wear that prevents the teeth from engaging and the AMT controller skips tenth gear to avoid a grinding engagement

D. The vehicle speed sensor is reading slightly low causing the AMT controller to calculate that the vehicle has not reached the minimum speed threshold required for the tenth gear upshift

75. A truck has a driveline vibration that occurs specifically at 55 km/h and 110 km/h but not at any speed in between. What does this speed-specific pattern suggest?

A. The vibration source has a resonant frequency that is excited at these specific speeds and the 110 km/h occurrence is the second harmonic (double) of the 55 km/h fundamental

B. The vibration occurs at multiples of a specific wheel RPM corresponding to a tire flat spot that impacts the road surface at a frequency matching 55 and 110 km/h vehicle speeds

C. The driveshaft critical speed is at 55 km/h and the second occurrence at 110 km/h is caused by the harmonic excitation of the centre bearing rubber isolator mount at double the speed

D. The engine firing frequency at the RPM corresponding to 55 km/h matches a frame natural frequency and the doubled engine RPM at 110 km/h re-excites the same frame resonance

76. A truck's transfer case is leaking lubricant from the front output seal. The leak has been ongoing and the fluid level is significantly low. What additional damage should the technician inspect for before simply replacing the seal and refilling?

A. The transfer case internal bearings and gears for wear or damage from operating with insufficient lubrication during the period of low fluid level before the leak was discovered

B. The front driveshaft U-joints for contamination from the leaked transfer case lubricant that may have degraded the U-joint bearing grease and accelerated needle bearing wear

C. The transfer case housing for cracks that may have caused the seal to fail by changing the bore alignment and creating uneven pressure on the seal lip during rotation

D. The engine rear main seal for sympathetic damage because the transfer case lubricant may have migrated along the bellhousing surface and contaminated the engine rear seal

77. A truck with a 13-speed manual transmission has a complaint of difficult shifting into all gears when the transmission is cold. After the transmission warms up to operating temperature, the shifting becomes smooth and easy. What is the most likely cause?

A. The clutch hydraulic fluid becomes more viscous in cold weather requiring more pedal effort and travel to fully disengage the clutch for clean gear engagement

B. The synchronizer blocking rings contract in cold temperatures reducing the clearance between the ring and the gear cone which creates excessive friction during speed matching

C. The engine idle speed drops in cold weather reducing the RPM differential management needed for smooth synchronizer operation during the gear engagement process

D. The transmission lubricant viscosity is too high for the cold operating temperature — the thick fluid creates resistance to shift fork movement and slows synchronizer speed matching

78. A drive axle oil sample shows elevated iron and zinc content. The iron level has doubled since the last sample and the zinc is a new finding. What components are the most likely sources?

A. Iron from ring and pinion gear wear and zinc from the axle lubricant's anti-wear additive package that is depleting faster than expected from increased operating temperatures

B. Iron from normal bearing race wear and zinc from the axle lubricant zinc dialkyldithiophosphate (ZDDP) anti-wear additive that is being consumed by a chemical reaction with water contamination

C. Iron from the axle shaft splines wearing against the side gear splines and zinc from the differential pinion shaft cross pin surface treatment wearing during differential action

D. Iron from the ring gear and zinc from the pinion bearing cage material — both elevating simultaneously suggests the ring gear teeth are contacting the pinion bearing cage during operation

79. A truck has a new U-joint installed on the rear driveshaft. After installation, the technician grease-guns the U-joint fittings until grease purges from all four bearing cap seals. One cap does not purge grease despite continued pumping. What does this indicate?

A. The grease passage inside the U-joint cross (journal) leading to that bearing cap is blocked — the needle bearings in that cap are not receiving lubrication and will fail prematurely

B. The bearing cap seal on that side is tighter than the others and requires significantly more grease pressure to break through — continued pumping will eventually produce a purge

C. The grease fitting has a faulty check ball that is not opening under the grease gun pressure and the grease is being diverted to the other three bearing caps through the cross passages

D. The bearing cap on that side was installed with excessive interference fit in the yoke ear which has distorted the cap and blocked the internal grease channel from the journal to the needles

80. A truck's automatic transmission has a shudder vibration during the torque converter lockup engagement at approximately 65 km/h. The shudder clears when the lockup clutch fully engages or when the converter unlocks during deceleration. What is the most effective initial repair approach?

A. Replace the torque converter because the internal lockup clutch friction material has degraded beyond the point where a fluid change can restore smooth engagement characteristics

B. Perform a transmission fluid and filter change using the OEM-specified fluid — degraded friction modifier additives are the most common cause of lockup shudder and a fluid change often resolves it

C. Reprogram the transmission control module with an updated shift strategy that increases the lockup clutch apply pressure to overcome the friction coefficient variation causing the shudder

D. Install an aftermarket lockup clutch apply pressure valve kit that increases the clamping force on the lockup clutch disc to prevent the micro-slipping that produces the shudder vibration

81. A truck's inter-axle differential lock indicator lamp on the dash does not illuminate when the lock switch is activated. The driver reports no noticeable difference in traction compared to when the lock was working. What is the most likely cause?

A. The indicator lamp circuit has failed (blown bulb, open wire, or failed driver in the cluster) but the actual lock mechanism is engaging correctly through its separate air or electric actuation circuit

B. The inter-axle lock air supply has been disconnected and both the lock function and the indicator lamp share the same air supply source so both are inoperative simultaneously

C. The ECM has disabled the inter-axle lock function due to a vehicle speed restriction fault and has also disabled the indicator lamp as part of the same protective lockout strategy

D. The inter-axle lock mechanism and the indicator lamp are both functioning correctly but the lock engagement is so smooth at the current road conditions that the driver cannot feel the difference

82. A truck equipped with a hydraulic retarder has a fluid leak at the retarder housing-to-transmission joint. What additional concern does this leak raise beyond the fluid loss?

A. The leaked retarder fluid may contaminate the driveshaft U-joint bearing grease causing premature U-joint failure from lubricant degradation in the bearing cap seal area

B. The retarder fluid and transmission fluid may cross-contaminate if they share a common seal at the junction — incompatible fluids can damage the transmission clutch packs and seals

C. The retarder fluid loss will cause the retarder's cooling circuit to draw air into the heat exchanger reducing the coolant flow rate and potentially overheating the engine cooling system

D. The leaked fluid will drip onto the exhaust system components and create a fire hazard from the hot exhaust surface igniting the petroleum-based retarder fluid during sustained braking events

83. A dual-plate clutch is slipping under heavy load. The release bearing free play is within specification. A visual inspection through the bell housing inspection cover shows the clutch disc linings still have 3 mm of material remaining (minimum is 1 mm). What else could cause slippage with adequate lining and correct free play?

A. The flywheel and/or pressure plate friction surfaces are contaminated with oil from a leaking rear main seal or transmission input seal reducing the friction coefficient below the minimum for torque transmission

B. The pressure plate diaphragm spring has taken a permanent set from heat exposure and cannot generate adequate clamping force despite the mechanical free play being within specification

C. The intermediate plate (floater plate) has warped from thermal cycling and is not making full contact with the clutch disc lining on one side reducing the effective clamping area by half

D. All of these conditions — oil contamination, weakened diaphragm spring, or warped intermediate plate — could cause slippage with adequate lining remaining and correct release bearing free play

84. A truck's driveshaft has excessive vibration that a technician suspects is caused by a worn slip joint spline. What symptom would specifically indicate slip joint spline wear rather than a U-joint or balance problem?

A. The vibration is constant at all speeds and does not change with vehicle load or torque direction because the worn splines are loose at all operating conditions equally

B. The vibration changes during acceleration and deceleration as the torque direction reverses and the worn spline play is taken up and released with each direction change

C. The vibration increases proportionally with vehicle speed and is identical during both acceleration and coast because the rotational imbalance from the worn spline is speed-dependent

D. The vibration produces a clunking noise during gear changes and direction reversals as the loose spline allows the front and rear driveshaft sections to rotate relative to each other momentarily

85. A truck with an automated manual transmission (AMT) has a "limp home" warning on the dash. The transmission is locked in sixth gear and will not shift up or down. The scan tool shows a fault code for the range actuator position sensor. What should the technician inspect?

A. The engine ECM for a torque management fault that prevents the AMT from receiving the torque reduction command needed for the range shift synchronization sequence

B. The range actuator motor, its position sensor, the sensor wiring, and the mechanical linkage from the actuator to the range shift mechanism for failure or disconnection

C. The transmission oil temperature sensor for a high reading that triggers the AMT controller to lock the transmission in a single gear to prevent further heat generation from shifting

D. The vehicle speed sensor for an erratic signal that prevents the AMT controller from calculating the correct range shift point causing it to default to the current gear as a safety measure

86. A truck's power steering system is making a chattering noise and the steering wheel vibrates during slow-speed turns. The fluid level is correct and the fluid is clean. The drive belt is tight. What is the most likely cause?

A. The power steering pump's internal pressure relief valve is oscillating rapidly between open and closed as it tries to maintain pressure at the flow demand rate of the slow-speed turn

B. The steering gearbox has excessive internal clearance between the worm shaft and the sector shaft allowing the gears to rattle under the variable loading of the slow turn

C. The power steering fluid viscosity is incorrect for the ambient temperature causing the pump to cavitate during the high-flow-demand condition of a slow-speed full-lock steering maneuver

D. The steer axle king pin bushings are worn and the front wheels oscillate rapidly on the king pins during the turn creating vibration that transmits through the steering linkage to the wheel

87. A truck has excessive play in the steering that has been traced to worn drag link ball joints. The drag link has been replaced and the total steering free play is now within specification. However, the driver reports the steering still feels vague during highway driving. What should be checked next?

A. The steering gearbox for internal wear that may not contribute enough free play to exceed the specification but still reduces the precision of the steering response during highway driving

B. The wheel alignment for incorrect toe setting which does not affect the free play measurement but significantly affects the vehicle's straight-line tracking feel during highway driving

C. The steer tire tread pattern for irregular wear that creates unpredictable contact patch behavior making the steering feel vague even though the mechanical components are within specification

D. The steering damper for a failed internal valve that allows the steer wheels to oscillate at a frequency below the driver's perception threshold creating a subjective feeling of vagueness

88. A truck's frame has been repaired with a bolted splice plate over a cracked area in the web. The technician notices that standard Grade 5 bolts were used for the repair. What is the concern with this bolt selection?

A. Grade 5 bolts are adequate for frame web repairs because the web carries primarily shear loads and Grade 5 bolts have sufficient shear strength for this application

B. Grade 5 bolts are acceptable if the bolt diameter is increased by one size above the specification to compensate for the lower tensile strength compared to Grade 8 bolts

C. The repair should be removed and redone because frame structural repairs require metric Class 10.9 bolts which are stronger than both Grade 5 and Grade 8 SAE bolts

D. Grade 5 bolts may not have adequate tensile and fatigue strength for a structural frame repair — Grade 8 bolts or the specific grade recommended by the OEM should be used

89. A heavy-duty truck's steer tires are wearing rapidly on both outer edges while the centre tread area has significantly more remaining depth. The tire size is correct for the rim width. What is the most common cause of this wear pattern?

A. The steer axle weight exceeds the tire load rating causing the tire to flatten excessively and overload both outer edges during normal straight-line highway driving conditions

B. The steering gearbox has excessive play that allows the steer tires to wander slightly during highway driving loading the outer edges more than the centre of the tread

C. Chronic under-inflation causes the tire sidewalls to flex excessively and the outer edges of the tread to carry a disproportionate share of the load wearing them faster than the centre

D. Excessive positive caster on both sides causes the tires to lean during turns loading the outer edges alternately depending on the direction of the turn during normal driving operation

90. A truck with air ride suspension has been loaded and the air bags are at their maximum inflation pressure. The ride height is still 20 mm below specification. What is the concern?

A. The suspension is bottoming out on the bump stops and the vehicle may be overloaded beyond the suspension's capacity — the load must be reduced or redistributed

B. The air compressor cannot produce adequate pressure to inflate the bags to the height required for the current load and the compressor or governor needs to be checked

C. The height control valve is stuck in the add-air position and is over-pressurizing the bags which will eventually cause a bag rupture if the load is not reduced immediately

D. The air ride system is functioning correctly and the 20 mm difference is within the normal tolerance range for a fully loaded heavy-duty commercial vehicle's air ride suspension system

91. A fifth wheel has been lubricated but the driver reports the trailer does not articulate smoothly during tight turns — the tractor feels like it is dragging the trailer around turns rather than pivoting smoothly. What should be inspected?

A. The fifth wheel locking jaw adjustment for excessive tightness that is clamping the king pin too firmly and preventing the normal rotational freedom between the tractor and trailer

B. The trailer upper coupler plate for damage, warpage, or corrosion buildup that prevents it from sliding smoothly on the fifth wheel plate surface during articulation during turns

C. The trailer king pin for excessive wear that creates a loose coupling allowing the trailer to bind at extreme articulation angles during tight turns from geometric interference

D. The fifth wheel plate surface for inadequate lubrication, contamination with road debris, or a worn plate surface with ridges or grooves that impede the trailer's smooth pivoting movement

92. A truck's front wheel bearing has failed and the hub assembly is being removed. During removal, the technician discovers that the inner bearing cone is still on the spindle — it did not come out with the hub. The cone appears to be welded to the spindle from heat. What caused this?

A. The inner bearing was installed too loosely allowing the cone to spin on the spindle and generate friction heat that eventually fused the bearing race to the spindle surface

B. The bearing was operated with insufficient lubricant — the resulting friction generated enough heat to cause the bearing cone to seize and metallurgically bond to the spindle through welding

C. The wheel seal failed first allowing lubricant to leak out and contaminate the brakes then the dry bearing generated excessive heat that caused the bearing to seize on the spindle

D. The bearing preload was adjusted too tight during the last service creating excessive rolling friction that generated heat beyond the lubricant's capacity resulting in thermal seizure on the spindle

93. A technician inspects a drive axle hub oil seal and finds a thin film of oil on the brake backing plate behind the hub. There is no oil dripping to the ground and the hub oil level is at the sight glass centre mark. What should the technician do?

A. Monitor the condition — a very thin film of oil residue on the backing plate may be from initial seal break-in or minor weepage that stabilizes and does not require immediate seal replacement

B. Replace the seal immediately because any oil on the backing plate indicates a seal failure that will contaminate the brake linings and require brake component replacement if not addressed now

C. Clean the backing plate and add oil to the hub to raise the level above the centre mark to compensate for the minor seepage and ensure the bearings remain adequately lubricated

D. Check the brake lining contact surface for oil contamination — if the linings show no evidence of oil the current condition can be monitored at shortened inspection intervals for progression

94. A trailer's tandem axle alignment has been checked and the rear axle tracks 10 mm to the left of the front axle. The trailer has a sliding tandem. What is the most efficient method to correct this misalignment?

A. Adjust the suspension equalizer beam on one side to shift the rear axle laterally until both axles track in the same line when measured against the trailer centreline

B. Loosen the axle U-bolts on the rear axle and shift the axle on its spring seats until the tracking measurement shows both axles aligned to the same track within specification

C. Reposition the sliding tandem on its track to a different position — the track hole pattern may have been causing a geometric misalignment that changes at a different slide position

D. Shim one side of the rear axle spring seats to angle the axle slightly and bring the rear axle tracking into alignment with the front axle position using tapered alignment shims

95. A truck's tire has been repaired with a combination plug-patch from the inside. The repair is in the crown area of the tread. The repair was performed by an external tire shop. Before returning the tire to service, what should the technician verify about the repair?

A. The repair was performed within the repairable area of the tread, the puncture was within the maximum repairable size, the patch is properly bonded, and no internal damage exists beyond the puncture

B. The tire repair receipt from the external shop is on file and the shop's liability insurance certificate number is documented in case the repair fails during subsequent vehicle operation

C. The external shop used the same brand of repair material as the original tire manufacturer specifies for warranty compliance and repair integrity documentation requirements

D. The tire pressure has been set to 10% above the normal specification for the first 500 km after the repair to ensure the plug-patch assembly seats properly during the initial driving break-in period

96. A heavy-duty truck's steering wheel is not centered — it is rotated approximately 15 degrees to the left during straight-line driving. The vehicle tracks straight and the toe setting is within specification. What should be adjusted?

A. The camber on both sides needs to be equalized because unequal camber creates a steering offset that manifests as an off-centre wheel position during straight driving conditions

B. The drag link length should be adjusted to re-centre the steering wheel without changing the toe setting — the drag link controls the relationship between the steering wheel and the steer wheels

C. The steering gearbox must be removed and the sector shaft repositioned to centre the steering wheel's neutral position with the steer axle's straight-ahead wheel position

D. The tie rod length should be adjusted on both sides equally to shift the steering wheel to the centred position while maintaining the toe setting within the manufacturer's specification

97. A truck has had a steer tire blowout on the highway. After the tire is replaced, the technician inspects the steer axle components for damage. Which components are most important to check after a blowout event?

A. The steering linkage, king pin bushings, wheel bearings, and the axle spindle for damage or deformation from the sudden impact loads and vibration of driving on a deflated or destroyed tire

B. The engine cooling system for overheating damage because the increased drag from the blown tire may have caused the engine to overspeed and overheat during the deceleration event

C. The transmission synchronizers for damage from the sudden change in wheel speed that occurred when the tire lost pressure and the vehicle decelerated from the flat tire drag condition

D. The fuel injection system for timing errors caused by the vibration of the blowout event that may have shifted the fuel injection pump timing or loosened fuel line connections at the injectors

98. A truck's hub-piloted wheel is being installed after a brake job. The technician notices that the hub pilot surface has a buildup of rust and corrosion. What must be done before mounting the wheel?

A. Apply a thin coat of anti-seize compound to the hub pilot surface to prevent future corrosion and ensure the wheel can be easily removed at the next service interval

B. Install the wheel directly on the corroded hub pilot — the wheel nut torque will compress the corrosion and seat the wheel properly during the torquing procedure

C. Clean the hub pilot surface thoroughly to remove all rust and corrosion ensuring the wheel seats flat and concentric on the pilot for proper centering and balanced load distribution

D. Machine the hub pilot surface on a lathe to restore the original dimensional specification before mounting the wheel to prevent any vibration from the uneven corroded surface

99. A truck's suspension ride height has been measured and the left side is 15 mm lower than the right side. Both air bags are inflated and the height control valves appear to function. The vehicle is on level ground with an evenly distributed load. What is the most likely cause?

A. The left-side air spring has developed an internal restriction that limits its ability to inflate to the same pressure as the right-side spring under the same air supply conditions

B. The frame is twisted from a loading or collision event causing one side to sit lower than the other regardless of the air spring inflation state and height control valve function

C. The height control valve on the left side is maladjusted or its linkage arm is bent causing it to read the low-ride-height condition as correct and not add additional air to compensate

D. The left-side height control valve is set to a lower target height than the right-side valve because the valves were replaced at different times and the adjustment was not equalized between sides

100. A truck's wheel nut torque has been checked 200 km after a tire rotation. Three of the ten nuts on one wheel have lost approximately 15% of their initial torque setting. What is the most likely cause?

A. The wheel studs on those three positions have stretched from a previous over-torque event and can no longer maintain the correct clamping force at the specified torque setting

B. The initial seating and compression set in the wheel-to-hub interface has caused a normal loss of clamping force that is compensated by the re-torque procedure being performed now

C. The three loose nuts are from a different manufacturer than the other seven and have different thread pitch characteristics that cause them to back off at a different rate than the matching nuts

D. The hub pilot surface was not properly cleaned before the wheel was mounted and the residual corrosion under those three stud locations has compressed and settled since installation

101. A technician is inspecting a tire that has been removed from service. The tire's inner liner shows a pattern of circular abrasion marks on the interior surface beneath the tread. What caused this wear pattern?

A. The tire was operated at high speed with insufficient inflation pressure causing the inner liner to flex excessively and abrade against the internal reinforcing belt edges during high-speed rotation

B. The tire was mounted on a rim that is slightly too narrow for the tire's section width causing the beads to flex inward and the inner liner to contact the internal belt reinforcement during rotation

C. The tire was driven for an extended period while flat or severely underinflated and the inner liner was abraded by the rim flanges or by the tire carcass collapsing against itself during rotation

D. The tire had a manufacturing defect in the inner liner rubber compound that caused it to deteriorate chemically from the inside outward producing the circular abrasion pattern over time

102. A sliding fifth wheel is being inspected. The technician finds that the slide lock pins engage easily when the fifth wheel is in the forward position but two of the four pins on the right side do not engage when the fifth wheel is repositioned to the middle or rear positions. What is the most likely cause?

A. The right-side slide rail is bent or has accumulated debris in the track holes at the middle and rear positions preventing the lock pins from entering those specific holes in the rail

B. The right-side lock pin springs have weakened and cannot extend the pins with enough force to engage the holes when the fifth wheel's weight distribution changes at different slide positions

C. The lock pin air release mechanism on the right side has a slow leak that does not allow the pins to fully retract during the slide and then they cannot re-extend into the new track hole position

D. The right-side lock pins have worn to a smaller diameter than the left-side pins and the track holes at the middle and rear positions have tighter tolerances than the holes at the forward position

103. A tandem axle truck's equalization (load sharing) between the front and rear drive axles has been tested by weighing each axle individually. The front drive axle carries 12% more weight than the rear drive axle. What effect does this uneven load distribution have?

A. The overloaded front drive axle tires will wear faster than the rear drive axle tires and the front drive axle bearings and suspension components will be subjected to accelerated fatigue loading

B. The vehicle will pull to one side during straight-line driving because the unequal axle loads create a steering moment that deflects the vehicle's heading from the driver's intended course

C. The uneven loading will cause the inter-axle differential to lock automatically to compensate for the different traction levels between the overloaded and underloaded drive axle positions

D. The engine retarder effectiveness will be reduced because the rear drive axle has less traction and will break loose before the retarder reaches its full retarding capacity during downhill braking

104. A truck's cab air ride suspension height control valve has been replaced. After the replacement, the cab sits at the correct height at rest but bounces excessively over bumps — significantly more than before the valve replacement. What is the most likely cause of the increased bouncing?

A. The replacement height control valve has a faster response time than the original which causes it to add and exhaust air too quickly in response to normal road inputs

B. The cab suspension shock absorbers are worn and should have been replaced at the same time as the height control valve — the new valve is masking a pre-existing shock absorber failure

C. The height control valve linkage arm was installed at the wrong length causing the valve to operate outside its designed range creating an oscillating add-exhaust cycle during movement

D. The replacement valve has a different internal orifice size than the original which changes the air flow rate to and from the air springs during suspension compression and rebound events

105. A truck driver reports that the sleeper cab bunk heater shuts off unexpectedly during the night. The heater restarts normally when the driver activates it again but shuts off after approximately two hours each time. The heater's diagnostic system shows no fault codes. What is the most likely cause?

A. The fuel supply to the bunk heater is restricted by a partially clogged fuel filter that allows enough fuel for startup but cannot sustain the flow rate needed for continuous overnight operation

B. The bunk heater's combustion air intake is drawing air from a location that becomes covered by snow or ice during overnight parking blocking the air supply after initial operation

C. The sleeper cab temperature reaches the bunk heater's thermostat set-point after two hours of operation and the heater cycles off normally — this is the intended operating behavior

D. The bunk heater's internal safety timer is programmed for a two-hour maximum continuous run time after which it shuts down requiring a manual restart as a carbon monoxide safety precaution

106. A heavy-duty truck's driver seat has a broken mounting bolt. The seat shifts noticeably during acceleration, braking, and cornering. Beyond the obvious discomfort, what is the critical safety concern?

A. A loose seat can shift during an emergency braking event or collision causing the driver to lose contact with the controls and preventing the seatbelt and airbag from providing proper occupant protection

B. The shifting seat creates excessive wear on the cab floor mounting surface which will eventually rust through and require expensive cab floor panel replacement to restore structural integrity

C. The broken bolt may vibrate loose from the cab floor and fall into the engine compartment below creating a foreign object damage risk to the engine accessories and belts during operation

D. The seat shift changes the driver's eye height and reach to the controls which may cause the driver to fail a DOT physical examination if the examiner notices the seat movement during testing

107. A truck's windshield has developed a small stone chip in the driver's direct line of sight. The chip has not cracked further. According to commercial vehicle safety regulations, what is the required action?

A. Repair the chip with a resin injection repair kit to prevent it from spreading and restore the optical clarity of the windshield in the driver's line of sight before the vehicle operates again

B. Monitor the chip during subsequent PM inspections and replace the windshield only if the chip develops into a crack that extends beyond the repair zone designated by the windshield manufacturer

C. Replace the windshield because any damage in the driver's direct line of sight that impairs visibility is a regulatory violation that cannot be corrected with a chip repair on a commercial vehicle

D. Apply a clear adhesive film over the chip to prevent moisture intrusion and debris accumulation while the vehicle continues to operate until the next scheduled windshield replacement interval

108. A truck cab equipped with power-adjustable pedals has a complaint that the brake pedal position intermittently shifts forward during driving. The adjustment switch on the dash is not being contacted by the driver's leg. What should be inspected?

A. The pedal adjustment motor electrical connector for an intermittent connection or the adjustment switch for internal short circuits that command pedal movement without driver input

B. The brake pedal pivot bushing for wear that allows the pedal assembly to shift forward under the force of repeated brake applications rather than maintaining its adjusted position

C. The cab floor-mounted pedal assembly bracket for loose mounting bolts that allow the entire pedal assembly to shift forward under the dynamic forces of acceleration and braking cycles

D. The body controller software for a calibration error that intermittently sends the pedal adjustment motor a forward command in response to a CAN bus data conflict from another module

109. A reefer trailer's diesel-powered TRU starts normally but produces significantly less cooling capacity than its specification. The technician measures suction and discharge pressures and finds both are lower than normal. The condenser and evaporator coils are clean. What is the most likely cause?

A. The condenser fan is running in the wrong rotation direction circulating air through the condenser in the incorrect flow path which reduces heat rejection efficiency to approximately half capacity

B. The refrigerant charge is low due to a leak in the system — insufficient refrigerant reduces both suction and discharge pressures and limits the system's total heat absorption capacity

C. The TRU engine is running at reduced RPM due to a governor fault which drives the compressor at lower speed reducing the volume of refrigerant circulated through the system per unit of time

D. The expansion valve sensing bulb has lost its charge and is stuck in the wide-open position flooding the evaporator with liquid refrigerant which reduces both pressures and cooling capacity

110. A trailer's brake system has been converted from drum brakes to disc brakes during a major refurbishment. After the conversion, the trailer brakes feel grabby and disproportionately strong compared to the tractor brakes during light pedal applications. What needs to be adjusted?

A. The trailer relay valve crack pressure may need to be adjusted or the valve replaced to properly proportion the application pressure to match the higher friction coefficient of the disc brake pads

B. The tractor foot valve proportioning needs to be recalibrated to reduce the trailer service line signal pressure accounting for the increased braking efficiency of the trailer's disc brake conversion

C. The disc brake caliper piston size is too large for the trailer's weight and the calipers should be replaced with a smaller piston diameter to reduce the application force per unit of air pressure

D. The trailer ABS modulator valve gain settings need to be reprogrammed through the scan tool to accommodate the different brake torque characteristics of disc brakes versus drum brakes

111. A trailer's upper coupler plate (the flat steel plate that rests on the fifth wheel) shows significant wear — the plate thickness has been reduced by 4 mm from the original specification. What is the operational consequence?

A. The reduced plate thickness may cause the coupling height to drop below the minimum specification creating a geometric mismatch between the tractor fifth wheel and the trailer king pin loading angle

B. The trailer landing gear will contact the ground prematurely during uncoupling because the reduced coupler plate height lowers the trailer's front-end height relative to the landing gear's extended length

C. The reduced plate thickness lowers the trailer's front-end height which changes the king pin loading geometry and increases the stress on the king pin and fifth wheel locking jaw mechanism

D. The worn coupler plate creates a depression that the fifth wheel plate must ride through during articulation causing clunking noise, accelerated fifth wheel plate wear, and unstable coupling

112. A trailer's electrical system has a 12-volt battery installed to power the interior cargo lights and a liftgate motor independently of the tractor's electrical system. The battery is discharged and the cargo lights do not function. What should be checked?

A. The trailer battery charging circuit — verify the charging wire from the tractor's seven-pin connector auxiliary pin is connected and functioning to recharge the trailer battery during driving

B. The liftgate motor for an internal short that is continuously drawing current from the trailer battery even when the liftgate is not being operated draining the battery during parking periods

C. The trailer battery itself for a failed cell or sulfation from prolonged discharge that prevents the battery from accepting and holding a charge from the tractor's charging circuit during operation

D. The cargo light switch for a fault that is leaving the lights on continuously when the trailer is parked draining the battery between driving sessions when the tractor is not connected for charging

113. A reefer trailer's set-point temperature is -18°C but the cargo space temperature has risen to -12°C and is not recovering. The TRU engine runs normally, the compressor engages, and the condenser fan operates. A frost pattern on the evaporator coil shows ice covering approximately 75% of the coil surface. What action is needed?

A. Increase the TRU engine RPM to drive the compressor faster and increase the refrigerant flow rate through the evaporator to overcome the frost restriction and restore cooling capacity

B. Manually initiate a defrost cycle to clear the ice from the evaporator coil and then investigate why the automatic defrost cycle failed to prevent this level of ice accumulation on the coil surface

C. Add refrigerant to the system because the ice formation indicates the system is undercharged and the evaporator coil temperature has dropped below the frost point due to low suction pressure

D. Replace the evaporator fan motor because the ice pattern indicates the fan is not circulating air across the coil surface evenly which causes localized freezing from the stagnant air contact zone

114. A trailer inspector finds that a trailer's DOT-required reflective conspicuity tape on the rear is peeling and missing in several sections. Approximately 40% of the required tape coverage is missing. What action is required?

A. The reflective conspicuity tape must be replaced to meet the regulatory requirement for the minimum coverage area on the rear of the trailer before the trailer is returned to commercial service

B. The trailer can continue to operate because the remaining 60% of tape coverage exceeds the minimum regulatory threshold of 50% coverage for continued commercial highway operation

C. Additional reflective tape can be added to the trailer sides to compensate for the missing rear tape coverage as long as the total tape area across all surfaces meets the minimum requirement

D. The trailer must be removed from service and the entire trailer re-taped on all surfaces because partial tape failure indicates the adhesive batch may be defective and the remaining tape will also fail

115. A flatbed trailer's securement equipment (chains, binders, and straps) is inspected during a pre-trip. The technician finds that one of the four load binders has a cracked handle. The binder is currently tightened and holding the chain under tension. What should be done?

A. Leave the cracked binder in place since it is currently holding tension and add a backup strap adjacent to the cracked binder to provide redundant securement for that chain position

B. The cracked binder is a potential point of failure that could release under road vibration or impact loading and must be replaced before the vehicle departs

C. Wrap the cracked handle with duct tape to prevent it from separating during transit and schedule the binder for replacement when the load is delivered at the destination

D. The cracked binder must be replaced and all other binders should be inspected for similar cracks because the batch may have a metallurgical defect from the manufacturing process

116. A trailer's air supply system has a dedicated air tank mounted on the trailer underframe. This tank serves both the trailer's service brakes and spring brakes. After the tractor disconnects and the gladhands are sealed, how long should this tank maintain enough pressure to keep the spring brakes released?

A. The tank should maintain spring brake release pressure for approximately 30 minutes to allow the trailer to be maneuvered at a loading dock before the spring brakes gradually apply from leakage

B. The tank should maintain spring brake release pressure indefinitely if the system has no leaks — the sealed system should hold pressure until the gladhands are reconnected to a tractor supply

C. The tank should maintain spring brake release pressure for a maximum of 10 minutes which is the regulatory standard for the trailer air system reserve capacity after supply disconnection

D. The tank cannot maintain spring brake release pressure once the tractor supply is disconnected because the trailer protection valve on the tractor immediately exhausts the trailer supply circuit

117. A truck's A/C evaporator is producing a musty, mouldy odour when the blower is first turned on. The A/C system cools adequately and the evaporator drain tube is clear. What is causing the odour and how should it be addressed?

A. The heater core is leaking a small amount of coolant that pools in the HVAC housing and produces the mouldy odour from the glycol and water mixture decomposing in the warm enclosure

B. The cabin air filter has accumulated dust, pollen, and moisture that has created a mould growth environment in the filter media producing the musty odour when air passes through it

C. Mould and bacteria have colonized the wet evaporator surface and the HVAC housing interior — the evaporator must be treated with an antimicrobial spray and the cabin air filter replaced

D. The A/C compressor oil has degraded from moisture contamination and the decomposed oil residue on the evaporator surface produces the musty odour when exposed to heated cabin air

118. A technician is diagnosing an A/C system that blows cold air from the centre dash vents but warm air from the outer dash vents on both sides. The temperature setting is at maximum cold. What is the most likely cause?

A. A secondary blend door or a duct-mounted reheat valve that is only partially closing on the outer vent ductwork allowing some heated air from the heater core to mix into the outer vent airflow

B. The A/C compressor has insufficient capacity to cool all the air in the HVAC housing and the centre vents receive the coldest air because they are closest to the evaporator discharge location

C. The outer vent ductwork passes near the heater core housing and heat from the core is radiating through the duct walls warming the air before it reaches the outer vent outlet openings

D. The evaporator has a partial ice blockage on one side that forces all the cold air to the centre duct opening while the outer ducts receive uncooled air that bypasses around the iced section

119. A fuel-fired auxiliary coolant heater runs continuously but the cab heater does not produce adequate heat. The heater's output coolant temperature reads 75°C. The thermostat opening temperature is 82°C. What is the relationship between these readings and the complaint?

A. The auxiliary heater is working correctly at 75°C — the cab heater core should produce adequate heat at this temperature and the HVAC blend door or blower motor should be investigated

B. The auxiliary heater is not producing adequate outlet temperature — 75°C is below the thermostat opening point so the coolant should be reaching the heater core without losing heat to the radiator

C. The thermostat is stuck open and routing the heated coolant through the radiator where it loses heat before reaching the cab heater core — even though the aux heater output is below the thermostat point

D. The auxiliary heater output temperature of 75°C is below the cab heater core's minimum effective temperature threshold and the heater's combustion system needs service to increase output

120. An A/C system has been evacuated to 200 microns and holds at 210 microns for 30 minutes. The technician then charges the system with the correct weight of R-134a. Upon startup, the system cools well initially but after 20 minutes the cooling deteriorates and the low-side pressure drops very low while the high side rises moderately. What is occurring?

A. The system was overcharged and the excess refrigerant is flooding the evaporator reducing its efficiency as the liquid refrigerant cannot fully evaporate in the available coil surface area

B. Residual moisture in the system (not fully removed during evacuation) is freezing at the expansion valve orifice progressively restricting refrigerant flow as the ice accumulates over operating time

C. The compressor clutch air gap has increased from thermal expansion during operation and the clutch is beginning to slip reducing the compressor's effective pumping capacity under the heat load

D. The condenser fan is cycling off due to a faulty temperature switch and the condenser's heat rejection capacity decreases as the fan cycles creating a progressive pressure imbalance in the system

121. A truck's HVAC system has no heat output from any vent position. The blower motor operates at all speeds. The engine is at full operating temperature. The heater hoses at the firewall are both cool to the touch. What is the most likely cause?

A. The coolant level is severely low and there is insufficient coolant circulation through the heater core despite the engine reaching operating temperature from the remaining coolant in the block

B. The heater core is completely plugged with sediment or scale and no coolant can flow through it even though the engine cooling system is maintaining normal temperature and pressure

C. The heater control valve is closed or stuck preventing hot coolant from entering the heater core — both hoses being cool confirms no coolant flow through the core despite adequate engine temperature

D. The HVAC blend door is stuck in the full-cool bypass position directing all air around the heater core rather than through it even though the heater is receiving hot coolant from the engine circuit

122. A truck's A/C compressor clutch engages when 12 volts is applied directly to the clutch coil connector, but does not engage during normal operation from the A/C switch. The A/C switch, fuse, and relay are all confirmed good. What should be checked next?

A. The low-pressure switch and the high-pressure switch in the A/C protection circuit — either switch in an open state prevents the clutch circuit from completing through the relay coil control side

B. The evaporator temperature sensor for a reading that tells the control module the evaporator is already at freezing temperature which prevents the clutch from engaging to avoid evaporator icing

C. The engine ECM for an A/C request denial — some systems require the ECM to authorize A/C clutch engagement and the ECM may be blocking the request due to a high engine load or temperature condition

D. The body controller module for a software fault that prevents it from processing the A/C switch input signal and sending the clutch relay activation command through the multiplexed control circuit

123. A truck's APU (auxiliary power unit) A/C system has adequate refrigerant charge, the APU compressor engages, and the condenser fan runs. However, the cooling performance is poor. The technician measures the APU condenser discharge temperature and finds it only 10°C above the ambient temperature. Normally, the condenser discharge should be approximately 15 to 25°C above ambient. What does the low temperature differential suggest?

A. The APU compressor is worn internally and cannot compress the refrigerant to an adequate high-side pressure to reject heat efficiently through the condenser coil during operation

B. The condenser is oversized for the APU system and is rejecting heat too efficiently — the technician should install a smaller condenser to match the APU compressor output capacity

C. The system is performing better than expected because the lower condenser temperature indicates more efficient heat rejection which should produce better cooling at the evaporator output

D. The APU compressor is not developing adequate discharge pressure — possibly from a worn compressor, a stuck-open discharge valve, or a slipping clutch that reduces the effective compression ratio

124. A hydraulic system operates a knuckle-boom crane. The crane's boom extends smoothly but retracts with a jerky, pulsating motion. The retract speed is also slower than specification. The hydraulic oil level is correct and the oil is clean. What is the most likely cause?

A. The counterbalance valve on the boom retract circuit is chattering from an incorrect pilot pressure ratio setting causing it to alternately open and close during the retraction operation

B. Air is trapped in the rod-end of the boom cylinder — the compressible air pocket causes the jerky motion during retraction as the oil alternately compresses the air and then moves the piston

C. The directional control valve spool is not shifting fully to the retract position creating a partial restriction that limits flow and causes pressure pulsations in the retract circuit

D. The boom cylinder rod seal is worn and allowing fluid to bypass from the rod-end to the cap-end during retraction which creates pressure fluctuations that manifest as jerky piston movement

125. A dump truck's hydraulic pump is being tested with a flow meter. At 1,800 RPM (rated PTO speed), the pump delivers 72 LPM at no load (200 kPa). When the flow meter's load valve is gradually closed to simulate working pressure of 17,000 kPa, the flow drops to 45 LPM. The pump is rated at 75 LPM. What is the assessment?

A. The pump is within acceptable performance limits — some flow loss under load is normal for positive-displacement pumps and a 38% drop from no-load to full-load is within industry standards

B. The pump is operating at the high end of acceptable flow loss but should be monitored at shortened intervals to track the wear trend before it deteriorates to the point of requiring replacement

C. The pump has significant internal wear — a flow drop of 38% from no-load to full-load exceeds the typical 10-15% acceptable range and the pump should be rebuilt or replaced before it fails completely

D. The flow meter is providing inaccurate readings because the pressure drop across the meter at 17,000 kPa creates a measurement error that makes the pump appear worse than it actually performs

126. A hydraulic system has a persistent overheating problem. The fluid temperature regularly exceeds 85°C during normal operation. The oil cooler has been cleaned and the fan operates correctly. The fluid level and type are correct. What should be investigated?

A. The hydraulic fluid's viscosity index — a fluid with a low viscosity index thins excessively at high temperatures creating more internal leakage which generates additional heat in a self-reinforcing cycle

B. The system's duty cycle — if the equipment is being operated at or near maximum pressure for extended periods the system may be generating more heat than the cooling capacity was designed to dissipate

C. The system for excessive internal leakage — worn pumps, cylinders, or valves that bypass fluid internally convert the pump's hydraulic energy to heat without performing useful work on the actuators

D. The relief valve for a setting that is too close to the normal operating pressure — the valve may be cracking open intermittently during normal operation and converting the bypassed fluid energy directly to heat

127. A hydraulic liftgate cylinder will not retract. The technician disconnects the return line from the directional control valve and activates the retract function. No oil flows from the disconnected port. What does this indicate?

A. The hydraulic pump has failed and is not generating any flow — without flow the directional valve has nothing to direct to the cylinder regardless of which function is selected

B. The directional control valve spool is stuck in the neutral or extend position and is not shifting to direct pump flow to the rod-end port when the retract function is activated by the operator

C. The cylinder piston has separated from the rod inside the cylinder bore and the pump is circulating fluid through the cap-end only without any retraction force being applied to the piston assembly

D. The cylinder rod-end port has a check valve that has failed in the closed position preventing any oil from entering the rod-end chamber regardless of the directional valve position selected

128. A hydraulic system uses a nitrogen-charged accumulator as part of a hydraulic launch assist (HLA) system on a refuse truck. During a pre-work inspection, the technician checks the accumulator pre-charge pressure and finds it has dropped from the specified 12,000 kPa to 8,000 kPa. What effect does this have on system performance?

A. The HLA system will provide reduced energy storage and recovery — less nitrogen pre-charge means less energy can be stored during braking and less energy is available for launch assist

B. The reduced pre-charge will cause the accumulator bladder to be over-compressed by the hydraulic fluid creating a risk of bladder failure from excessive flexing beyond its design limits

C. The system will compensate automatically by increasing the hydraulic pump output during braking events to make up for the reduced accumulator capacity and maintain the same energy recovery level

D. The reduced nitrogen pre-charge has no effect on system performance because the hydraulic system pressure compensates automatically for the gas spring rate change inside the accumulator

129. A hydraulic crane truck has a safety feature that prevents boom extension when the outriggers are not fully deployed. The operator has deployed all four outriggers but the boom will not extend. What should the technician check?

A. The outrigger proximity sensors or limit switches that signal the crane controller whether the outriggers are in the fully deployed position — a faulty sensor can block boom operation even with outriggers deployed

B. The crane controller software for a firmware update that may have changed the outrigger deployment verification logic and requires recalibration after the update installation procedure

C. The boom hydraulic cylinder for a seized piston that prevents extension regardless of the outrigger status because the mechanical failure overrides the controller's permission to operate

D. The main hydraulic pump pressure output because inadequate pump pressure may prevent both the outrigger cylinders from achieving their fully deployed position and the boom from extending

130. A PTO-driven hydraulic system has been installed on a new truck. During the first operational test, the pump makes a loud cavitation noise and the oil in the reservoir develops a significant foam layer. The oil type, level, and viscosity are correct. What installation error is most likely causing this?

A. The PTO gear ratio is too high causing the pump to run faster than its rated maximum RPM and the high shaft speed is creating cavitation from the excessive flow velocity at the pump inlet

B. The pump rotation direction does not match the PTO rotation direction and the pump is attempting to draw fluid through its discharge port while pressurizing its suction port creating severe cavitation

C. The suction line between the reservoir and the pump inlet is undersized, too long, has too many fittings, or has a kink that restricts flow to the pump inlet creating a vacuum that causes cavitation

D. The reservoir breather cap was left sealed from shipping and the closed tank cannot admit air as the pump draws fluid down creating a vacuum that pulls dissolved air out of the oil solution

131. A hydraulic system's pressure gauge fluctuates rapidly between 18,000 and 21,000 kPa during cylinder operation. The system relief valve is set at 21,000 kPa. What is causing this pressure fluctuation?

A. The system is operating near the relief valve cracking pressure and the valve is alternately opening and closing as the pressure oscillates around the set point during the cylinder operation

B. The hydraulic pump has a worn check valve that allows pressure pulses to propagate backward through the pump creating a resonant pressure wave in the circuit between the pump and the cylinder

C. The directional control valve spool is vibrating in its bore from contamination or a worn centering spring creating flow variations that produce the pressure fluctuation during cylinder operation

D. The pressure gauge is malfunctioning and displaying an oscillating reading that does not represent the actual system pressure — a second gauge should be installed to verify the reading accuracy

132. A hybrid commercial vehicle's 12-volt auxiliary battery is repeatedly going dead. The main high-voltage battery is fully charged and the vehicle operates normally when the auxiliary battery is jump-started. What is the most likely cause?

A. The high-voltage main battery has a cell imbalance that is draining energy from the DC-DC converter circuit and preventing it from adequately charging the 12-volt auxiliary battery

B. The DC-DC converter that steps down the high-voltage bus to 12 volts for auxiliary battery charging has failed or is underperforming and not maintaining the auxiliary battery's state of charge

C. The auxiliary battery is being drained by a parasitic load from the BMS monitoring system that continuously draws current from the 12-volt supply even when the vehicle is in sleep mode

D. The regenerative braking system is routing all recovered energy to the high-voltage battery and not allowing the DC-DC converter to divert any charging current to the 12-volt auxiliary system

133. A battery-electric truck has a complaint of reduced range. The BMS reports the battery state of health (SOH) at 82%. The battery pack is 4 years old with 180,000 km. What does the 82% SOH indicate?

A. The battery pack has lost 18% of its original energy storage capacity through normal degradation — the cells can store and deliver only 82% of the energy they could when new

B. The battery pack has 82% of its cells functioning normally and 18% have failed completely requiring individual cell module replacement to restore the pack to full capacity

C. The battery management system has restricted 18% of the pack's capacity as a safety margin to protect the remaining cells from deep discharge damage during normal operation

D. The pack's charging efficiency has dropped to 82% meaning it requires 18% more electrical energy input from the charging station to achieve the same usable state of charge as when new

134. A technician is inspecting the high-voltage cables on a battery-electric truck during a routine service. The cables are orange as required by SAE J1673. During the inspection, the technician notices one cable has a visible crack in its outer insulation jacket. The inner insulation appears intact. What is the required action?

A. Apply electrical tape over the cracked outer jacket to prevent moisture from reaching the inner insulation layer and schedule the cable for replacement at the next major service interval

B. Monitor the crack during subsequent inspections and replace the cable only if the inner insulation also shows signs of deterioration or if the crack extends beyond a specified length limit

C. Replace the cable because any damage to the high-voltage cable insulation — even if only the outer jacket is affected — compromises the insulation system and creates a potential electrical hazard

D. Verify the cable's insulation resistance with a megohmmeter — if the resistance is above the minimum specification the cable can remain in service with the outer jacket damage documented

135. A hybrid truck's propulsion control system sets a fault code indicating the traction motor inverter is operating at reduced power. The inverter temperature reads 95°C and the maximum operating temperature is 100°C. What is the system doing?

A. The inverter is operating normally at 95°C which is within the acceptable range and the fault code is a false alarm from a calibration error in the temperature sensor threshold

B. The inverter has failed internally and the 95°C reading is a consequence of the internal short circuit that is generating excessive heat within the power semiconductor switching devices

C. The PCS has detected contaminated inverter coolant that is not providing adequate cooling and has set the code to alert the technician to flush and replace the inverter cooling circuit fluid

D. The PCS is thermally derating the inverter — reducing the power output to prevent the temperature from reaching the 100°C maximum which would cause automatic shutdown to protect the semiconductors

Practice Exam 5: Answer Key and Explanations

1. B — Asbestos fibres are a confirmed carcinogen that causes mesothelioma and asbestosis when inhaled. Any dust from a vehicle that transported asbestos-containing materials must be treated as potentially contaminated. Specific containment, wet-cleaning, and respiratory protection procedures must be followed before any work begins — never use compressed air to blow the dust.

2. D — A first-year apprentice must receive proper instruction and demonstration on unfamiliar equipment before operating it. The foreman has a duty to ensure the apprentice understands the equipment's operation, hazards, and safety procedures. Assigning unsupervised work on unfamiliar equipment violates workplace safety obligations.

3. C — A radiator hose that bulges excessively under normal test pressure has deteriorated internally — the reinforcing fabric layers have weakened from heat, chemical attack, or age. The hose may hold pressure during a static test but is at risk of rupturing under the dynamic conditions of actual engine operation. It should be replaced.

4. A — The only reliable method for verifying torque wrench accuracy is calibration against a known standard by a qualified calibration service, or comparison against a calibrated master torque tool. Using two unverified wrenches against each other proves nothing — both could be equally inaccurate. Calibration certificates should be maintained on file.

5. B — Carbon monoxide is a colourless, odourless gas that accumulates rapidly in enclosed spaces. Headache and dizziness are early symptoms of CO poisoning. The engine must be shut off immediately

and all shop doors opened to ventilate the space. Running engines inside enclosed shops requires exhaust extraction systems.

6. D — Regulatory compliance during a safety audit is demonstrated through complete, signed inspection reports that detail every item inspected, measurements taken, defects found, and corrective actions performed. These documents prove that inspections were conducted systematically and that identified defects were addressed per regulatory requirements.

7. A — Used oil filters must be drained for a minimum period (typically 12 to 24 hours at warm temperature), then the casings are crushed to express remaining oil, and the metal casings are sent to scrap metal recycling. The expressed oil goes to the waste oil collection tank. Provincial regulations may specify additional requirements.

8. C — Measuring the exposed thread length or overall length from the adjusting sleeve to the tie rod end centreline before removal allows the technician to install the new end at the same position. This preserves the approximate toe setting and minimizes the vehicle's alignment deviation, though a final alignment check is still recommended.

9. D — The ECM retards injection timing as part of the aftertreatment regeneration or emissions management strategy. Retarded timing causes fuel to burn later in the combustion cycle, raising exhaust gas temperature — which is necessary for DPF regeneration. This retarded timing also increases ignition delay, which can produce the fuel knock symptom.

10. B — The noid light does not flash at the injector connector, meaning the ECM's activation signal is not reaching the connector. Since the ECM commands a normal pulse width (the ECM intends to fire the injector), the fault is in the signal path — the ECM driver circuit, the wiring, or a connector between the ECM and the injector has an open or high-resistance fault.

11. A — Zero oil pressure immediately on startup is most commonly caused by an unprimed oil pump. After an overhaul, the pump and galleries are empty of oil. The pump must be primed (pre-filled with oil or pre-lubricated using an external prelube system) before the first start to ensure immediate pressure. Starting without priming risks bearing damage in the first seconds.

12. C — Fuel dilution of 0.5% at only 8,000 km indicates an abnormal fuel source entering the crankcase. A leaking fuel injector — one that dribbles liquid fuel into the combustion chamber during

the soak period or fires with poor atomization — deposits liquid fuel on the cylinder wall where it washes past the rings into the oil.

13. D — White smoke that persists at full operating temperature with a sweet odour and dropping coolant level confirms coolant is entering the combustion chamber. The sweet smell is ethylene glycol. A failed head gasket, cracked cylinder head, or cracked wet liner allows pressurized coolant to leak into the cylinder where it vaporizes as white steam.

14. B — Intermittent rail pressure drops with normal transfer pump pressure and normal operation between events points to a periodically excessive fuel return. An injector with an intermittent internal leak allows fuel to escape from the rail back to the return circuit in bursts, causing the rail pressure to drop momentarily before the pump recovers.

15. A — The scan tool showing 0 RPM during cranking means the ECM is not receiving a crankshaft position signal. Without this signal, the ECM cannot determine engine position, cannot calculate injection timing, and will not command any fuel injection. No smoke during cranking confirms no fuel is being delivered — consistent with a missing CKP signal.

16. C — With the turbocharger functioning correctly and the intake tract pressure-tested leak-free, low boost can result from insufficient exhaust energy reaching the turbine. Exhaust manifold gasket leaks between the manifold and the cylinder head divert exhaust gas before it reaches the turbine inlet, reducing the energy available to drive the compressor.

17. D — With no external leaks, clean oil, and a passed EGR cooler test, coolant loss through microscopic head gasket porosity is a plausible cause. Very small amounts of coolant can enter the combustion chambers and vaporize without producing visible white smoke — the volume is too small to be detected visually but is large enough to lower the coolant level over time.

18. B — After replacing an injector on a common rail system, the new injector's calibration code must be entered into the ECM. If the code from the old injector remains programmed, the ECM applies the wrong correction factor for the new injector's delivery characteristics. This mismatch causes incorrect fuel delivery to that cylinder, producing a consistent misfire.

19. A — Before assuming internal engine wear, verify the oil pressure with a mechanical test gauge installed directly at the main gallery. The dash gauge or electronic sending unit could be faulty,

producing a false low reading. A mechanical gauge provides an independent, reliable pressure measurement that confirms or rules out the electrical indication.

20. C — The VGT actuator failing in the fully closed vane position accelerates exhaust gas velocity across the turbine to maximum. With the vanes stuck closed, the turbine receives concentrated exhaust energy at all operating conditions — not just at low RPM where closed vanes are commanded — driving the shaft speed beyond its design maximum.

21. D — A combustion gas test at the surge tank is the most effective method. If combustion gases (CO_2) are entering the cooling system through a head gasket breach or cracked head, the chemical test fluid will change colour when exposed to the gases at the coolant surface. This test detects even small leaks that do not produce visible white smoke.

22. B — An injector set 0.3 mm too high above the head surface places the injector tip closer to the piston crown than the design allows. During engine operation, the piston approaches TDC and the clearance between the piston crown and the injector nozzle tip may be insufficient — the tip contacts the piston, damaging both components.

23. A — With no fault codes and the accelerator pedal reading 0% at idle, the ECM is commanding the idle speed based on its programmed parameters. The idle speed may have been reprogrammed for a PTO application, or an idle bump feature (for A/C, fan load, or auxiliary equipment) may be active — check the ECM calibration and accessory activation inputs.

24. C — A DPF with normal differential pressure but elevated overall exhaust backpressure indicates a restriction elsewhere in the aftertreatment system. The DOC catalyst substrate can melt from excessive temperatures or collapse from thermal shock, physically blocking the exhaust flow path upstream of the DPF.

25. D — The engine starts and runs in the start position but stalls when the key moves to run. This indicates that a circuit essential for engine operation (ECM power, fuel pump, injector power) is supplied through the start position but loses power in the run position. A faulty run-position contact in the ignition switch is the most common cause.

26. B — The EGR system recirculates exhaust gas into the intake manifold. Exhaust gas contains soot, hydrocarbons, and particulate matter that accumulate as carbon deposits on the intake ports, valve stems,

and valve faces over time. This is a known consequence of EGR systems and is the primary cause of intake carbon buildup on EGR-equipped diesel engines.

27. A — Over-concentrated SCA causes additive dropout — the excess silicate, phosphate, or molybdate compounds cannot remain in solution and precipitate as gel, sludge, and solid deposits. These deposits plug the radiator tubes, heater core passages, and oil cooler channels, restricting coolant flow and causing overheating and component damage.

28. A — The fuel metering unit at maximum duty cycle (fully open) means the ECM is commanding maximum fuel delivery to the high-pressure pump, yet the pump still cannot achieve the target rail pressure. This confirms the high-pressure pump has worn beyond its volumetric efficiency limit — it is leaking internally and cannot displace enough fuel even at maximum metering.

29. D — A persistent exhaust leak at a single port that returns after gasket replacement and correct torque could be caused by a warped manifold face, warped head face, damaged bolt threads, or a cracked manifold runner. All of these conditions should be investigated by removing the manifold and inspecting both sealing surfaces.

30. B — The compressor is relatively new, so pump wear is unlikely. A slow build-up time with a functioning compressor most commonly results from air leaks distributed throughout the system. Even small leaks at multiple fittings, valves, and chambers add up to significant cumulative air loss that extends the time needed to pressurize the system.

31. D — With normal air pressure and spring brakes releasing correctly, the foot valve is the remaining suspect. If the foot valve's internal piston seals have failed, the valve cannot build adequate delivery pressure in either circuit despite having full supply pressure available. The pedal feels normal (the mechanical linkage moves) but the pneumatic output is insufficient.

32. A — The spring brakes on most heavy-duty trucks are supplied from the secondary circuit. Pulling the parking brake valve exhausts the secondary reservoir air that was holding the spring brakes released. The springs apply the brakes mechanically, and the secondary gauge drops to zero as the air is exhausted to atmosphere.

33. A — The most efficient approach is to isolate the tractor and trailer and test each separately. Disconnect the gladhands and cap them, then test the tractor alone. If the tractor passes both tests, the

trailer is the leak source. If the tractor fails, the leak is in the tractor. This immediately cuts the diagnostic scope in half.

34. A — The trailer ABS requires a minimum voltage (typically 9 to 10 volts) to operate its internal electronics and modulator valve solenoids. During a heavy brake application, the increased current draw through the corroded seven-pin connector pins drops the voltage below the minimum threshold, causing the ABS to lose power and stop modulating.

35. D — Both conditions should be investigated. Oil residue from the contaminated old cartridge can deposit on the purge valve seat, reducing its opening. Additionally, an incorrect replacement cartridge with a different purge orifice size or internal configuration would also produce a shortened purge. Both the valve and the cartridge part number should be verified.

36. A — If the drum, linings, hardware, and chamber are all in acceptable condition but the automatic slack adjuster repeatedly falls out of adjustment, the adjuster itself has failed internally. The internal ratchet mechanism, worm gear, or clutch assembly has worn or broken and cannot maintain its adjustment. The adjuster must be replaced — manual readjustment is a temporary measure only.

37. C — Brake pedal pulsation during every stop with disc brakes on all axles is caused by rotor runout or thickness variation. As the rotor rotates through the pads, the high and low spots push the piston in and out, transmitting the pulsation through the hydraulic or pneumatic circuit to the pedal. Rotor measurement confirms the diagnosis.

38. B — During a tractor-trailer separation, the supply (red) gladhand line is severed, cutting off the air supply from the tractor that was holding the trailer's spring brakes released. As the supply air exhausts from the severed line and the spring brake chambers, the springs extend and mechanically apply the trailer brakes — this is the fail-safe design.

39. D — Brake drums can develop hard spots — localized areas where the cast iron has transformed to a harder metallurgical phase from repeated heating and cooling cycles. These hard spots resist wear differently than the surrounding material, creating raised areas that produce a pulsation as the harder spots contact the brake linings during rotation.

40. A — The low-pressure warning switch or its electrical connection is faulty. The air gauges show normal pressure during the buzzer events, confirming the system pressure is adequate. The switch is

activating at a pressure above its calibrated threshold, or it has an intermittent electrical fault. The switch or its wiring should be tested and replaced.

41. C — Lining delamination is the separation of the friction material from the metal shoe table. It is caused by excessive braking heat that degrades the adhesive bond, moisture contamination that weakens the bonding agent, or adhesive failure from age or manufacturing defects. Delaminated linings can separate completely during braking and must be replaced.

42. B — The wear indicator lamp provides a warning, but it should be verified by physically measuring the pad thickness at each wheel position. Sensor wiring faults, incorrect sensor installation, or a damaged sensor can produce false indications. Physical measurement confirms the actual pad condition before committing to the replacement expense.

43. A — The secondary reservoir has full pressure (supply is not the issue), but the foot valve delivers zero pressure from the secondary circuit. The secondary piston or its seals inside the dual foot valve have failed — the piston cannot compress air in the secondary delivery chamber, so no pressure reaches the secondary circuit despite adequate supply.

44. D — The drums expand from heat during repeated braking. As the drum diameter grows, the brake shoe linings must travel further (greater pushrod stroke) before contacting the now-larger drum surface. This increased pedal travel is a direct consequence of brake drum thermal expansion and is the precursor to the loss of braking effectiveness known as brake fade.

45. C — The correct driver response to ABS activation on any axle is to maintain firm, steady pressure on the brake pedal. The ABS modulates individual wheel brake pressures to prevent lockup while maintaining maximum braking force and steering control. Releasing, pumping, or supplementing with the parking brake defeats the ABS function.

46. B — Disc brake pads typically wear faster than drum brake linings because the pads maintain slight contact with the rotor even when the brakes are not applied — there is a minimal running clearance that allows residual drag. This is a normal characteristic of floating caliper disc brake designs and is expected in mixed brake system configurations.

47. A — A 24-volt system at 28.8 volts is normal — the charging voltage for a 24-volt system is approximately 27.6 to 28.8 volts (2.3 to 2.4 volts per cell × 12 cells). This is within the correct range and no action is required. The system is charging normally for a 24-volt configuration.

48. D — SPN 639, FMI 9 (abnormal update rate) reported by multiple modules simultaneously suggests the CAN bus itself has a quality problem. Aftermarket devices connected to the CAN bus frequently inject non-standard messages that disrupt the bus timing, corrupt data, and cause multiple modules to report communication abnormalities.

49. C — With voltage readings nearly identical (12.4 vs 12.3 — only 0.1V difference), the electrical delivery is not the cause of the brightness difference. A new bulb can appear brighter than an older bulb of the same specification if the filament has deposited tungsten on the glass envelope of the older bulb, reducing its light output despite normal current draw.

50. B — A viscous fan clutch that runs continuously at full speed has failed in the engaged (locked) position. The silicone fluid coupling mechanism or the thermal spring that controls engagement has seized, preventing the clutch from freewheeling when the engine does not require full fan airflow. The clutch must be replaced.

51. A — The dash indicator illuminates (proving the turn signal switch provides power to the circuit) but the exterior lamps do not light. An open circuit between the flasher output and the lamps prevents current from flowing through the exterior lamps. Without the lamps completing the circuit to ground, the flasher cannot cycle — the indicator stays steady.

52. D — Intermittent failures of multiple accessories controlled by the body controller without fault codes suggest the controller itself is experiencing momentary power loss or ground interruption. When the module briefly loses power, it resets and drops all its outputs. The module's power and ground connections should be tested for intermittent high-resistance faults.

53. C — A whining noise proportional to engine RPM with normal electrical output is the signature of a failing alternator bearing. The bearing can produce noise long before it affects the shaft alignment enough to reduce electrical output. The bearing will eventually seize, destroying the alternator. Proactive replacement prevents a roadside failure.

54. A — The solenoid clicks (the plunger engages) but the motor does not turn. The voltage drops only to 11.8V (not severely) indicating the batteries have capacity. The solenoid contact disc — the internal copper disc that bridges the two main motor terminals when the plunger pulls in — is burned, pitted, or worn and cannot pass the heavy starter motor current.

55. D — LED light bars use rapid-switching power supplies (switch-mode converters) that generate broadband radio-frequency emissions. The AM radio antenna receives these emissions as static noise across the AM band. Proper RF filtering, shielding, and grounding of the LED light bar installation typically resolves the interference.

56. B — On this system where full tank = high resistance, an open signal wire leaves the ECM reading its full 5-volt reference voltage unloaded by any sensor resistance. The ECM interprets the full reference voltage as maximum resistance, which corresponds to a full tank reading. The gauge displays full regardless of actual fuel level.

57. A — A rapidly flashing security indicator with a cranking-but-no-start condition indicates the immobilizer system is not authenticating the key fob. The immobilizer allows the starter circuit to operate (cranking is not controlled by the immobilizer on most systems) but prevents the ECM from enabling fuel injection. Without fuel, the engine cranks but cannot start.

58. C — The engine operates normally at the correct speed (confirmed by the scan tool), but the tachometer displays a higher reading. Since the ECM is the source of the speed data on the CAN bus and the scan tool confirms the data is correct, the error is in the instrument cluster's interpretation or display of that data — a calibration error in the cluster.

59. B — The switch indicator lamp illuminates (confirming the switch circuit works) but the windshield does not heat. The heating elements draw significant current (20 to 40 amps) that is switched through a dedicated relay or power module separate from the low-current switch circuit. A failed relay or power module prevents the high current from reaching the heating elements.

60. D — The reverse lamps illuminate (confirming the reverse switch, wiring, and fuse for the lamp circuit are working). The backup alarm is typically on the same switched circuit but the alarm unit itself has failed internally. Since the power signal reaches the alarm (the same switch activates both), the alarm unit is the most likely failed component.

61. A — A parasitic draw that disappears when the alternator B+ wire is disconnected indicates current is flowing backward from the battery through the alternator. Failed rectifier diodes shorted in the forward-bias direction allow battery current to flow through the stator windings to ground, draining the battery whenever the engine is off.

62. C — Six glow plugs at 12 amps each wired in parallel should draw a total of 72 amps (6 × 12 = 72). The measured 60 amps is exactly 12 amps short of the expected total — consistent with one glow plug having failed open and drawing zero current. Five functioning plugs × 12 amps = 60 amps matches the measurement.

63. B — A starter motor that spins freely (high-pitched whine) without cranking the engine has a drive engagement failure. The starter drive gear (Bendix or solenoid-actuated) is not extending into mesh with the flywheel ring gear. The motor spins at no-load speed but cannot transmit torque to the flywheel because no mechanical connection is established.

64. C — A terminating resistor that has increased from 120 to 300 ohms creates an impedance mismatch at that end of the CAN bus. When data signals reach the mismatched termination, they are partially reflected back along the bus rather than being fully absorbed. These reflected signals corrupt the original data, causing intermittent communication errors.

65. A — SPN 91 FMI 2 (accelerator pedal position — erratic/intermittent) directly points to the pedal position sensor circuit. A damaged wire, corroded connector pin, or worn sensor element (potentiometer or Hall effect) produces an inconsistent signal that causes the engine to surge at idle (random inputs) and not respond during driving (signal dropouts).

66. C — On a 24-volt system with a 12-volt tap, the battery equalizer maintains equal charge across both batteries by transferring energy from the stronger battery to the weaker one, and provides a stable 12-volt mid-point tap for accessories. Without it, the 12-volt tap voltage is unregulated and fluctuates as the batteries discharge unevenly.

67. B — An intermittent LED headlamp flicker after recent replacement points to the connector. If the connector is not fully locked or the pin terminals have insufficient tension, vibration during driving causes intermittent loss of contact. LED driver circuits respond to momentary power interruptions by flickering — unlike incandescent lamps which have thermal inertia.

68. A — Normal voltage (12.4V) with elevated current (15A versus 8A rated) indicates the motor is working harder than designed. The motor is drawing more current because its internal resistance has increased from worn brushes, a binding armature, or failing field windings. The increased electrical load produces more heat but less mechanical output, resulting in slow operation.

69. D — A noise present in all gears and neutral that changes only with vehicle speed (not gear selection) must originate from a component that rotates proportionally to vehicle speed regardless of gear. The countershaft gears mesh continuously whenever the input shaft rotates, but the output shaft bearing rotates with vehicle speed in all conditions — making it the most likely source.

70. C — Insufficient clutch pedal free play (10 mm versus 15-25 mm specified) means the release bearing is too close to or in contact with the pressure plate fingers. This constant contact partially disengages the clutch, reducing the clamping force on the friction disc. Under heavy load, the reduced clamping force cannot prevent the disc from slipping.

71. B — A flare (RPM increase) during a specific gear change with all other shifts normal indicates the apply clutch pack for that gear is slipping during engagement. The clutch pack that applies for third gear has worn plates, a weak apply piston seal, or low apply pressure — it cannot absorb the engine torque quickly enough and the RPM flares momentarily.

72. A — A dry bearing cap packed with rust (no needle bearings visible) confirms a long-standing seal failure. Moisture entered through the failed seal, grease escaped, and the needle bearings corroded away completely. The U-joint journal operated metal-to-metal on corrosion debris — a complete failure that had been developing over an extended period.

73. D — A clicking noise during tight turns with correct ring-and-pinion backlash points to the differential internals. During turns, the spider gears rotate on the cross shaft to allow speed differentiation. If the thrust washers are missing or incorrect, the side gears have insufficient clearance control and contact the differential case during rotation.

74. D — On a 10-speed AMT, tenth gear may require a specific splitter valve and range position combination. The vehicle speed sensor reading slightly low prevents the AMT controller from calculating that the vehicle has reached the minimum speed threshold for the tenth gear upshift. All other gears engage because their speed thresholds are met.

75. B — A vibration at exactly 55 km/h and exactly 110 km/h (double the speed) indicates a source with a specific rotational frequency. A tire flat spot contacts the road once per revolution — at the tire diameter and speed corresponding to 55 km/h, the impact frequency matches a resonance. At 110 km/h, the same flat spot hits at double the frequency, exciting the second harmonic.

76. A — A transfer case that has been leaking lubricant for an extended period may have caused internal damage from operating with insufficient lubrication. Before simply replacing the seal and refilling, the internal bearings, gears, and shift mechanism should be inspected for wear, scoring, or heat damage that occurred during the low-fluid operating period.

77. D — Cold-shift difficulty that resolves once the transmission warms up is the classic symptom of excessively viscous lubricant. Cold, thick gear oil resists the movement of the shift forks and slows the synchronizer speed-matching process. Using the correct viscosity grade for the expected ambient temperature range resolves the condition.

78. C — Iron is from bearing races, gears, or shafts. Zinc in a drive axle oil sample is unusual and points to the differential pinion shaft (cross pin) surface treatment. The cross pin in many differentials has a zinc or zinc-phosphate surface coating — elevated zinc combined with iron suggests the spider gears are wearing against the cross pin during differential action.

79. A — Grease must purge from all four bearing cap seals to confirm lubrication has reached every needle bearing set. A cap that does not purge despite continued pumping has a blocked grease passage — the internal cross channel in the U-joint journal leading to that cap is obstructed. Those needle bearings will run dry and fail prematurely.

80. B — A lockup clutch shudder during engagement at a consistent speed that clears once fully locked is most effectively addressed by changing the transmission fluid and filter. Degraded friction modifier additives in the fluid are the primary cause. A fluid change with OEM-specified fluid restores the correct friction characteristics and often eliminates the shudder.

81. D — The indicator lamp circuit and the lock mechanism actuation circuit are typically separate systems. The lamp circuit can fail (blown bulb, open wire) independently of the lock's air or electric actuation circuit. Since the driver reports no traction difference, the lock may still be engaging correctly while the indicator lamp simply does not function.

82. B — The retarder housing-to-transmission joint is a potential cross-contamination point. If the retarder fluid and transmission fluid share a common seal at this junction, a leak can allow the fluids to mix. Incompatible fluids can damage the transmission's clutch pack friction material, seals, and internal components.

83. A — With 3 mm of lining remaining (well above the 1 mm minimum) and correct free play, the friction surfaces and clamping force are the remaining variables. Oil contamination from a leaking rear main seal or transmission input seal on the flywheel and pressure plate surfaces reduces the friction coefficient below the level needed to transmit full engine torque.

84. D — Slip joint spline wear produces a clunking noise specifically during torque reversals — when the drivetrain transitions between acceleration and deceleration (or vice versa) and the looseness in the worn splines is taken up. This clunk during gear changes and direction reversals is distinct from the constant vibration of a U-joint or balance problem.

85. B — The fault code for the range actuator position sensor points directly to the range shift mechanism. The actuator motor, its position sensor, the sensor wiring, and the mechanical linkage from the actuator to the range shift mechanism inside the transmission should be inspected for failure, disconnection, or calibration error.

86. A — Chattering and vibration during slow-speed turns with correct fluid and belt points to the power steering pump's internal pressure relief valve oscillating. During the high-demand condition of a slow full-lock turn, the pump operates near its maximum output. If the relief valve seat is worn, the valve alternately opens and closes rapidly, producing the chatter.

87. D — With steering free play corrected and all mechanical components within specification, a vague steering feel at highway speed points to the steering damper. A failed damper allows the steer wheels to react to every road surface irregularity without resistance, producing the subjective sensation of imprecise or vague steering response.

88. D — Grade 5 bolts have lower tensile strength and fatigue resistance than Grade 8 bolts. Frame structural repairs are subjected to continuous dynamic loading from road impacts, suspension forces, and payload stresses. Grade 5 bolts may not withstand these fatigue loads and could fail over time. Grade 8 or OEM-specified bolt grades must be used.

89. C — Wear on both outer edges with a full centre tread is the signature of chronic under-inflation. Insufficient pressure causes the tire sidewalls to flex excessively, and the tread contact patch concentrates on the outer edges rather than distributing evenly across the full width. Correct inflation eliminates this wear pattern on replacement tires.

90. A — If the air bags are at maximum pressure and the ride height is still below specification, the suspension has reached its load limit. The vehicle may be overloaded beyond the suspension system's capacity. Continued operation risks structural damage to the suspension components, frame, and air springs. The load must be reduced or redistributed.

91. B — If the fifth wheel is properly lubricated but the trailer does not articulate smoothly, the trailer upper coupler plate surface should be inspected. Damage, warpage, corrosion buildup, or debris on the coupler plate prevents smooth sliding contact with the fifth wheel plate, creating the dragging sensation during turns.

92. D — A bearing cone welded to the spindle from heat is the result of operating with inadequate lubrication. The bearing ran dry (from seal failure, insufficient oil, or missed lubrication), generated extreme friction heat, and the bearing race metallurgically bonded to the spindle. The seal failure and lubricant loss initiated the chain of failure.

93. B — Any oil on the brake backing plate indicates a seal that is no longer containing the hub lubricant. Even a thin film means the seal has failed and oil is migrating toward the brake friction surfaces. The seal must be replaced immediately before oil reaches and contaminates the brake linings, which would require lining replacement as well.

94. C — A sliding tandem axle tracking error can sometimes be corrected by repositioning the tandem on its track. The track hole pattern geometry changes at different slide positions, and a misalignment caused by the relationship between the pin positions and the axle mounting may resolve at a different track position without requiring component replacement.

95. D — A tire repaired by an external shop should be verified by the receiving technician before returning to service. Confirm the repair is in the repairable tread zone, the puncture was within the maximum repairable diameter, the patch is properly bonded to the inner liner, and no internal damage (belt separation, sidewall bruising) exists beyond the puncture.

96. B — The drag link controls the relationship between the steering gearbox output (pitman arm position) and the steer axle (steering arm position). Adjusting the drag link length changes where the steering wheel sits when the steer wheels are pointing straight ahead, without altering the toe setting. The tie rod controls toe; the drag link controls wheel centering.

97. A — A tire blowout subjects the steer axle components to severe impact loads and vibration. The steering linkage (drag link, tie rod ends), king pin bushings, wheel bearings, and the spindle should all be inspected for damage, deformation, or looseness that may have resulted from driving on the destroyed tire.

98. C — Hub pilot surfaces must be thoroughly cleaned before wheel installation. Rust, corrosion, road debris, or old rubber between the wheel bore and the hub pilot prevents the wheel from seating flat and concentric. This creates runout that produces vibration, uneven lug nut loading, and potential wheel fatigue cracking.

99. D — With both air bags inflated, height control valves functioning, level ground, and even load distribution, a 15 mm height difference most likely results from the two height control valves being adjusted to different target heights. If the valves were replaced or adjusted at different times, the settings may not have been equalized.

100. B — The initial seating and compression set that occurs in the wheel-to-hub interface during the first 80 to 160 km of driving causes a normal reduction in clamping force. This is exactly why the re-torque procedure exists — to compensate for this initial settling. The 15% loss on three nuts is consistent with normal seating behaviour.

101. A — Circular abrasion marks on the inner liner beneath the tread indicate the tire operated at insufficient inflation pressure. Under-inflation causes excessive sidewall flex that allows the tire carcass to collapse inward, and the inner liner repeatedly contacts the belt edges during high-speed rotation, creating the characteristic circular abrasion pattern.

102. A — Lock pins that engage in the forward position but not in the middle or rear positions indicate a problem with the track holes at those specific locations. Bent track rails, accumulated debris, or corrosion in the track holes prevents the pins from entering those particular holes while the forward-position holes remain clear and functional.

103. D — The front drive axle carrying 12% more weight than the rear causes accelerated tire wear on the overloaded front axle, increased fatigue loading on the front axle bearings and suspension components, and reduced tire life due to the higher load per tire. The equalizer beam or suspension geometry should be inspected and corrected.

104. B — Excessive cab bounce with correct air bag inflation and ride height after a height control valve replacement points to the cab shock absorbers. The new valve maintains correct height (confirming it works) but cannot control the oscillation rate — that is the shock absorber's function. Worn shocks were masked by the old valve's behaviour and are now exposed.

105. D — The bunk heater shuts off after two hours with no fault codes — this is normal thermostat-controlled cycling. The sleeper cab reaches the set-point temperature and the heater's thermostat turns it off. When the cab cools below the set-point, the heater restarts. This is the intended energy-saving operating behaviour, not a malfunction.

106. A — A seat with a broken mounting bolt is a critical safety hazard. During an emergency stop or collision, the seat can shift, ejecting the driver from the designed seating position. This prevents the seatbelt from restraining the occupant correctly and may position the driver outside the airbag's protective deployment zone.

107. C — Commercial vehicle regulations require that any windshield damage in the driver's direct line of sight that impairs visibility constitutes a defect. A stone chip in the direct line of sight on a commercial vehicle must be addressed — most jurisdictions require replacement rather than repair for commercial vehicles to ensure uncompromised visibility.

108. A — Power-adjustable pedals that intermittently shift position without driver input point to the adjustment motor receiving a command it should not. The pedal adjustment motor connector may have an intermittent connection, or the adjustment switch may have an internal short that intermittently closes the circuit and commands pedal movement.

109. B — Both suction and discharge pressures lower than normal with clean coils and a functioning compressor indicate the system has insufficient refrigerant. A low charge reduces the mass of refrigerant circulating, which lowers both the suction pressure (less refrigerant in the evaporator) and the discharge pressure (less refrigerant to compress).

110. A — Disc brakes have a higher friction coefficient and more immediate application response than drum brakes. If the trailer relay valve delivers the same proportional pressure to disc brakes that was calibrated for drum brakes, the disc brakes will apply more aggressively. The relay valve crack pressure or proportioning must be adjusted to match the disc brake characteristics.

111. D — A worn upper coupler plate creates a depression that the fifth wheel plate rides into during normal operation. This depression causes clunking during acceleration and braking as the tractor-trailer coupling rocks in and out of the worn area, and accelerates wear on both the fifth wheel plate surface and the king pin and locking jaw mechanism.

112. C — The trailer battery charging circuit (from the seven-pin auxiliary pin) charges the battery during driving. If the battery is discharged and the cargo lights do not work, the battery's condition should be checked first. A battery with a failed cell or severe sulfation from prolonged discharge cannot accept or hold a charge regardless of the charging circuit's condition.

113. B — An evaporator coil with 75% ice coverage has severely restricted airflow and heat transfer. A manual defrost cycle must be initiated immediately to clear the ice, then the automatic defrost system must be investigated. A failed defrost heater, a faulty defrost timer, or a malfunctioning defrost termination sensor caused the automatic defrost to fail.

114. A — DOT conspicuity tape is a regulatory safety requirement designed to make trailers visible to other vehicles during nighttime and low-visibility conditions. Missing tape below the required coverage must be replaced before the trailer returns to commercial service. This is a direct safety compliance requirement, not discretionary maintenance.

115. D — A cracked binder handle is a potential point of catastrophic failure. If the handle breaks during transit, the binder releases, the chain goes slack, and the load can shift or fall from the trailer — creating an extreme hazard. The cracked binder must be replaced before departure. Additionally, all other binders should be inspected for similar defects.

116. B — A sealed trailer air system with no leaks should maintain pressure indefinitely after the tractor disconnects. The one-way check valves in the system prevent air from escaping backward through the gladhands. If the system has no internal or external leaks, the trapped air maintains the spring brake release pressure until the gladhands are reconnected.

117. C — Mould and bacteria thrive on the wet evaporator surface and in the dark, humid HVAC housing. The condensation from normal A/C operation provides the moisture, and organic material (dust, pollen) provides nutrients. The evaporator must be treated with an antimicrobial spray to kill existing growth, and the cabin air filter replaced to remove the contaminated media.

118. A — Cold air from the centre vents but warm air from the outer vents indicates the air is being reheated in the outer ductwork. A secondary blend door, a reheat valve, or a duct-mounted temperature control flap that is partially open on the outer vent path allows some heated air from the heater core to mix with the cooled air before it exits the outer vents.

119. D — The auxiliary heater output of 75°C is below the thermostat's 82°C opening temperature, so the thermostat should remain closed and the heated coolant should go directly to the heater core without passing through the radiator. If the cab heater still produces inadequate heat at 75°C, the heater may not be producing its rated output — the combustion system needs service.

120. B — The system was evacuated to 200 microns (very good vacuum), but the hold test showed 210 microns — only a 10-micron rise, which passes. However, if any residual moisture remained that the evacuation did not fully remove, it will freeze at the expansion valve orifice during operation. The progressive flow restriction from ice buildup explains the deteriorating performance over 20 minutes.

121. C — Both heater hoses being cool at the firewall with the engine at operating temperature confirms that no hot coolant is reaching the heater core. If coolant were flowing, at least the inlet hose would be hot. A closed heater control valve (cable-operated, vacuum-operated, or electrically operated) is blocking coolant flow to the core entirely.

122. A — The clutch engages with direct power (proving the coil and clutch mechanism work) but not during normal operation. The A/C protection circuit — which includes the low-pressure switch and high-pressure switch wired in series with the clutch relay control circuit — must be checked. Either switch in an open state breaks the relay control circuit and prevents clutch engagement.

123. D — A condenser discharge temperature only 10°C above ambient (versus the normal 15-25°C) indicates the compressor is not developing adequate high-side pressure. Without sufficient compression, the refrigerant does not reach a high enough temperature differential to reject heat effectively through the condenser. A worn compressor, stuck-open discharge valve, or slipping clutch reduces the compression ratio.

124. B — Jerky retraction with slow speed and correct oil level and condition suggests air trapped in the rod-end of the cylinder. The compressible air pocket alternately compresses (piston stops) and releases (piston lurches forward) as the hydraulic pressure fluctuates around the air pocket's compression-release cycle. Bleeding the air from the circuit resolves the jerky motion.

125. A — A flow drop from 72 LPM at no load to 45 LPM at 17,000 kPa represents a 38% volumetric efficiency loss. The acceptable range for a positive-displacement gear pump is typically 10-15% flow loss from no-load to full-load pressure. A 38% loss confirms significant internal wear — enlarged clearances allow excessive internal leakage under pressure.

126. C — A system that persistently overheats despite a clean cooler and functioning fan has an internal heat source that exceeds the cooling capacity. Worn pumps, cylinders, or valves that bypass fluid internally convert hydraulic energy directly to heat without performing useful work. This internal leakage is the most common cause of chronic hydraulic system overheating.

127. B — No oil flows from the retract port of the disconnected directional valve when the retract function is activated. This means the valve spool is not moving to the retract position to direct pump flow to that port. The spool is stuck in neutral or the extend position — from contamination, corrosion, a broken centering spring, or a failed actuator.

128. A — Nitrogen pre-charge pressure determines the accumulator's energy storage capacity. A drop from 12,000 to 8,000 kPa reduces the volume of hydraulic fluid the accumulator can accept during braking (less energy stored) and the force with which it can return that fluid during launch assist (less energy available). The system provides reduced performance.

129. A — Outrigger proximity sensors or limit switches provide the feedback that tells the crane controller whether the outriggers are fully deployed. A faulty, misadjusted, or disconnected sensor will report the outrigger as not fully deployed even when it is, blocking boom operation as a safety interlock. The sensors should be inspected and tested.

130. C — A new hydraulic system installation with cavitation noise and foaming despite correct oil type and level points to an installation error in the suction circuit. An undersized suction line, excessive length, too many fittings, a kink, or an improperly installed suction strainer restricts oil flow to the pump inlet, creating a vacuum that causes cavitation.

131. D — Rapid pressure fluctuation between 18,000 and 21,000 kPa during cylinder operation indicates the system is operating near the relief valve's cracking pressure. The relief valve alternately opens (pressure drops to 18,000) and closes (pressure rebuilds to 21,000) as the cylinder's load demand oscillates around the valve's set point.

132. B — The DC-DC converter steps down the high-voltage bus (300-800 VDC) to 12 volts to charge and maintain the auxiliary battery. If the converter fails or underperforms, the auxiliary battery is not recharged during vehicle operation and gradually discharges. The main high-voltage battery being fully charged confirms the propulsion system is functioning — the failure is in the 12-volt supply path.

133. A — State of health (SOH) at 82% means the battery pack has lost 18% of its original energy storage capacity through normal electrochemical degradation over its 4-year, 180,000 km life. The cells can physically store and deliver only 82% of the energy they held when new, directly reducing the vehicle's driving range proportionally.

134. C — Any damage to the high-voltage cable insulation system — even if limited to the outer jacket — compromises the insulation barrier that protects personnel from lethal voltage. The cable must be replaced because moisture, road debris, or further deterioration can breach the inner insulation layer. High-voltage insulation integrity is absolute — there is no acceptable level of damage.

135. D — The PCS is thermally derating the inverter — proactively reducing the power output to prevent the temperature from reaching the 100°C maximum automatic shutdown threshold. Operating at 95°C with a 100°C limit leaves only a 5°C margin. The system reduces power to lower heat generation and maintain the inverter within its safe operating range.