# PRACTICE EXAM 6: RED SEAL TRUCK AND TRANSPORT MECHANIC SIMULATION (135 QUESTIONS)

1. A technician is assigned to weld a bracket onto a truck frame. The area around the weld zone is coated with undercoating material. Before striking the arc, what must the technician do regarding the undercoating?

A. Apply a thicker layer of undercoating around the weld zone to protect the surrounding paint from heat discolouration and spark damage

B. Proceed with welding through the undercoating since the arc temperature will burn through it and create adequate fusion with the base metal

C. Remove the undercoating completely from the weld zone and surrounding area because it produces toxic fumes when heated and prevents proper weld fusion

D. Spray the undercoating with water to cool it during welding and prevent the material from igniting while the arc generates heat in the adjacent area

2. A truck shop has a parts washer that uses an aqueous (water-based) cleaning solution. A technician has been using gasoline in a bucket to clean parts because the parts washer is occupied by another technician. What is the primary hazard of this practice?

A. Gasoline vapours are extremely flammable and a spark from static discharge, nearby equipment, or electrical devices could ignite the vapours causing a fire or explosion

B. Gasoline dissolves the protective oxide layer on aluminium parts causing them to corrode faster than parts cleaned in the approved aqueous solution

C. Gasoline cleaning is prohibited because the chemical residue left on the parts interferes with torque wrench accuracy during reassembly of critical components

D. Gasoline is classified as a controlled substance under provincial regulations and its use as a cleaning solvent requires a separate environmental handling permit

3. During a pre-trip inspection, a driver discovers that the cargo securement on a flatbed trailer appears questionable — the load appears to be shifting but the driver is not trained in cargo securement evaluation. What should the driver do?

A. Continue with the trip and report the concern at the next fuel stop where a more experienced driver can evaluate the securement condition

B. Tighten all visible chains and straps by hand without using load binders and proceed cautiously to the destination at reduced highway speed

C. Contact the shipper and request that they send their own personnel to re-secure the load before the driver departs with the trailer

D. Refuse to depart until a qualified person evaluates and corrects the cargo securement to ensure it meets the regulatory requirements for transport

4. A fleet shop has implemented a buddy system for confined space entry during fuel tank repairs. What does the buddy system require in this context?

A. Two technicians must enter the confined space simultaneously so they can assist each other in the event of an atmospheric emergency inside the tank

B. A trained attendant must remain outside the confined space at all times monitoring the entrant and maintaining communication while ready to summon rescue

C. Two technicians must take turns entering the space in 15-minute intervals to limit each person's individual exposure time to the confined atmosphere

D. A supervisor must accompany the technician into the confined space to directly observe the work and verify the repair quality before the space is sealed

5. A technician is using a bench grinder to sharpen a chisel. The tool rest is set 15 mm away from the grinding wheel face. The maximum gap specification is 3 mm. Why is this excessive gap dangerous?

A. The workpiece can be pulled between the tool rest and the wheel causing it to jam and shatter the wheel or launch the workpiece at the operator with injuring force

B. The excessive gap causes the grinding wheel to vibrate at a resonant frequency that accelerates wheel deterioration and reduces the wheel's rated burst speed

C. The wide gap allows grinding dust to accumulate between the rest and the wheel creating a fire hazard from the heated metal particles contacting the trapped debris

D. The excessive gap reduces the grinding precision because the operator cannot maintain a consistent angle between the chisel edge and the wheel surface during sharpening

6. A heavy-duty truck has been parked with the service brakes applied for three days in freezing conditions. When the driver attempts to drive, the brakes will not release. Before applying any force, what should the technician check?

A. The air system pressure to verify the compressor has built sufficient pressure to release the service brakes through the relay valves and quick-release valves

B. The automatic slack adjusters for over-adjustment that occurred while the brakes were applied in the parked position creating interference between shoes and drum

C. The brake chamber pushrod stroke on each wheel to determine if the chambers have shifted position during the three-day parking period from temperature cycling

D. Whether the brake drums have frozen to the linings from moisture that accumulated between the friction surfaces and froze during the extended cold parking period

7. A technician drops a 12-point socket into the gap between the engine and the firewall of a truck. The socket lands on top of the starter motor. What is the electrical hazard of leaving a metal tool resting on the starter?

A. The socket may corrode from engine heat and battery acid fumes causing it to bond permanently to the starter housing requiring destructive removal

B. The metal socket could bridge the starter motor B+ terminal to the starter housing creating a short circuit that can cause a fire or burn the battery cables

C. The socket will interfere with the starter solenoid engagement preventing the solenoid plunger from fully extending and engaging the drive gear with the flywheel

D. The residual magnetism in the starter motor will attract the socket more firmly over time making it progressively more difficult to retrieve without specialized tools

8. A technician is documenting a vehicle inspection and writes "brakes OK" on the inspection form. Why is this documentation inadequate?

A. The entry does not specify what was inspected, what was measured, or the actual condition found — it provides no useful information for regulatory compliance or future reference

B. The phrase "brakes OK" is not recognized by provincial regulatory agencies as an acceptable notation and will result in automatic audit failure

C. The entry should include the technician's personal opinion on the expected remaining service life of the brake components before the next scheduled inspection interval

D. The documentation must include photographs of all brake components to supplement the written entry and provide visual evidence for the inspection file

9. A heavy-duty diesel engine has been running at full load for 30 minutes on a dynamometer. The technician notices that the exhaust manifold on cylinder 5 is visibly cooler (darker colour when viewed with the engine running in dim lighting) than the manifolds on the other five cylinders. What does this indicate?

A. Cylinder 5 has a higher compression ratio than the other cylinders which produces more efficient combustion and lower exhaust gas temperature

B. The exhaust manifold on cylinder 5 has a thicker casting wall than the others which insulates the heat better and appears cooler on the outside surface

C. Cylinder 5 is producing less combustion heat than the others — likely from a failed injector, low compression, or incorrect valve timing on that cylinder

D. The turbocharger is extracting more energy from cylinder 5's exhaust gas pulse than from the other cylinders due to its position relative to the turbine inlet

10. A diesel engine has had its cylinder head resurfaced during an overhaul. The machine shop removed 0.25 mm of material from the head's deck surface. What effect does this material removal have on the engine's operating parameters?

A. The valve timing advances because the camshaft-to-crankshaft relationship changes when the head-to-block dimension is reduced by the resurfacing operation

B. The injector protrusion height decreases because the head is now thinner and the injector sits deeper in the combustion chamber relative to the piston crown

C. The fuel injection pressure must be increased to compensate for the higher compression ratio that results from the reduced combustion chamber volume

D. The compression ratio increases because the combustion chamber volume is reduced by the amount of material removed from the head deck surface

11. An oil cooler on a heavy-duty diesel engine uses engine coolant to cool the oil. During a cooling system pressure test, the technician pressurizes the cooling system to 105 kPa (15 psi). While holding pressure, the technician notices that the engine oil level on the dipstick has risen above the full mark. What does this confirm?

A. The coolant system pressure has compressed the air space in the crankcase causing the oil to rise artificially on the dipstick from the air pressure differential

B. The oil cooler has an internal leak — pressurized coolant is crossing through the failed cooler core into the oil circuit causing the oil level to rise with coolant

C. The oil filter bypass valve has opened from the coolant system pressure transmitting through the block casting to the oil filter housing and releasing oil into the sump

D. The crankcase ventilation system has pressurized from the cooling system test pressure causing the crankcase pressure to push oil up the dipstick tube artificially

12. A truck driver reports that the engine produces a loud ticking noise from the valve cover area that increases with engine RPM. The noise began suddenly during a highway trip. Oil level and pressure are normal. What should the technician investigate first?

A. A broken rocker arm, a collapsed lifter, or a failed pushrod that is allowing one valve to remain closed while the rocker arm ticks against the valve stem tip without opening the valve

B. A loose valve cover that is vibrating against the cylinder head surface from the engine's normal vibration pattern at the RPM range matching the driver's highway cruising speed

C. An exhaust manifold bolt that has backed out and is allowing the manifold gasket to leak producing a ticking noise synchronized with the exhaust firing order of that cylinder

D. The valve lash has gradually increased over the service interval from normal cam follower wear and all valves need their lash readjusted to the OEM specification

13. A common rail diesel engine intermittently sets a fault code for fuel rail pressure above commanded value. The code sets during sudden throttle release from full load. What is the most likely cause?

A. The fuel injectors are sticking open momentarily during the rapid transition from full fuel delivery to zero fuel delivery creating a hydraulic pressure spike in the rail

B. The high-pressure fuel pump check valve has a delayed closing response that allows the pump to deliver one or two additional strokes after the metering unit closes

C. The fuel rail pressure limiter or pressure relief valve is not opening quickly enough to bleed the excess pressure when the fuel demand drops suddenly on throttle release

D. The fuel metering unit's response time is slower than the ECM's command rate and the pump continues delivering fuel for a brief period after the ECM commands reduced delivery

14. A heavy-duty diesel engine has a consistent miss on one cylinder at idle. The technician performs a power balance test by disabling each injector through the scan tool. When injector number 3 is disabled, there is no change in engine RPM or sound. What does this result confirm?

A. Injector number 3 is flooding that cylinder with excessive fuel which is washing the oil from the liner wall and reducing the compression on that cylinder

B. Cylinder number 3 has excessive compression that the ECM is compensating for by reducing fuel to that cylinder to maintain balanced cylinder contribution

C. The ECM driver circuit for injector number 3 has an intermittent fault that occasionally fires the injector but was not firing it during the power balance test window

D. Cylinder number 3 is not contributing power to the engine — either the injector is not delivering fuel or the cylinder has a mechanical failure preventing combustion

15. A diesel engine coolant contains a 40/60 mixture of ethylene glycol and water. The coolant protection level tests to -34°C. A fleet operating in Northern Canada requires freeze protection to -45°C. Should the technician add more concentrate to increase the glycol percentage?

A. Yes — increasing the glycol concentration to 70% will lower the freeze point to approximately -55°C and provide adequate protection for Northern Canadian operation

B. No — increasing the glycol concentration beyond 60% actually raises the freeze point and reduces the coolant's heat transfer efficiency making the engine more prone to overheating

C. Yes — the technician should drain the system completely and refill with 100% ethylene glycol to achieve the maximum possible freeze protection for extreme cold environments

D. No — the correct approach is to switch from ethylene glycol to propylene glycol coolant which provides superior freeze protection below -40°C at any mixture concentration

16. A turbocharged diesel engine is producing intermittent puffs of black smoke under load that were not present before a recent charge air cooler replacement. Boost pressure and all other parameters are normal. What should be rechecked on the charge air cooler installation?

A. The charge air cooler piping connections for a slight misalignment that creates a turbulent airflow restriction during peak boost demand producing momentary fuel-rich combustion

B. The charge air cooler's internal fin structure for shipping debris or packing material left inside the cooler during manufacturing that intermittently blocks airflow passages

C. The charge air cooler mounting brackets for excessive vibration that is causing a resonance in the intake tract disrupting the laminar airflow at specific engine operating points

D. The charge air cooler size specification for the vehicle model — an incorrect replacement cooler with lower capacity would reduce the intake air density under full load conditions

17. A heavy-duty diesel engine has a persistent fault code for crankcase pressure above threshold. Blow-by measurements through the breather tube are within normal specification. The CCV (crankcase ventilation) filter was recently replaced. What should the technician check?

A. The turbocharger oil drain line for a restriction that is causing oil to back up in the turbocharger bearing housing and overflow into the crankcase through the drain connection

B. The oil fill cap seal for a leak that allows ambient air to enter the crankcase and produce a false pressure reading on the crankcase pressure sensor during engine operation

C. The crankcase pressure sensor wiring and connector for damage, corrosion, or a faulty sensor element that is producing an inaccurate pressure reading to the ECM despite normal blow-by

D. The crankcase pressure sensor itself — since blow-by is normal and the CCV filter is new, the sensor or its circuit may be reading incorrectly and setting a false fault code

18. A diesel engine equipped with a DPF has completed an active regeneration cycle. The technician checks the DPF differential pressure and finds it has not decreased from the pre-regeneration level. Exhaust gas temperatures during regeneration were confirmed to have reached 600°C at the DPF inlet. What is the most likely explanation?

A. The regeneration cycle duration was too short to burn the accumulated soot and a second consecutive regeneration cycle is needed to complete the cleaning process

B. The DPF is loaded primarily with ash rather than soot — ash is the non-combustible residue from engine oil consumption that cannot be burned during any regeneration cycle

C. The diesel fuel used during the regeneration contained a high sulphur content that inhibited the soot oxidation reaction and prevented the carbon from burning at the normal temperature

D. The DOC catalyst upstream of the DPF has degraded and did not produce the full temperature rise needed to sustain the soot oxidation throughout the entire DPF substrate volume

19. A heavy-duty diesel engine has a turbocharger that whistles during acceleration but the noise disappears at steady-state RPM. Boost pressure builds normally. What is the most likely source of the whistle?

A. The turbocharger compressor wheel has sustained minor FOD (foreign object damage) that disrupts the airflow pattern during the transient acceleration phase creating a tonal whistle

B. A small leak in the intake plumbing between the compressor outlet and the intake manifold that whistles during the high-velocity airflow of boost buildup but seals under steady pressure

C. The turbocharger wastegate actuator rod is vibrating at its resonant frequency during the rapid pressure change of acceleration creating a metallic whistle that dampens at steady speed

D. The turbocharger bearing oil film is too thin during the rapid acceleration phase causing shaft whirl that produces a high-pitched noise until the oil supply stabilizes at steady RPM

20. A fleet manager asks a technician to explain why one truck consistently achieves better fuel economy than an identical truck in the same fleet operating the same route. Both trucks have the same engine, transmission, rear axle ratio, and tire size. Both are properly maintained. What vehicle-related factor is most likely responsible for the difference?

A. Aerodynamic condition — missing or damaged side extenders, roof fairings, or chassis skirts on the less-efficient truck create additional drag that increases fuel consumption on the highway

B. The alternator on the less-efficient truck is producing higher charging voltage which increases the electrical load on the engine and consumes more fuel to maintain the higher output level

C. The exhaust system on the less-efficient truck has a slightly larger pipe diameter that reduces exhaust backpressure and allows the turbocharger to overspeed consuming additional fuel

D. The engine oil viscosity on the less-efficient truck is one grade lighter than specification which reduces the oil film thickness and increases internal friction resulting in higher fuel consumption

21. A diesel engine has an oil consumption rate of 0.25 litres per 1,000 km. The engine has 400,000 km and has never been overhauled. The OEM considers 0.5 litres per 1,000 km to be the maximum acceptable rate. What is the assessment?

A. The oil consumption rate is within the OEM's acceptable range but trending upward — the technician should monitor the rate at each service and plan for an overhaul when it approaches 0.5 L

B. The engine requires immediate attention because 0.25 L per 1,000 km at 400,000 km indicates an accelerating wear pattern that will rapidly exceed the threshold within the next 50,000 km

C. The oil consumption is caused by external leaks rather than internal engine wear at this level and the technician should focus on finding and repairing the external leak sources before investigating internal wear

D. The oil consumption rate is within the normal acceptable range for a 400,000 km engine and should be documented and monitored as part of the routine PM program with no immediate action required

22. A truck's DEF (diesel exhaust fluid) warning lamp illuminates and the scan tool shows a code for DEF quality below specification. The driver reports that the DEF tank was recently refilled from a bulk storage tank at a fuel stop. What is the most likely cause?

A. The DEF has been stored in the bulk tank at temperatures above 35°C for an extended period which has degraded the urea concentration below the required 32.5% specification level

B. The DEF tank heater on the truck has failed and the cold DEF is registering as low quality because the quality sensor cannot accurately measure concentration at low fluid temperatures

C. The DEF from the bulk storage was contaminated, diluted, expired, or was an incorrect concentration — the quality sensor detected the off-specification fluid immediately after refilling

D. The DEF quality sensor has failed and is reading incorrectly regardless of the actual fluid quality — the sensor should be tested independently before condemning the bulk DEF supply

23. A heavy-duty diesel engine equipped with a compression brake (engine retarder) experiences intermittent retarder disengagement during mountain descents. The retarder functions correctly when first activated but drops out after approximately 5 minutes of continuous use. What should be investigated?

A. The engine coolant temperature because some compression brake systems have a thermal protection feature that disengages the retarder when coolant temperature exceeds a programmed maximum

B. The engine oil pressure at the retarder slave pistons for a drop below the minimum required to hold the exhaust valves open during extended continuous retarder operation at high engine RPM

C. The retarder control module for a firmware limitation that restricts continuous retarder operation to a maximum duration as a noise-reduction compliance feature for residential driving zones

D. The exhaust backpressure sensor for a false high reading that triggers the ECM's aftertreatment protection strategy and disengages the retarder to prevent excessive DPF loading from oil vapour

24. A technician is performing an injector cup (sleeve) replacement on a heavy-duty diesel engine. After pressing the new cup into the cylinder head bore, what critical step must be performed before reassembly?

A. The injector cup must be pressure-tested by filling it with coolant and applying regulated air pressure to verify the cup-to-head seal is watertight before installing the injector

B. The injector cup must be coated with anti-seize compound on its outer surface to prevent future corrosion bonding between the cup and the cylinder head bore casting material

C. The injector cup bore depth must be re-measured after pressing to verify the cup has seated at the correct depth to maintain the specified injector tip protrusion in the combustion chamber

D. The cylinder head must be resurfaced after the cup replacement because the pressing operation distorts the head deck surface around the cup bore changing the gasket sealing plane

25. A diesel engine produces excessive white smoke during DPF regeneration events. The smoke appears only during regeneration and clears immediately after the regeneration cycle completes. The coolant level is stable and the engine oil level is not rising. What is causing the white smoke during regeneration?

A. The DOC is converting the late-post injection hydrocarbons efficiently but the DPF is releasing the oxidized soot as a fine white ash cloud during the high-temperature burn event

B. The injector tip on one cylinder is cracked and dribbles raw fuel into the exhaust stream during the late-post injection event which exits as unburned white fuel vapour through the tailpipe

C. The EGR valve is opening during regeneration and the recirculated exhaust gas displaces the fresh air charge causing incomplete combustion that produces white smoke from all cylinders

D. The late-post fuel injection is delivering more fuel than the DOC can fully oxidize — the excess unburned hydrocarbons pass through the DPF and exit the tailpipe as white fuel vapour

26. A heavy-duty diesel engine's oil pressure relief valve is tested by removing it from the engine and inspecting it on the bench. The valve spring measures 5 mm shorter than the OEM specification free length. What effect would this weakened spring have on engine operation?

A. The oil pressure would be higher than specification because the shorter spring allows the valve to open further increasing the bypass flow rate and reducing downstream pressure

B. The oil pressure would fluctuate rapidly between high and low as the weakened spring allows the valve to oscillate between open and closed positions at all engine operating speeds

C. The oil pressure would be lower than specification because the shorter spring exerts less force on the valve requiring less pressure to open it and bypassing oil at a lower threshold

D. The weakened spring would have no measurable effect on oil pressure because the relief valve only activates during cold-start conditions when the oil viscosity is at its maximum value

27. A technician is diagnosing a heavy-duty diesel engine that starts and runs for approximately 10 seconds then stalls. It restarts immediately and runs for another 10 seconds before stalling again. There are no fault codes. Fuel pressure is normal during the brief running period. What should be investigated?

A. The fuel tank vent for a blockage that creates a vacuum in the tank as fuel is consumed — the vacuum eventually overcomes the transfer pump's ability to draw fuel until air enters and breaks the vacuum

B. The air intake system for a collapsed hose or blocked filter that starves the engine of air — the engine runs on residual air volume but stalls once the intake vacuum exceeds the turbocharger's ability to draw air

C. The engine oil level for an overfill condition that allows the crankshaft to contact the oil surface creating aeration that triggers the oil pressure switch to activate the engine shutdown protection circuit

D. The fuel return system for a restriction that creates excessive back pressure on the injector return circuit — the fuel pressure builds to the point where the injectors cannot close and the engine hydraulically locks

28. A common rail diesel engine has a recurring fault for the fuel rail pressure sensor signal being implausible. The fault sets intermittently and the engine runs normally most of the time. The sensor has been replaced once already with no improvement. What should the technician investigate beyond the sensor?

A. The fuel rail pressure sensor mounting port for contamination, carbon buildup, or a small crack that allows pressure pulsations to reach the sensor at an abnormal frequency creating signal noise

B. The sensor wiring harness for chafing against the engine block or a hot surface that intermittently shorts or opens the signal wire when the engine's thermal expansion shifts the harness position

C. The high-pressure pump timing for a slight error that creates rail pressure oscillations too rapid for the sensor to track accurately producing an implausible signal pattern in the ECM data

D. The ECM power supply for voltage fluctuations that affect the sensor's 5-volt reference stability causing the sensor output to vary even though the actual fuel rail pressure is stable and correct

29. A diesel engine equipped with a variable geometry turbocharger has the VGT actuator replaced due to a sticking vane complaint. After installation, the technician must perform a calibration procedure using the scan tool. What does this calibration establish?

A. The maximum boost pressure limit that the ECM will command from the new actuator based on the actuator's specific manufacturing tolerance and response characteristics

B. The VGT vane fully-open and fully-closed positions so the ECM knows the actual physical range of the new actuator and can accurately command intermediate vane positions across the full sweep

C. The fuel injection timing correction factor that accounts for the different exhaust gas flow characteristics produced by the new actuator's vane geometry compared to the original unit

D. The turbocharger shaft speed limit that the ECM programs into the actuator's internal controller to prevent the turbine from exceeding its mechanical burst speed during operation

30. A heavy-duty truck's air system has been upgraded from a single air dryer to a twin air dryer configuration. After the upgrade, the technician notices that the purge cycle alternates between the two dryer cartridges. What is the operating principle of a twin air dryer system?

A. One dryer cartridge actively dries the incoming compressed air while the other cartridge is being regenerated by a portion of the dried air — they alternate roles with each governor cycle

B. Both dryers operate simultaneously in parallel to double the air drying capacity and handle the increased air volume demand of the upgraded brake system on the vehicle

C. The primary dryer handles normal air drying and the secondary dryer activates only during heavy air consumption periods when the primary cannot keep up with the moisture removal demand

D. The two dryers operate in series — air passes through the first dryer for initial moisture removal and then through the second dryer for final polishing to achieve ultra-dry air quality

31. A trailer's spring brakes have been manually caged using the caging bolts on each spring brake chamber. The trailer needs to be towed to the shop for brake repair. What critical safety consideration applies while towing this trailer?

A. The caged spring brakes provide normal service brake function through the front chamber so the trailer can be safely towed at any legal highway speed using the tractor's brake system

B. The towing speed must be limited to 30 km/h because the caged spring brakes create an aerodynamic imbalance that affects the trailer's stability at higher speeds during towing

C. The trailer has no parking brake capability while the springs are caged — if the air supply is lost during towing the trailer cannot be stopped by its own brakes and will roll freely

D. The caging bolts must be retorqued every 50 km during towing because vibration and road impacts gradually loosen the caging mechanism allowing the spring to partially re-engage

32. A truck's brake pedal has a noticeably longer travel than normal before the brakes begin to engage. The air pressure gauges read full cut-out and there are no audible leaks. The brakes, once engaged, provide normal stopping force. What is the most likely cause?

A. The relay valves have developed delayed crack-open characteristics that require more pedal travel to generate the minimum signal pressure needed to initiate the relay valve delivery

B. The pushrod stroke on one or more brake chambers has increased beyond the specification requiring more air volume to fill the additional chamber travel before the linings contact the drums

C. The foot valve delivery pistons have worn internal seals that create a dead band at the beginning of pedal travel where the pistons move without building delivery pressure in the output circuits

D. The air dryer has passed moisture into the system and water accumulation in the foot valve body creates a hydraulic cushion that delays the initial pressure delivery during pedal application

33. A truck equipped with disc brakes on all positions has a complaint of brake squeal during light brake applications at low speed. The pads have adequate remaining material and the rotor surfaces appear smooth and evenly worn. What is the most common cause of this squeal?

A. The brake pad friction material has glazed from repeated light applications at low speed creating a hardened surface that vibrates against the rotor instead of gripping smoothly

B. The brake caliper mounting bolts have loosened slightly allowing the caliper assembly to vibrate at a frequency that produces the audible squeal during light contact pressure applications

C. The anti-squeal shim or dampening layer on the back of the brake pads is missing, damaged, or improperly installed allowing the pad backing plate to vibrate against the caliper piston

D. The brake pads are manufactured from a friction material formulation that is incompatible with the rotor's metallurgical composition creating a harmonic vibration at light application pressures

34. A tractor-trailer combination has an air leak rate of 20 kPa (3 psi) per minute with the brakes released. The specification allows 14 kPa (2 psi) per minute for the combination with brakes released. The technician disconnects the trailer gladhands and retests the tractor alone. The tractor's leak rate drops to 7 kPa (1 psi) per minute. What does this confirm?

A. The trailer's air system has a leak that accounts for the 13 kPa (2 psi) per minute difference between the combination test and the tractor-only test — the trailer needs leak diagnosis

B. The tractor's leak rate of 7 kPa is at the maximum specification for a tractor alone and both the tractor and trailer have borderline leaks that combine to exceed the combination limit

C. The gladhand connection between the tractor and trailer was the leak source and the disconnection test proved the sealing surfaces need cleaning or gasket replacement at both gladhands

D. The trailer protection valve on the tractor is leaking internally and only manifests when the trailer gladhands are connected because the valve is in the open position during the combination test

35. A truck's rear brake drums are measured during a brake inspection. The left drum measures 416.5 mm and the right drum measures 420.0 mm. The maximum allowable diameter is 422 mm and the original diameter was 410 mm. Both drums have minor scoring. What action should be taken?

A. Machine both drums to the same diameter to equalize braking force — the right drum can be machined to 420 mm and the left drum should be machined to 420 mm to match

B. Replace the right drum because it is closer to the discard diameter and machine the left drum to remove the scoring then return it to service with the maximum remaining service life

C. Replace both drums as a matched pair because the 3.5 mm diameter difference between left and right means the drums have different wall thicknesses creating unequal thermal capacity and braking force

D. Machine the left drum only to remove scoring since the right drum's scoring is within the remaining machining allowance and does not require immediate attention for continued service

36. A truck's ABS modulator valve on the left front wheel is commanded to release pressure during an ABS event, but the wheel continues to decelerate toward lockup. The wheel speed sensor signal confirms the wheel is slowing rapidly. What has failed?

A. The tone ring on the left front wheel has lost teeth and the ABS module is receiving an inaccurate speed signal that falsely indicates the wheel is decelerating when it is actually rotating normally

B. The ABS modulator valve on the left front is stuck in the apply position and cannot release pressure even though the ABS module is commanding it to release to prevent the wheel from locking

C. The brake pad on the left front has a higher friction coefficient than the right front pad creating a braking force imbalance that the ABS cannot fully compensate through modulator valve control

D. The ABS module's internal power supply has dropped below the minimum operating voltage and the module cannot generate enough solenoid current to shift the modulator valve to the release position

37. An air brake system has two separate reservoirs — primary and secondary — each feeding different axle brake circuits. If the primary circuit develops a catastrophic leak and loses all pressure, what happens to the vehicle's braking capability?

A. The secondary circuit continues to provide braking on its designated axle group — the vehicle retains partial braking capability and the spring brakes may apply if the supply pressure also drops

B. Both circuits lose pressure simultaneously because the primary and secondary reservoirs are connected through equalization ports that balance pressure between the two circuits at all times

C. The ABS system automatically transfers all remaining secondary circuit pressure to the primary circuit ports to maintain balanced braking across all axle positions for a controlled emergency stop

D. The engine ECM detects the primary circuit failure through the pressure sensor and commands an automatic engine shutdown to prevent the driver from operating the vehicle without full braking

38. A loaded truck is being driven on a rain-slicked highway. The driver applies the brakes firmly for a curve. The ABS activates on the front steer axle and the steering wheel begins to vibrate rapidly. What is causing the steering wheel vibration?

A. The front suspension springs are bouncing on the wet road surface and transmitting the oscillation through the steering linkage to the steering wheel during the ABS braking event

B. The ABS is modulating the front brake pressure which varies the braking force on the steer tires creating a pulsating drag that is felt through the steering linkage as a vibration at the wheel

C. The steer tires have hit a hydroplaning condition and the ABS is attempting to prevent the tires from regaining traction too aggressively which would snap the steering wheel in the driver's hands

D. The ABS is rapidly cycling the brake pressure at the front wheels — applying, releasing, and reapplying — and this pulsating brake force transmits through the steering linkage as a vibration the driver feels

39. A fifth wheel coupling has been verified as properly locked using both the tug test and visual inspection of the jaw engagement. However, during driving, the driver hears a repetitive clunking noise from the coupling area during acceleration and braking. What is the most likely cause?

A. The trailer king pin has a minor bend that allows it to rock inside the locked jaws producing a clunking noise as the torque direction alternates between acceleration and braking forces

B. The fifth wheel mounting bolts have loosened allowing the entire fifth wheel assembly to shift on its bracket during the torque reversals of acceleration and braking dynamic loading cycles

C. Excessive play between the king pin and the locking jaws from wear on the jaw faces, the jaw pivot pins, or the king pin shank that allows movement within the locked coupling under dynamic loads

D. The trailer's upper coupler plate has warped from heat exposure and is rocking on the fifth wheel plate surface during the weight transfer that occurs with each acceleration and braking transition

40. A truck's brake warning buzzer and lamp activate simultaneously while driving on the highway with no brake application. The air gauges show the primary circuit at 825 kPa and the secondary circuit at 350 kPa. What does this pressure reading indicate?

A. The primary circuit is at normal pressure but the secondary circuit has a significant leak that has dropped its pressure to 350 kPa activating the low-pressure warning on the secondary circuit

B. The secondary circuit has dropped below the low-pressure warning threshold of 380 to 415 kPa while the primary remains normal — indicating a leak isolated to the secondary circuit

C. Both circuits are below their normal operating pressure and the compressor governor is stuck in the unload position preventing the system from building to the normal cut-out pressure

D. The air dryer is bypassing dried air only to the primary circuit while sending moisture-laden undried air to the secondary which is triggering the warning from moisture accumulation

41. A technician is adjusting a Haldex automatic slack adjuster. The manufacturer's procedure calls for installing the adjuster at a specific clock position relative to the S-cam shaft splines. Why is this initial clock position critical?

A. The clock position determines the adjuster's internal gear mesh relationship which establishes the correct adjustment direction and ensures the adjuster tightens (not loosens) the brake during the automatic adjustment cycle

B. The clock position aligns the adjuster's grease fitting with the most accessible orientation for routine lubrication during PM service intervals without requiring adjuster removal from the shaft

C. The clock position sets the air chamber pushrod clevis pin alignment relative to the slack adjuster arm travel arc ensuring the push rod operates at the optimal mechanical advantage angle

D. The clock position determines the adjuster's internal ratchet engagement phase which controls whether the adjuster compensates on the apply stroke or on the release stroke of each brake application

42. A loaded tanker truck is descending a 7% grade. The driver is using a combination of engine retarder and periodic service brake applications to maintain a safe speed. The driver notices that the brake application frequency is increasing — the brakes are needed more often to maintain the same speed. What is happening?

A. The engine retarder efficiency decreases as the exhaust system temperature rises from continuous use reducing its contribution to the total deceleration force available during the descent

B. The air system pressure is dropping from the repeated brake applications and each subsequent application delivers less braking force requiring more frequent applications to achieve the same deceleration

C. The tanker's liquid cargo is sloshing forward during the descent shifting the centre of gravity toward the front axle and increasing the gravitational force component that the brakes must overcome

D. The brake drums are heating from repeated use causing brake fade — the friction material's coefficient decreases as temperature rises so each application produces less braking force requiring more frequent use

43. A trailer's emergency relay valve has a crack in its housing. What is the function of the emergency relay valve and what would happen if it fails?

A. It protects the tractor's air supply from a trailer leak — a cracked housing would allow the tractor's air to drain through the trailer's air system instead of being contained within the tractor

B. It equalizes pressure between the tractor and trailer air systems during normal operation — a cracked housing would create unequal pressure between the two systems affecting brake proportioning

C. It applies the trailer service brakes during an emergency disconnect by using the supply circuit air to apply the service brakes — a cracked housing could prevent full emergency brake application

D. It provides a rapid exhaust path for the trailer spring brake circuit during parking brake application — a cracked housing would slow the spring brake application when the parking brake is activated

44. A truck equipped with automatic traction control (ATC) has the ATC warning lamp illuminated on the dashboard. The ABS lamp is off. The driver reports reduced acceleration traction on wet roads. What is the most likely cause of the ATC lamp?

A. A fault in the ATC system — possibly a wheel speed sensor, an engine communication fault, or an ATC-specific component failure — has disabled the traction control while the base ABS remains operational

B. The ATC system has detected a tire size mismatch between the left and right drive axle tires that creates a continuous false traction loss signal and the system has defaulted to the disabled state

C. The drive axle differential lock is engaged which conflicts with the ATC system logic and automatically disables the ATC function while the differential lock remains in the engaged position

D. The transmission control module has set a fault that affects the torque management interface between the engine and the ATC system preventing the ATC from reducing engine power during wheel spin

45. A brake drum on a steer axle has been machined to remove scoring. The final drum diameter after machining is 418 mm. The maximum allowable diameter is 422 mm. The drum wall thickness at the thinnest point after machining is measured at 7 mm. The minimum wall thickness specification is 8 mm. Can this drum be returned to service?

A. Yes — the drum diameter of 418 mm is below the maximum allowable diameter of 422 mm and the drum has adequate remaining capacity for continued safe service operation

B. No — the wall thickness of 7 mm is below the minimum specification of 8 mm even though the diameter is within limits — the drum must be replaced because it cannot safely absorb braking heat

C. Yes — the wall thickness measurement is secondary to the diameter measurement and as long as the diameter is within specification the drum meets the safety standard for continued service

D. No — both the diameter and wall thickness must be within specification simultaneously but the diameter alone determines serviceability and the wall thickness is only a manufacturing reference

46. A driver reports that the truck's brakes make a loud hissing noise each time the brake pedal is released. The noise comes from under the cab area. The brakes apply and release normally with no dragging or pulling. What is the source of this noise?

A. The air compressor governor is signaling the compressor to unload each time the brake pedal is released and the noise is the compressor unloading air through its discharge valve

B. The foot valve internal pistons are worn and air is leaking past the piston seals during the release stroke creating a hissing sound as the pressurized air escapes to the valve exhaust port

C. The ABS modulator valves are performing a post-application system check and the hissing is the diagnostic cycle exhausting small amounts of air through each modulator valve after every stop

D. The quick-release valves are exhausting the application air from the brake chambers to atmosphere — this is the normal exhaust sound that occurs every time the brakes are released after an application

47. A truck's engine ECM stores both active and inactive fault codes. A technician clears all codes and road-tests the vehicle. After the road test, one code returns as active while three other codes remain cleared. What does this tell the technician?

A. The three cleared codes were caused by a previous temporary condition that no longer exists while the active code represents a current ongoing fault that requires diagnosis and repair

B. The ECM memory has a partial failure that prevents it from correctly storing and retrieving fault codes and the module should be replaced to ensure reliable diagnostic information

C. The returning active code triggered the other three codes as secondary effects — repairing the active code will likely prevent the other three from returning during subsequent road testing

D. All four codes are related to the same root cause and the ECM is prioritizing the most critical code as active while suppressing the less critical codes to simplify the diagnostic process

48. A truck's charging system is producing a ripple voltage of 1.2 VAC measured at the battery terminals with the engine running. Normal ripple is below 0.5 VAC. Beyond failed rectifier diodes, what other alternator component could produce excessive AC ripple?

A. The rotor's field coil has developed shorted turns reducing the magnetic field strength and producing an asymmetric three-phase output that manifests as increased AC ripple at the battery

B. The stator has a phase winding with intermittent continuity that drops out periodically creating gaps in the three-phase waveform that appear as increased AC ripple at the DC output terminals

C. The voltage regulator is cycling the field current too rapidly creating a pulsating magnetic field that produces an amplitude-modulated AC component on the three-phase stator output waveform

D. The alternator drive belt is slipping intermittently causing the rotor speed to fluctuate relative to the engine speed creating a variable-frequency AC component in the alternator's output signal

49. A heavy-duty truck has four headlamps — two low-beam and two high-beam. When the high beams are selected, the low beams turn off on this vehicle. A voltage test at the low-beam connector shows 0 volts when high beams are on. What circuit design causes this behaviour?

A. The dimmer switch is a single-pole double-throw design that connects battery power to either the low-beam or high-beam circuit but not both simultaneously — selecting high disconnects low

B. The body controller detects high-beam activation and commands the low-beam relay to open as a power management strategy to reduce the total electrical load on the charging system

C. The headlamp fuse panel uses a current-limiting design that automatically disconnects the low-beam circuit when the high-beam circuit draws current to prevent exceeding the fuse capacity

D. The low-beam bulbs are wired in series with the high-beam bulbs and when the high beams activate the increased circuit resistance drops the voltage at the low-beam connection to zero

50. A truck's electric fuel shutoff solenoid on a mechanically-injected diesel engine fails to energize when the ignition is turned on. The engine will not start. The solenoid tests good when bench-tested with direct battery voltage. What should be checked in the vehicle circuit?

A. The fuel injection pump timing because a pump that is out of time produces a mechanical resistance that prevents the fuel shutoff solenoid plunger from moving to the fuel-on position

B. The engine oil pressure switch because on some systems the fuel shutoff solenoid circuit is routed through the oil pressure switch and the solenoid will not energize until the engine has oil pressure

C. The engine coolant temperature sensor because some systems disable the fuel shutoff solenoid when the coolant temperature is below -20°C to prevent cold-start fuel system damage

D. The ignition switch run circuit, the fuse, the relay, and the wiring to the solenoid for an open circuit that prevents battery voltage from reaching the solenoid during normal key-on operation

51. A truck's instrument cluster shows the fuel gauge reading full when the tank is empty and empty when the tank is full — the gauge reading is inverted. What is the most likely cause?

A. The fuel sending unit was replaced with an incorrect part that has the opposite resistance range — high resistance at empty and low resistance at full instead of the vehicle's specified characteristic

B. The body controller software has been updated with an incorrect calibration file that inverts the fuel gauge display algorithm for the sending unit's resistance range specification

C. The fuel gauge wiring has been connected with reversed polarity at the sending unit connector causing the gauge to interpret the resistance signal in the opposite direction from normal

D. The fuel gauge stepper motor in the instrument cluster has been installed 180 degrees out of phase during a previous cluster repair causing it to move in the opposite direction from the signal command

52. A truck's cranking speed has decreased gradually over several months. The batteries consistently test good on a conductance tester and the voltage drop across the cables is within specification. What should the technician investigate?

A. The starter motor for increasing internal friction from worn bushings, carbon brush wear, or commutator glazing that progressively reduces the motor's mechanical efficiency over time

B. The engine's mechanical condition for increasing internal friction from bearing wear, piston ring drag, or accessory drive belt tension that increases the cranking resistance progressively

C. The battery cable terminal connectors for gradual corrosion buildup under the cable insulation jacket that is not visible during a standard terminal inspection but increases resistance over time

D. The engine ECM cranking fuel delivery strategy for a calibration change that was applied during a recent software update that reduces the fuel quantity available during cranking to meet emission standards

53. A truck's trailer ABS communicates with the tractor through power line communication (PLC). The tractor's scan tool cannot establish communication with the trailer ABS. The trailer ABS lamp cycles through its self-test normally indicating the module is powered and functional. What is the most likely communication barrier?

A. The seven-pin connector's power pin (pin 7) has excessive resistance that attenuates the PLC signal below the receiver's detection threshold even though enough power passes to operate the ABS module

B. The tractor's scan tool requires a PLC adapter or interface module that converts the PLC signal from the trailer's power line to a standard data protocol the scan tool can process and display

C. The trailer ABS module's PLC transmitter has failed internally while the core ABS functions and self-test sequence continue to operate normally on the module's independent processing circuitry

D. The trailer wiring harness has a splice point that acts as a low-pass filter blocking the high-frequency PLC data signal while passing the low-frequency DC power required to operate the ABS module

54. A truck's alternator is belt-driven and the belt has been replaced due to squealing. After replacement, the new belt squeals intermittently during engine acceleration. The belt tension and alignment have been verified as correct. What is the most likely cause?

A. The new belt's friction surface material has not yet broken in and requires 500 km of driving before the rubber surface conforms to the pulley groove profile and stops squealing

B. The replacement belt is the correct length and width but is a different rib profile (number of ribs or rib spacing) than the original which prevents full contact with all the accessory drive pulleys

C. The new belt is glazed from the manufacturing process and the smooth surface cannot grip the pulley during rapid acceleration until the glaze wears off naturally from normal driving friction

D. The alternator front bearing has increased internal friction that loads the belt beyond its grip capacity during acceleration when the engine's sudden speed increase creates a transient torque spike

55. A truck equipped with LED tail lamps notices that when the turn signal is activated, the cab interior lights dim slightly in rhythm with the turn signal flash. What is the most likely cause?

A. A high-resistance ground connection shared between the turn signal circuit and the interior light circuit creates a voltage drop that affects the interior lights when the turn signal draws current

B. The LED turn signal lamps are drawing more current than the incandescent lamps they replaced and the increased current draw is overloading the vehicle's electrical system during each flash

C. The flasher module is using a pulse-width-modulated output that creates electrical noise on the power bus which the interior light driver circuit interprets as a dimming command signal

D. The body controller is intentionally dimming the interior lights during turn signal operation as an alert feature to remind the driver that the turn signal is activated during nighttime driving

56. A truck's engine ECM has set a fault code for the exhaust gas recirculation (EGR) valve position sensor — SPN 412, FMI 7 (mechanical system not responding). The scan tool actuator test commands the EGR valve to 50% open but the actual position reads 12%. What does FMI 7 indicate?

A. The sensor itself is functioning correctly but the mechanical system it monitors is not responding to the ECM's commands — the valve is physically stuck and cannot reach the commanded position

B. The sensor has failed mechanically and is sending a fixed signal regardless of the actual valve position creating the appearance that the valve is not moving when it actually may be functioning

C. The EGR valve position sensor is reporting a signal that conflicts with the ECM's expected response timing — the valve is moving but the sensor's response time is slower than the ECM expects

D. The ECM's EGR driver circuit has a high-resistance fault that reduces the current delivered to the EGR valve actuator motor preventing it from generating enough force to move the valve assembly

57. A truck has an aftermarket backup camera that displays an image on the dash-mounted screen when reverse is selected. The image has become progressively darker over several months until it is barely visible. The camera lens appears clean externally. What is the most likely cause?

A. The camera's CCD or CMOS image sensor has degraded from prolonged exposure to direct sunlight and UV radiation which permanently damages the light-sensing elements over time

B. The display screen backlight has dimmed from age and the reduced backlight intensity makes the camera image appear darker even though the camera is producing a normal-quality video signal

C. The camera lens has developed internal fogging from moisture intrusion through a failed seal that creates a hazy film between the lens elements that progressively reduces image clarity and brightness

D. The camera's power supply voltage has dropped from a corroding connector reducing the current available to the camera's image processor which compensates by reducing the image brightness output

58. A truck's auxiliary battery disconnect switch has been accidentally left in the off position overnight. In the morning, the driver discovers the main batteries are completely dead. Why would the disconnect switch being off cause the batteries to die?

A. The disconnect switch interrupts the alternator's charging circuit and the vehicle's parasitic loads continued to drain the batteries through circuits that bypass the disconnect switch path

B. The disconnect switch only disconnects the starter circuit and all other vehicle systems continued to operate normally from the batteries draining them overnight without any charging source

C. The disconnect switch creates a high-resistance path when off rather than a complete disconnect and the resulting current leakage through the switch gradually drains the batteries over 12 hours

D. The disconnect switch should not cause the batteries to die — the batteries must have had an existing problem that coincided with the switch being left off creating a false correlation between the two events

59. A technician measures the resistance of a fuel injector solenoid coil and reads 0.5 ohms. The specification calls for 0.8 to 1.2 ohms. What does this below-specification reading indicate?

A. The injector coil has shorted turns that reduce the overall resistance — the injector draws more current than designed which can damage the ECM driver circuit and cause incorrect fuel delivery

B. The injector coil is within normal manufacturing tolerance and the 0.5 ohm reading is close enough to the specification range that the injector will function correctly without replacement needed

C. The injector has an internal open circuit and the 0.5 ohm reading is the resistance of the injector's internal fuel passage which the DMM is measuring through the coil leads by capacitive coupling

D. The DMM is reading the resistance of the test leads in addition to the coil resistance — subtracting the lead resistance will bring the reading within the specification range for this injector type

60. A truck's multiplexed lighting system has a body controller that receives the lighting switch input and controls the lamp outputs. The headlamp switch is turned on but only the left headlamp illuminates. The right headlamp bulb is good. What should the technician check?

A. The headlamp switch for a failed internal contact that only sends the left headlamp signal to the body controller while the right side contact has corroded open from moisture intrusion

B. The fuse for the right headlamp circuit in the main fuse panel since multiplexed systems still use individual fuses for the high-current lamp circuits even though the control is multiplexed

C. The body controller's output driver circuit for the right headlamp for a failed semiconductor output device that cannot switch the current needed to illuminate the right headlamp assembly

D. The CAN bus communication between the headlamp switch module and the body controller for a partial data error that corrupts the right headlamp command while the left command transmits correctly

61. A truck's engine will not crank. The battery voltage reads 12.6 volts. When the key is turned to start, there is a single loud click from the starter solenoid but the engine does not rotate. What is the most probable cause?

A. The starter solenoid plunger is engaging (producing the click) but the solenoid contact disc cannot pass adequate current to the motor due to worn or burned contacts inside the solenoid assembly

B. The starter drive gear has jammed against the flywheel ring gear and the motor cannot rotate because the drive mechanism is mechanically locked in the engagement position from tooth interference

C. The batteries have adequate resting voltage but insufficient CCA capacity to deliver the current the starter motor requires under the full compression load of the diesel engine during cranking

D. The starter motor has a single loud click because the solenoid pulls in but immediately releases — the hold-in winding has failed and only the pull-in winding energizes momentarily before releasing

62. A truck's scan tool displays live data showing the engine coolant temperature at 185°C. The engine is running normally and the temperature gauge on the dash reads in the normal range at approximately 88°C. Which reading is correct?

A. The dash gauge is correct and the scan tool is displaying the temperature in Fahrenheit rather than Celsius — 185°F is approximately 85°C which matches the dash gauge reading

B. The scan tool reading is correct and the dash gauge has a failed stepper motor that is stuck at the normal position despite the engine actually operating at a dangerously high coolant temperature

C. Neither reading is reliable because the coolant temperature sensor has an intermittent fault that sends different values to the ECM and the instrument cluster through separate signal paths

D. The dash gauge is correct and the scan tool is reading the data from an incorrect parameter ID (PID) that corresponds to a different temperature sensor such as the EGT or transmission oil temperature

63. A truck's chassis wiring harness has a section that has been damaged by road debris. Several wires have compromised insulation and are exposed to the elements. The technician repairs each wire individually with sealed crimp splices and heat-shrink tubing. What additional step should be performed to protect the repaired section?

A. Apply a liberal coating of dielectric grease over the entire repaired area to waterproof the exposed wire insulation and prevent future corrosion from moisture penetration at the repair sites

B. Wrap the repaired area with split-loom conduit and secure it with cable ties to provide mechanical protection against future road debris contact and abrasion on the repaired wire section

C. Re-wrap the repaired section with harness tape and install split-loom or protective conduit over the repaired area to restore the harness's original mechanical and environmental protection

D. Install the repaired harness section inside a stainless steel conduit to provide permanent protection against all future road debris impacts and prevent any further damage from external contact

64. A truck's scan tool shows a fault code for the vehicle speed sensor — SPN 84, FMI 2 (erratic/intermittent). The speedometer works normally most of the time but occasionally drops to zero for one to two seconds before returning to the correct reading. What is the most likely cause?

A. An intermittent connection in the vehicle speed sensor circuit — a corroded connector, chafed wire, or loose terminal that momentarily loses contact during vehicle vibration or temperature changes

B. The vehicle speed sensor tone ring has a contamination buildup (grease, metallic debris) that intermittently bridges between teeth producing a false signal that the ECM interprets as erratic speed data

C. The transmission output shaft bearing has excessive play that allows the shaft to wobble and change the sensor air gap intermittently producing signal dropout at certain rotational positions

D. The ABS module is intermittently overriding the vehicle speed data on the CAN bus with its own wheel speed calculation which conflicts with the transmission speed sensor data temporarily

65. A truck's electric power steering assist system (EPS) warning lamp illuminates and the steering becomes noticeably heavier. The EPS is a rack-assist type with an electric motor. A scan tool shows a fault code for the EPS motor temperature exceeding the maximum limit. What should the technician investigate?

A. The EPS motor cooling fan for a failure that prevents adequate heat dissipation from the motor housing during sustained steering operation at low vehicle speeds in hot ambient conditions

B. The power steering fluid level and condition because the EPS system uses both hydraulic and electric assist and low fluid raises the motor's workload and temperature during steering operations

C. The vehicle's operating conditions for sustained low-speed steering events (parking lots, loading docks) that keep the EPS motor running continuously at high current draw without adequate rest periods

D. The EPS motor for excessive internal resistance from worn brushes, corroded commutator, or bearing friction that causes the motor to generate more heat than designed during normal steering assist operation

66. A truck's tail lamp circuit is protected by a 20-amp fuse. The circuit draws 12 amps normally. A trailer is connected and the combined tail lamp current for tractor and trailer totals 22 amps. What will happen?

A. The fuse will hold initially but will overheat and blow after a short period of operation because the 22-amp continuous load exceeds the 20-amp fuse rating creating a progressive thermal failure

B. The 20-amp fuse will blow immediately when the tail lamps are turned on because the combined 22-amp current draw exceeds the fuse's instantaneous rupture rating by 2 amps above its capacity

C. The tail lamps will operate at reduced brightness because the fuse acts as a current limiter restricting the circuit to 20 amps which is shared between the 22 amps of tractor and trailer lamp loads

D. The circuit will function normally because fuses have a built-in 25% overload tolerance and a 20-amp fuse will carry 22 amps continuously without blowing under normal operating temperature conditions

67. A truck has a parasitic battery drain. The technician measures 2.5 amps with all systems off. When the fuse for the engine ECM is pulled, the drain drops to 0.3 amps. Does this mean the ECM is faulty?

A. Not necessarily — the ECM and its associated sensors and actuators may have a normal keep-alive current draw that accounts for the 2.2 amps and the actual fault may be in a component powered through the ECM circuit

B. Yes — a 2.2-amp draw from the ECM circuit confirms the ECM has an internal fault because the maximum normal ECM keep-alive current for any heavy-duty engine controller is 0.5 amps

C. Not necessarily — the ECM powers multiple sensors and actuators through its fused circuit and one of these components may be causing the drain while the ECM itself is functioning normally

D. Yes — the ECM circuit should draw zero current with the ignition off because all ECM functions are disabled when the key is removed and any current flow indicates an internal module fault

68. A truck's heated windshield system uses a timer relay that limits the heating duration to 15 minutes per activation cycle. A driver complains that the heated windshield turns off too quickly in extreme cold conditions and the windshield does not fully clear. What is the appropriate repair?

A. Replace the timer relay with a unit that has a longer activation cycle to allow the heated windshield to remain powered for the duration needed to clear ice in extreme cold ambient temperatures

B. Install a manual override switch that bypasses the timer relay allowing the driver to control the heated windshield duration based on the actual conditions rather than a fixed time interval

C. Rewire the heated windshield to operate continuously whenever the ignition is on eliminating the timer relay entirely and allowing the driver to use the main defrost switch as the only control

D. Leave the system as designed — the timer relay protects the windshield heating elements from overheating and the driver should use the defroster fan as a supplement during extreme cold conditions

69. A truck with a 13-speed manual transmission has a complaint of a growling noise that is present in all gears in the high range but completely absent in all gears in the low range. The noise increases with vehicle speed. What is the most likely source?

A. The mainshaft rear bearing is failing and only rotates at vehicle speed in the high range because the high-range gear path loads this bearing while the low-range path bypasses it

B. The countershaft front bearing is worn and only produces noise in the high range because the gear mesh forces in high range load this bearing differently than in the low range configuration

C. The range section countershaft gear has a damaged tooth that contacts the range mainshaft gear only when the high-range synchronizer is engaged and not during low-range operation

D. The auxiliary section input gear bearing is failing — this bearing is loaded differently in high range versus low range because the power path changes direction through the auxiliary gear train

70. A truck equipped with a hydraulic clutch release system has a clutch pedal that slowly sinks to the floor when held in the depressed position. Releasing the pedal and re-depressing it restores the normal pedal height temporarily. What component is most likely failing?

A. The clutch release bearing is collapsing under sustained load and recovering when the load is removed creating the symptom of gradual pedal sink followed by recovery on re-application

B. The clutch master cylinder has a worn internal piston seal that allows hydraulic fluid to bypass the seal under sustained pressure — the pedal sinks as fluid leaks past and recovers momentarily when pressure is released

C. The slave cylinder pushrod has a loose adjustment that allows it to slowly retract under spring pressure but resets to the correct position when the pedal is depressed with a quick positive stroke

D. The hydraulic clutch fluid has absorbed moisture from the atmosphere and the resulting lower boiling point creates vapour bubbles that compress under sustained pedal pressure causing the sink

71. A truck's automated manual transmission (AMT) has a fault code for the clutch wear indicator exceeding the threshold. The clutch still engages and the truck drives normally. What does this code indicate?

A. The AMT controller has measured the clutch engagement point position and determined that it has shifted to a point indicating the friction disc lining has worn to the point where replacement should be planned

B. The clutch disc has worn through its friction material and the rivets are contacting the flywheel surface causing material transfer that the clutch position sensor incorrectly interprets as normal wear

C. The AMT controller has detected a change in the clutch pedal position sensor calibration that requires a touch-point relearn procedure to update the controller's engagement point reference data

D. The clutch pressure plate diaphragm spring has weakened from heat cycling and cannot generate the clamping force needed for the engagement speed the controller expects during normal shift events

72. A truck's driveshaft is removed for U-joint replacement. Upon inspection, the technician discovers that the driveshaft tube has a visible dent approximately 3 mm deep in the middle of the tube. The dent measures roughly 50 mm in diameter. Can this driveshaft be returned to service after the U-joint replacement?

A. The driveshaft can be returned to service because a 3 mm dent in the tube does not significantly affect the structural integrity or balance of the driveshaft for normal commercial vehicle operation

B. The driveshaft must be straightened on a hydraulic press before reinstallation because the dent will cause a vibration from the rotational imbalance created by the displaced metal at the dent location

C. The driveshaft should be replaced because any dent in the tube changes the shaft's critical speed and creates a stress concentration point that could lead to tube failure under torsional load during operation

D. The driveshaft can be returned to service only after it is rebalanced on a driveshaft balancing machine to verify the dent has not shifted the rotational balance beyond the maximum acceptable tolerance

73. A heavy-duty truck's differential carrier bearings are being adjusted using shim packs. The technician installs the ring gear assembly, sets the backlash to specification, and then checks the bearing preload by measuring the turning torque with a beam-type torque wrench on the pinion nut. The preload reads significantly below specification. What adjustment is needed?

A. Remove shims equally from both sides of the carrier bearing caps to increase the lateral load on the bearings and bring the preload up to the specified turning torque value

B. Add shims equally to both sides of the carrier bearing caps to increase the outward force on the bearings and bring the preload up to the specified turning torque value

C. Remove shims from the ring gear side only and add them to the opposite side to increase the bearing preload without changing the backlash setting that was previously established

D. Increase the preload by reducing shims from both sides equally which squeezes the carrier bearings tighter against the carrier housing bore and increases the measured turning torque

74. A truck's transfer case makes a whining noise in four-wheel drive that increases with vehicle speed. The noise is not present in two-wheel drive. The transfer case fluid level is correct and the fluid appears clean. After draining the transfer case, the technician finds fine metallic particles on the drain plug magnet. What do the metallic particles indicate?

A. Internal gear or bearing wear in the four-wheel-drive circuit of the transfer case — the metallic particles combined with the speed-dependent whine confirm progressive component failure

B. Normal break-in wear from the transfer case gears that is typical for the first 50,000 km of operation and should stabilize as the gear tooth surfaces polish and the contact pattern matures

C. Contamination from the transfer case assembly process at the factory that was not fully flushed during the initial fill and has circulated through the system during the vehicle's operational life

D. Wear from the transfer case shift mechanism's internal components that contact each other only during the four-wheel engagement process and deposit particles during each shift cycle event

75. A dual-plate clutch on a Class 8 tractor has been slipping under full engine torque. During disassembly, the technician finds the flywheel surface has a deep blue discolouration from extreme heat exposure. The flywheel is cast iron and the thickness is within specification after machining. Should the flywheel be reused?

A. Yes — machining the heat-damaged surface removes the discoloured material and restores the flywheel to a serviceable condition as long as the minimum thickness specification is maintained

B. The flywheel should be sent to a metallurgical laboratory for hardness testing before deciding to reuse it — heat exposure may have changed the surface hardness affecting clutch engagement

C. No — the deep blue discolouration indicates the flywheel surface has been heated to a temperature that changes the cast iron's metallurgical properties and may have created heat checks that will cause clutch chatter

D. Yes — cast iron is resistant to heat-induced metallurgical changes and the discolouration is only a surface oxide layer that machining removes without affecting the flywheel's mechanical properties

76. A truck equipped with an Allison automatic transmission shifts normally through all gears except lockup. The torque converter clutch does not engage at any speed. The fluid level and condition are correct. A scan tool shows the lockup solenoid is being commanded on by the TCM. What should be checked?

A. The engine ECM for a fault code that prevents it from authorizing lockup through the CAN bus communication with the transmission control module during normal highway operation

B. The transmission fluid temperature sensor for a reading below the minimum lockup enable temperature that prevents the TCM from allowing lockup engagement until the fluid reaches operating temperature

C. The lockup clutch apply circuit in the valve body for a stuck-open exhaust valve or a failed regulator that prevents adequate apply pressure from reaching the lockup clutch piston inside the torque converter

D. The lockup solenoid's electrical connection, the solenoid's mechanical function, and the valve body's lockup clutch apply circuit for a fault that prevents the commanded lockup from being hydraulically executed

77. A truck has had its rear axle ratio changed from 3.70:1 to 4.11:1 to improve startability for a different vocation. After the change, the speedometer reads 10% low. What calibration change is needed?

A. The tire size must be changed to compensate for the axle ratio change and bring the speedometer reading back to the correct value without requiring any electronic calibration changes

B. The vehicle speed sensor output must be recalibrated in the ECM or instrument cluster to account for the new rear axle ratio so the speedometer correctly calculates vehicle speed from the sensor input

C. The transmission shift points must be reprogrammed to match the new axle ratio because the shift schedule is calculated based on the vehicle speed data which is now reading incorrectly

D. No calibration change is needed because the ABS module will automatically detect the axle ratio change from the wheel speed sensor data and update the speedometer calibration during the first drive

78. A drive axle has been drained and the gear oil appears milky grey instead of the normal clear amber colour. What does this fluid condition indicate?

A. Water has entered the axle housing through a failed axle shaft seal, a compromised vent, or a housing crack — the milky appearance is an oil-water emulsion created by the churning gears

B. The gear oil has oxidized from overheating and the milky grey colour is the characteristic appearance of petroleum-based gear oil that has exceeded its thermal degradation threshold

C. The limited-slip differential additive has separated from the base oil creating a two-phase fluid mixture that appears milky when mixed by the rotating ring gear and pinion during operation

D. The gear oil was inadvertently mixed with automatic transmission fluid during the last service and the incompatible fluids have chemically reacted to produce the milky grey emulsion appearance

79. A truck's clutch release fork pivot ball stud has worn to the point where the fork can move laterally on the stud. What symptom will this produce?

A. The clutch pedal will be hard to depress because the fork's lateral movement increases the friction between the fork and the stud surface under the release bearing loading condition

B. The clutch pedal free play will change inconsistently because the fork's position on the stud varies with each pedal cycle changing the effective geometry between the fork and the release bearing

C. The release bearing will wear on one side only because the fork's lateral movement tilts the bearing relative to the pressure plate fingers creating a cocked loading pattern on the bearing face

D. The clutch pedal will have a mechanical interference feel as the fork reaches the end of its lateral travel and contacts the bell housing wall before the release bearing fully disengages the clutch

80. A truck's drive axle has been reassembled with a new ring and pinion gear set. The gear pattern check using marking compound shows the contact pattern centered on the tooth face in the drive (coast) direction, but the pattern is shifted toward the heel in the drive (power) direction. What adjustment corrects this condition?

A. Increase the backlash by moving the ring gear away from the pinion until the drive pattern shifts from the heel toward the centre of the tooth face matching the coast pattern position

B. Decrease the backlash by moving the ring gear toward the pinion until the drive pattern shifts from the heel toward the centre of the tooth face for centered contact under power loading

C. Move the pinion deeper into the housing by adding shim thickness behind the pinion head to shift the drive-side pattern from the heel toward the centre of the tooth face for proper loading

D. Move the pinion outward from the housing by removing shim thickness from behind the pinion head to shift the drive-side pattern from the heel toward the centre of the tooth face for even wear

81. A truck with an automated manual transmission (AMT) repeatedly displays a "clutch overheat" warning during city driving with frequent stop-and-go traffic. The driver's technique appears normal. What is the most likely cause?

A. The AMT software calibration is too aggressive with clutch slip during low-speed manoeuvring generating more heat than the clutch can dissipate in the stop-and-go duty cycle

B. The clutch disc friction material has worn to the point where the engagement slip time has increased significantly and the heat generated per engagement exceeds the clutch's thermal capacity

C. The engine idle speed is set too high causing the speed differential between the engine and transmission to be larger during each engagement event generating excessive clutch heat per cycle

D. The AMT clutch cooling system (if equipped) has a restricted air passage that prevents adequate airflow across the bell housing to dissipate the heat generated during normal stop-and-go operation

82. A tandem axle truck has a power divider (inter-axle differential) between the front and rear drive axles. The driver reports that when driving through deep mud, one axle spins freely while the other axle provides no traction. What function of the power divider is responsible?

A. The power divider proportioning valve is diverting all hydraulic pressure to one axle leaving the other axle without drive force to overcome the mud's traction-reducing effect on the tire surface

B. The power divider is diverting all engine power to the forward drive axle for improved handling stability in the mud leaving the rear axle unpowered until the driver activates the rear axle engagement switch

C. The inter-axle differential lock is not engaged and the power divider is sending torque to the axle with the least resistance — the spinning axle in the mud receives all the torque while the other axle gets none

D. The inter-axle differential is sending equal torque to both axles but the axle in deeper mud cannot convert its torque into traction because the mud's friction coefficient is below the minimum needed for propulsion

83. A truck's automatic transmission has a persistent check transmission lamp and a fault code for "main pressure low." The fluid level is correct and the fluid is clean. What component is the most likely cause?

A. The transmission oil pump has worn to the point where it cannot maintain the required main line pressure across the full range of engine RPM and fluid temperature during normal operation

B. The main pressure regulator valve is stuck in a position that diverts too much pump output back to the sump reducing the pressure available to apply the clutch packs and bands during shifting

C. The torque converter charge circuit is bypassing excessive fluid to the cooler and lubrication circuits starving the main pressure circuit of the volume needed to maintain the commanded pressure level

D. Both the oil pump and the main pressure regulator should be investigated because either component could independently cause a low main pressure condition that triggers the fault code and warning lamp

84. A drive axle differential is making a howling noise that is present during both acceleration and coast but changes pitch between the two. What does this noise characteristic indicate?

A. Both the drive-side and coast-side tooth contact patterns of the ring and pinion are incorrect indicating a general backlash or pinion depth error that affects the gear mesh in both loading directions

B. The differential carrier bearings have failed creating play that changes the ring gear position relative to the pinion during the transition between drive and coast loading conditions causing the pitch change

C. The ring gear has developed a crack that opens and closes with the changing tooth load direction between acceleration and deceleration producing a different noise frequency in each condition

D. The differential side gears are worn and the pitch change between drive and coast corresponds to the speed change of the side gears as the load transfers from the drive-side teeth to the coast-side teeth

85. A truck equipped with an engine compression brake and an exhaust brake has the exhaust brake controlled by a butterfly valve in the exhaust pipe downstream of the turbocharger. The driver reports that the exhaust brake is much less effective than it used to be. The butterfly valve operates correctly when tested through the scan tool. What else could reduce exhaust brake effectiveness?

A. An exhaust system leak between the turbocharger outlet and the butterfly valve that allows exhaust gas to escape before reaching the closed butterfly creating a pressure bypass around the restriction

B. The engine valve lash has increased from wear which allows some of the compressed air to escape during the exhaust brake hold period reducing the retarding force on each compression stroke

C. The turbocharger's VGT vanes have stuck in the open position which reduces the exhaust restriction upstream of the butterfly valve and decreases the overall backpressure available for retarding

D. The air intake system has a leak that allows atmospheric air to enter the intake manifold downstream of the throttle bypassing the restriction created by the closed butterfly valve in the exhaust

86. A truck has a steering complaint where the steering wheel must be turned approximately 5 degrees before the front wheels begin to respond. This free play exceeds the specification. The technician performs an under-vehicle inspection and finds that all steering linkage components, king pins, and wheel bearings are tight with no detectable play. Where is the remaining free play originating?

A. The steer tire sidewall flex is absorbing the initial steering input before the wheels begin to respond creating the sensation of free play at the steering wheel that is not detectable under the vehicle

B. The power steering pump is bypassing internally at low flow rates creating a delay between the steering input and the hydraulic assist response that the driver perceives as mechanical free play

C. The steering gearbox has internal play between the worm shaft, the recirculating ball mechanism, and the sector shaft that is not detectable from the external linkage inspection alone

D. The steering column flexible coupling or universal joint has developed internal wear that allows rotational movement in the column before transmitting it to the gearbox input shaft below

87. A truck has a severe shimmy (rapid side-to-side oscillation) in the steering at 90 km/h. The shimmy disappears below 75 km/h and above 105 km/h. Steer tire balance, alignment, king pins, and tie rod ends are all within specification. What component should be checked?

A. The steering gearbox mounting bolts for looseness that allows the gearbox to shift on the frame and change the steering geometry at the specific speed corresponding to the shimmy frequency

B. The steering damper for internal failure — a worn or failed damper cannot resist the oscillation at the resonant frequency of the steering system that occurs between 75 and 105 km/h on this vehicle

C. The drive axle U-joints for wear that produces a vibration input to the frame at a frequency that coincides with the steer axle's natural oscillation frequency in the 75-105 km/h speed range

D. The steer axle spring bushings for wear that allows the axle to oscillate fore-and-aft under the dynamic loading at highway speed creating a steering input that the driver perceives as shimmy

88. A truck's frame has been lengthened by a frame modification shop to accommodate a longer body. The modification includes welding splice plates to extend the side rails. After the modification, the truck develops cracks at the splice welds within 6 months. What is the most likely cause?

A. The splice welds were improperly executed — incorrect weld procedure, wrong electrode, insufficient preheat, or poor joint preparation created a weak weld that cannot withstand the dynamic frame loads

B. The splice location is in a high-stress zone of the frame where bending loads are greatest and even a perfect weld cannot survive the fatigue loading that this location experiences during normal operation

C. The frame modification shop used mild steel splice plates that are not compatible with the HSLA steel frame rails and the metallurgical mismatch creates stress concentrations at the weld fusion zone

D. The frame rail extension changed the vehicle's weight distribution placing more load on the splice location than the original frame analysis anticipated causing the welds to fail from unexpected overloading

89. A steer tire on a heavy-duty truck shows a wear pattern where the centre of the tread is worn significantly more than the edges. The tire appears properly inflated at the current pressure check. What is the most likely historical cause of this wear pattern?

A. The tire has been chronically run at a pressure higher than the maximum sidewall rating creating an excessively rigid tread that concentrates all ground contact force on the centre of the tread crown

B. The tire has been chronically run at excessive pressure for the axle load — the over-inflation causes the tread to crown (bow outward) concentrating ground contact on the centre tread area

C. The steer axle camber is set to zero degrees instead of the specified slight positive camber which causes the tire to roll perfectly flat and concentrate wear in the centre from the uniform load distribution

D. The tire's tread compound has a manufacturing defect where the centre rubber is softer than the edge rubber causing the centre to wear at an accelerated rate relative to the outer edges of the tread surface

90. A trailer equipped with air ride suspension has one air spring that has developed a large bulge on its sidewall. The spring is still holding air pressure and the ride height is correct on that side. Should the spring be replaced?

A. The spring should be monitored at subsequent inspections and replaced only when it fails to hold pressure since the bulge may stabilize and not progress further during normal service operation

B. The spring must be replaced because the bulge indicates a weakened area in the rubber bellows that will eventually rupture causing a sudden loss of support on that wheel position under load

C. The spring can continue in service because modern air spring rubber compounds are designed with a safety margin that accommodates localized bulging without affecting the spring's pressure capacity

D. The bulge can be repaired by applying a vulcanizing patch over the affected area similar to a tire puncture repair which restores the structural integrity of the air spring bellows for continued service

91. A truck's steering rack (on a vehicle equipped with rack-and-pinion steering) has developed a clunking noise when driving over bumps. The rack boots are intact and the tie rod ends are tight. What internal rack component could cause this clunk?

A. The rack support yoke (or slider bearing) that holds the rack bar against the pinion gear has worn and the rack bar shifts in its housing when road impacts push and pull on the tie rod ends

B. The power steering pump is cavitating and sending pressure pulses to the rack cylinder that move the rack bar in its housing producing a clunking noise that sounds like a mechanical impact

C. The rack-and-pinion mounting bushings have deteriorated allowing the entire rack housing to shift on the frame cross-member during bump impacts before returning to its neutral position elastically

D. The inner tie rod ball joints inside the rack boots have developed play that allows the rack bar to shift laterally relative to the tie rod connections during bump loading creating the clunking noise

92. A heavy-duty truck's front suspension uses leaf springs with the spring eyes mounted in rubber bushings pressed into the spring hanger brackets. After 300,000 km, the driver reports the ride has become progressively harsher. The springs appear to have adequate camber and are not cracked. What has changed to cause the harsher ride?

A. The rubber spring eye bushings have hardened from heat cycling and age losing their original compliance — they can no longer absorb the initial bump energy that the softer rubber previously dampened

B. The leaf spring main leaf has taken a permanent set that reduces its effective free camber and alters the spring rate making the suspension feel stiffer even though no visual cracks are present

C. The shock absorbers have developed excessive internal resistance from degraded valving oil that has thickened with age creating more damping force than designed and producing a harsher ride quality

D. The leaf spring centre bolt has elongated from fatigue allowing the spring pack to separate slightly which changes the interleaf friction characteristics and makes the spring feel stiffer during bump absorption

93. A truck's fifth wheel is being inspected for a coupling rattle complaint. The king pin diameter measures within specification and the locking jaws appear in good condition. When the trailer is coupled, the technician can lift the trailer king pin upward approximately 5 mm inside the fifth wheel throat. What does this vertical movement indicate?

A. The trailer's upper coupler plate has worn thinner from repeated coupling and articulation which creates additional vertical clearance between the coupler plate and the fifth wheel plate surface

B. The fifth wheel locking jaw pivot pins have worn allowing the jaws to tilt downward rather than gripping the king pin horizontally which creates the vertical lift clearance in the throat opening

C. The king pin has worn at the underside of its flange where it contacts the fifth wheel plate creating a reduced flange thickness that allows the pin to lift upward in the throat by the amount of the wear

D. The fifth wheel plate mounting bolts have loosened and the plate has sagged creating a gap between the trailer upper coupler plate and the fifth wheel plate surface that allows vertical movement

94. A truck tire rated at 295/75R22.5 has been installed on the steer axle. The vehicle specification calls for 11R22.5 tires. What potential problem could arise from this tire size substitution?

A. The 295/75R22.5 tire is physically wider and may interfere with the wheel well opening, suspension components, or steering linkage during full-lock turns that the narrower 11R22.5 would clear

B. The 295/75R22.5 has a significantly different rolling circumference than the 11R22.5 which will cause speedometer and odometer errors and affect ABS calibration for the wheel speed calculation

C. The 295/75R22.5 and 11R22.5 are generally considered equivalent sizes in the commercial tire industry and this substitution should not cause any operational issues or vehicle specification conflicts

D. The 295/75R22.5 tire has a lower load rating than the 11R22.5 because the metric-designated tire uses a lighter construction standard that cannot match the load capacity of the numeric-size designation

95. A truck's wheel bearing adjustment on an oil-bath hub has been performed correctly with the specified 0.001 to 0.005 inch end play verified with a dial indicator. Approximately 500 km later, the driver reports a howling noise from that wheel position. What could have gone wrong during the service?

A. The dial indicator was not properly zeroed before the end play measurement and the actual play is significantly different from the recorded value creating an incorrect preload condition

B. The inner or outer bearing was reinstalled dry without fresh lubricant and the initial lubrication from the oil bath was insufficient to prevent damage during the first several hundred kilometres of operation

C. The hub oil level was set incorrectly after the bearing adjustment — too low and the bearings operate without adequate splash lubrication leading to premature bearing failure and the howling noise

D. The bearing races were not inspected for damage before reinstallation and a pre-existing defect (spalling, pitting, brinelling) was not detected during the service and has now progressed to produce noise

96. A truck equipped with hub-piloted disc wheels has one wheel that consistently shows evidence of movement — the wheel paint on the mounting surface has circular scuff marks indicating the wheel has been rotating on the hub pilot. What is the most likely cause?

A. The wheel nuts were not torqued to the full specification or were not re-torqued after the initial drive and the clamping force is insufficient to prevent the wheel from shifting on the hub pilot surface

B. The hub pilot surface is worn from years of service and the pilot diameter is now slightly undersize allowing the wheel to sit loosely on the hub without adequate centring force during operation

C. The wheel stud diameter has decreased from thread wear and the nuts bottom out on the threads before achieving adequate clamping force against the wheel surface to prevent movement

D. The brake rotor hat (the centre section that mounts between the hub and the wheel) has a different thickness than the original and changes the clamping geometry preventing adequate wheel retention

97. A truck's rear suspension uses torque rods (control arms) to locate the drive axle relative to the frame. During an inspection, the technician finds one torque rod bushing is severely worn with visible rubber deterioration and metal-to-metal contact. What is the consequence of operating with this worn bushing?

A. The drive axle will have normal tracking characteristics because the other torque rods compensate for the worn bushing by increasing their restraining force on the axle assembly automatically

B. The worn bushing reduces the ride quality but has no effect on axle alignment because the axle is also located by the leaf springs or air ride trailing arms which maintain the geometric position independently

C. The engine driveline angles will change because the worn bushing allows the axle to shift forward or rearward under acceleration and braking forces changing the U-joint working angles dynamically

D. The worn bushing allows the drive axle to shift position under dynamic loads changing the axle alignment, driveline angles, and tire tracking which causes accelerated tire wear and potential driveline vibration

98. A driver reports that the truck pulls to the right during acceleration but tracks straight during cruise and braking. Tire pressures are equal and the alignment is within specification. What drivetrain component could cause a pull only during acceleration?

A. A broken engine mount on one side that allows the engine to twist and shift the steering column geometry during the torque reaction of acceleration changing the steer angle momentarily

B. The right drive axle has a slightly shorter axle shaft than the left due to a manufacturing tolerance variation that creates unequal torque delivery during the acceleration loading condition only

C. A worn or damaged drive axle U-joint on one side creates an unequal torque delivery to the left and right wheels during acceleration that disappears during cruise when the torque is balanced

D. An unequal drive axle lubricant level between the left and right wheel ends creates different resistance to wheel rotation that manifests only during the high-torque condition of acceleration

99. A trailer's ABS wheel speed sensor has been replaced due to a fault code. After installation, the fault code returns immediately. The sensor air gap is set correctly and the sensor resistance measures within specification. What should be checked next?

A. The tone ring for the correct number of teeth, damage, or improper installation that would produce a signal the ABS module cannot process correctly despite the sensor itself being in good condition

B. The ABS modulator valve for a fault that is generating a secondary code that appears to be a wheel speed sensor code but is actually caused by the modulator's internal feedback circuit malfunction

C. The trailer wiring harness for a pinched or shorted sensor wire that was damaged during the sensor installation process and is corrupting the signal between the sensor and the ABS module connector

D. The ABS module itself for an internal input circuit failure that cannot process the sensor signal regardless of which sensor is installed producing a recurring fault code on the same input channel

100. A truck is equipped with automatic tire inflation (ATI) on the drive and trailer axle positions. The system maintains tire pressure at the specified value by supplying air from the vehicle's air system through rotary seals at each wheel end. A driver reports that one drive axle tire is consistently 50 kPa below the set pressure. What should be inspected?

A. The air supply line from the main air system to the ATI control module for a restriction that limits the airflow rate and prevents the system from maintaining pressure on all tires simultaneously

B. The ATI steer axle circuit for a leak that is consuming all available air supply capacity preventing adequate air delivery to the drive axle circuit where the low-pressure tire is located

C. The rotary seal at the affected wheel end for a leak that allows air to escape at the spindle-to-hub interface faster than the ATI system can supply replacement air to that tire position

D. The vehicle's air system governor for a cut-out pressure that is too low to provide adequate supply pressure to the ATI system for all tire positions during normal sustained highway driving operation

104. A truck's driver-side sun visor has broken off its mounting bracket, leaving a sharp metal edge exposed on the headliner where the bracket was attached. Beyond replacing the visor, what safety concern does this create?

A. The sharp metal edge is a laceration hazard to the driver and any passengers especially during a sudden stop or collision when occupants may be thrown forward against the headliner surface

B. The broken visor will affect the driver's ability to pass a DOT physical examination because the examiner checks all cab components for proper function during the visual acuity portion of the test

C. The missing visor will cause sun glare that triggers the vehicle's lane departure warning system to produce false alerts whenever the sun angle coincides with the forward-facing camera's field of view

D. The exposed mounting bracket will interfere with the overhead air bag deployment path if the vehicle is equipped with curtain side-impact air bags that deploy from the headliner during a collision event

105. A truck's power window regulator on the passenger side has failed. The window is stuck in the fully down (open) position. A replacement regulator is not immediately available. What temporary measure can be taken to secure the cab until the part arrives?

A. Tape a piece of clear plastic sheeting over the window opening from the outside to keep weather out while maintaining visibility until the replacement regulator part arrives for installation

B. Remove the door panel, manually raise the glass to the closed position, and secure it with a temporary mechanical support (such as a wooden wedge or clamp) until the new regulator is installed

C. Disconnect the window motor electrical connector and use the manual override slot (if equipped) with a hand crank to raise the window to the closed position until the repair can be completed

D. Leave the window in the open position and park the vehicle inside the shop until the replacement part arrives to prevent exposure to weather and security risks from the open window position

106. A truck cab is equipped with a supplemental restraint system (SRS) including a steering wheel airbag. During a PM inspection, the technician notices the SRS warning lamp on the instrument cluster is not illuminating during the ignition-on bulb check. What does this indicate?

A. The SRS system has completed its self-test successfully and the lamp turns off so quickly during the bulb check that it appears not to illuminate under the normal ignition-on test sequence

B. The airbag system is functioning normally and the bulb check lamp was eliminated in the most recent instrument cluster software update to reduce visual clutter during the driver's startup routine

C. The SRS system is fully armed and ready to deploy — the lamp only illuminates when a fault is present and the absence of illumination during bulb check confirms no faults are stored in the module

D. The SRS warning lamp bulb has failed or the circuit to the lamp has a fault — the technician cannot verify whether the SRS system is functional without the lamp providing its diagnostic indication

107. A truck driver reports that the cab air suspension is too soft and the cab sways excessively during lane changes. The cab air spring pressure is at the correct specification. What should be checked?

A. The cab height control valve linkage for a misadjustment that is holding the air springs at a lower-than-designed operating height reducing the suspension's effective spring rate and roll resistance

B. The cab roll stabilizer bar (anti-sway bar) and its bushings and end links for wear, damage, or disconnection that would reduce the cab's resistance to lateral body roll during lane change manoeuvres

C. The engine mounting system for excessive compliance that allows the engine mass to shift laterally during lane changes creating a secondary rolling motion that amplifies the cab's sway characteristics

D. The cab air springs for internal bladder delamination that changes the spring's air volume and effective rate making it softer than the manufacturer's specification despite the correct pressure reading

108. A truck's cab tilt latch mechanism requires excessive force to release. The hydraulic tilt system functions normally once the latch is released. What should be inspected on the latch mechanism?

A. The hydraulic pump pressure for a cold-start condition that increases the resistance in the cylinder and transfers that force to the latch mechanism through the cab structure during the initial release

B. The cab weight distribution for an imbalance caused by aftermarket accessories mounted on the cab roof that shifts the centre of gravity and loads the latch mechanism asymmetrically during release

C. The latch mechanism pivot points, striker alignment, engagement surfaces, and springs for corrosion, lack of lubrication, wear, or misalignment that increases the force required to disengage the latch

D. The cab mounting bolt torque because over-torqued bolts compress the cab structure at the mounting points creating a preload that resists the latch release by pressing the latch engagement surfaces together

109. A reefer trailer's TRU (transport refrigeration unit) has a fault code for low suction pressure. The compressor engages and runs. Condenser and evaporator coils are clean. The evaporator fan operates normally. What are the two most probable causes of low suction pressure?

A. The compressor has worn internal components that are generating excessive vacuum on the suction side beyond the normal operating range for the refrigerant type and ambient conditions

B. The condenser fan motor is running in reverse creating negative airflow through the condenser coils that reduces the heat rejection capacity and lowers the suction pressure indirectly through the circuit

C. Low refrigerant charge from a leak, or a restricted expansion valve (TXV) that is not allowing adequate refrigerant flow into the evaporator — both conditions starve the evaporator and drop suction pressure

D. The TRU engine is running below its governed RPM reducing the compressor speed and the volume of refrigerant being circulated through the evaporator coil per unit of time during normal operation

110. A trailer's nosemount TRU (front-wall-mounted refrigeration unit) has been running continuously for 12 hours but the cargo space temperature has only reached -10°C against a set-point of -20°C. The trailer was pre-cooled to -20°C before the doors were opened for loading. What should be investigated?

A. The loading practices — if the doors were open for an extended period during loading, the warm moist air that entered the trailer may have formed such a heavy ice load on the evaporator that cooling capacity is severely reduced

B. The TRU fuel filter for a restriction that limits the engine RPM below the governed speed reducing the compressor capacity below what is needed to achieve the -20°C set-point in the current conditions

C. The cargo type — certain products generate metabolic heat (fresh produce) or release stored heat (products loaded above the set-point temperature) that the TRU must remove before the set-point can be achieved

D. The TRU high-pressure safety switch for a premature trip that shuts down the compressor periodically allowing the temperature to rise before the switch resets and the compressor re-engages each cycle

111. A trailer's swing doors will not open fully to 270 degrees (folded flat against the trailer sides). The doors open to approximately 180 degrees and stop. What is the most likely obstruction?

A. The door hold-back hooks or catches that secure the doors in the fully open position have been bent or repositioned to a point that contacts the door before it reaches the full 270-degree open position

B. The door hinge pin geometry has changed from wear or corrosion that reduces the total rotational range of the hinge preventing the door from swinging past the 180-degree position to the fully open state

C. The trailer side marker lamps, reflectors, or other hardware mounted on the trailer side body panels are interfering with the door panels when they attempt to swing past the 180-degree position to lay flat

D. The door hinges are the wrong type for a 270-degree swing application — standard 180-degree hinges have been installed instead of the extended-rotation hinges required for full-open door operation

112. A trailer equipped with an electric landing gear motor has the motor running but the landing gear does not extend or retract. The motor runs freely when the gear is disengaged. What is the most likely cause?

A. The electric motor's internal brake mechanism has engaged permanently preventing the motor shaft from transmitting torque to the landing gear gear train during both extension and retraction commands

B. The gear mechanism between the motor output and the landing gear screwjack has failed — a stripped gear, broken shaft, or failed coupling prevents the motor from transmitting torque to the legs

C. The motor's electrical polarity has been reversed and it is running in the wrong direction which the gear mechanism interprets as a neutral command and does not engage in either direction of travel

D. The landing gear leg tubes are corroded and seized in their outer sleeves and the motor cannot generate enough torque to overcome the static friction between the corroded extension tubes and sleeves

113. A trailer's brake adjustment on one axle shows that both automatic slack adjusters have over-adjusted the brakes — the pushrod stroke is 10 mm on both sides, well below the 15-25 mm normal range. The brake shoes are dragging against the drum. What caused the automatic slack adjusters to over-adjust?

A. The brake drums are severely out-of-round which causes the adjuster to ratchet tighter with each drum rotation as the shoes alternately contact and clear the oval drum surface

B. The automatic slack adjusters are installed with the incorrect clock position on the S-cam splines and are adjusting in the wrong direction tightening instead of maintaining correct clearance

C. The brake return springs on both sides of that axle are broken or weak allowing the shoes to remain in contact with the drum which the adjusters interpret as insufficient stroke and continue to tighten

D. The relay valve for that axle is delivering higher-than-commanded pressure causing deeper pushrod stroke readings that the adjusters interpret as excessive travel and respond by over-adjusting

114. A trailer has been loaded with 18,000 kg of cargo. The trailer axle group weight capacity is 17,000 kg. What is the immediate concern and required action?

A. The trailer's air ride suspension will automatically compensate for the overload by increasing the air spring pressure to handle the additional 1,000 kg within its designed safety factor capacity

B. The overloaded axle group will generate a fault code in the trailer ABS module that restricts vehicle speed to 50 km/h until the weight is reduced to the rated capacity of the axle group assembly

C. The trailer tires are being loaded beyond their rated capacity which accelerates tire wear but does not present an immediate safety concern as long as the tires are inflated to their maximum rated pressure

D. The trailer is overloaded beyond the axle group rating — the excess weight overstresses the tires, bearings, suspension, and brakes creating a safety hazard and a regulatory violation that must be corrected

115. A trailer's marker lamp lenses have yellowed and become opaque from UV exposure and road chemical attack over several years of service. The lamps still illuminate but the light output is visibly reduced compared to new lenses. Is this a compliance concern?

A. No — as long as the lamps illuminate when powered the legal requirement is met and the yellowed lenses do not constitute a regulatory violation during a roadside inspection or annual safety audit

B. The reduced light output is a concern because the amber and red lenses have lost their colour filtering ability and the marker lamps are no longer producing the correct colour required by regulations

C. Yes — the reduced light output from the yellowed lenses may fall below the minimum candela (brightness) specification required by the lighting regulation making the trailer non-compliant during inspection

D. The yellowed lenses only need to be replaced if they are cracked or broken — discolouration from UV degradation is considered normal aging and does not affect the lamp's regulatory compliance status

116. A trailer equipped with a liftgate has the liftgate platform tilting unevenly — one side lifts higher than the other when the platform raise function is activated. Both lift cylinders appear to extend. What is the most likely cause?

A. The liftgate hydraulic directional valve is defective and delivering unequal pressure to the two lift cylinders causing them to extend at different rates during the platform raise operation

B. One lift cylinder has an internal piston seal leak that allows fluid to bypass the piston reducing the extension force and speed on that side causing the platform to tilt toward the weaker cylinder

C. The liftgate hinges on one side are seized preventing that side of the platform from raising at the same rate as the freely-pivoting side creating the uneven tilt condition during the raise operation

D. The hydraulic fluid viscosity is incorrect for the ambient temperature causing one cylinder to respond faster than the other due to the different fluid flow characteristics in each cylinder's supply line

117. A truck's A/C system has been recently serviced with a new compressor, new receiver/dryer, correct refrigerant charge, and new PAG oil. The system cools well but the compressor is noticeably louder than the old unit — not a knock or rattle, but a constant humming that increases with compressor RPM. What is the most likely cause?

A. The replacement compressor was shipped with a mineral oil charge that is incompatible with the R-134a system's required PAG oil — the mixed oils cannot provide adequate lubrication creating the noise

B. The replacement compressor has a manufacturing defect in its internal valve plate or piston assembly that produces an abnormal resonance during the compression and discharge stroke cycle

C. The new compressor's clutch air gap is set too tight and the clutch friction surface is in constant light contact with the pulley creating a bearing-like hum that increases proportionally with shaft speed

D. The system has been overcharged by a small amount and the slight excess refrigerant causes the compressor to work against a marginally elevated head pressure which produces the audible humming noise

118. A truck's HVAC blend door actuator has been replaced. After installation, the temperature control works correctly in the heat position and the mid-range position but the maximum A/C position still produces slightly warm air. What is the most likely cause?

A. The new actuator has a slightly different travel range than the original and does not rotate the blend door fully to the maximum cooling bypass position leaving a small amount of air flowing through the heater core

B. The blend door shaft has a worn flat that allows the door to slip on the shaft at the extreme end of travel — the door stops short of the full cooling position even though the actuator reaches its maximum rotation

C. The A/C compressor clutch has a thermal lockout that prevents engagement at the same time the blend door reaches the maximum cooling position because the high-side pressure spikes momentarily

D. The heater control valve is not fully closing in the maximum A/C position and a small amount of hot coolant continues flowing through the heater core warming the air that passes through the core section

119. A truck's cab defroster produces adequate heat but the airflow pattern does not reach the outer edges of the windshield — the centre clears effectively but the outer corners remain fogged. What is the most likely cause?

A. The defroster duct nozzles at the outer positions are clogged with dust, debris, or have been blocked by dashboard accessories placed over the vent openings near the windshield corners

B. The blower motor is running at reduced speed and cannot produce enough air volume to reach the outer vent positions with adequate velocity to clear the fog from the windshield corners effectively

C. The defroster ductwork has deteriorated, separated, or collapsed between the HVAC housing and the outer dash vents reducing the airflow delivery to the far ends of the windshield defroster duct system

D. The windshield sealant at the outer corners has deteriorated allowing cold outside air to contact the glass from the exterior side creating a temperature differential that the defroster cannot overcome at the edges

120. A fuel-fired coolant heater (Webasto-type) on a truck has been operating for one hour to pre-warm the engine before starting on a cold morning. The technician checks the engine coolant temperature and finds it has only reached 35°C. The heater has a rated output of 5 kW. What is the most likely reason for the slow warmup?

A. The 5 kW heater output is normal for the thermal mass of a heavy-duty diesel engine cooling system and one hour of operation at -30°C ambient may only achieve 35°C depending on the system volume

B. The auxiliary coolant circulation pump has failed and the heated coolant is not being circulated through the engine block — only the local coolant near the heater is warming while the bulk remains cold

C. The heater's combustion glow plug has partially failed and the heater is producing approximately half its rated heat output due to incomplete combustion in the combustion chamber during the pre-warm

D. The engine thermostat is stuck open and the heated coolant is circulating through the radiator where it loses heat to the cold ambient air before returning to the heater for another pass through the system

121. A truck's A/C compressor clutch is engaging and disengaging every 3 to 5 seconds in a regular pattern. The system pressures fluctuate with each engagement cycle. The refrigerant charge has been verified correct by recovery and recharge to the exact OEM specification. What could cause this short cycling with a correct charge?

A. The low-pressure cutout switch is set at too high a threshold and is tripping at a pressure that is within the normal operating range causing premature compressor disengagement during each cycle

B. The evaporator thermistor (temperature sensor) is reading falsely cold and is commanding the clutch to disengage at a temperature above the actual evaporator surface freezing point to prevent icing

C. The high-pressure cutout switch has shifted its calibration and is tripping at a pressure within the normal high-side operating range causing the compressor to cycle off prematurely during each cycle

D. The expansion valve sensing bulb has lost its thermal contact with the evaporator outlet pipe and is responding to ambient temperature rather than evaporator temperature causing erratic superheat control

122. An A/C system has been recharged but the technician forgot to add refrigerant oil to compensate for the oil removed with the old compressor. The system is approximately 90 ml low on oil. What are the consequences of operating with this oil deficit?

A. The system will cool normally with no adverse effects because 90 ml represents less than 10% of the total system oil charge and the remaining oil provides adequate lubrication for all components

B. The evaporator will produce colder-than-normal air because the reduced oil volume leaves more space for refrigerant in the evaporator resulting in greater heat absorption capacity per cycle

C. No immediate effect may be noticed but over time the compressor will experience accelerated wear from inadequate lubrication leading to premature failure from internal scoring and overheating

D. The expansion valve will malfunction because the reduced oil volume changes the viscosity characteristics of the refrigerant-oil mixture affecting the valve's metering precision during operation

123. A truck's sleeper cab has an APU (auxiliary power unit) with a diesel-fired coolant heater for winter heating. The driver reports a strong exhaust odour inside the cab during APU heating operation. The heater's exhaust pipe is intact and routed to the vehicle's exterior. What should be checked?

A. The exhaust pipe routing for a section that passes near the cab's fresh air intake opening allowing exhaust fumes to be drawn into the HVAC system when the blower fan is operating during heating mode

B. The heater core for an internal leak that allows coolant to enter the HVAC airstream — the driver may be confusing the sweet coolant odour with a diesel exhaust odour in the enclosed sleeper cab space

C. The heater's combustion chamber heat exchanger for a crack that allows combustion exhaust gases to enter the coolant circuit where they are released as exhaust odour when the heated coolant reaches the cab heater core

D. The APU diesel engine's exhaust system for a leak at the manifold or turbocharger connection that allows exhaust to escape under the cab and enter through floor penetrations or deteriorated cab seals

124. A hydraulic system on a refuse truck uses a variable-displacement axial piston pump. The operator reports that the system response has become sluggish — all functions work but at noticeably reduced speed. System pressure is normal when deadheaded. What is the most likely cause?

A. The pump's swash plate control mechanism has shifted and is limiting the pump to a displacement below its maximum output even when the control commands full displacement for maximum flow

B. The hydraulic cylinder seals throughout the system have all worn simultaneously allowing internal bypass that consumes the pump's flow output before it can move the actuators at normal speed

C. The system relief valve setting has drifted lower and is bypassing pump flow at a pressure that is still high enough to move the actuators but not high enough to achieve full speed under load conditions

D. The pump's inlet suction strainer has partially clogged restricting the oil flow into the pump and limiting the maximum displacement the pump can achieve without cavitation during peak demand operation

125. A hydraulic crane's outrigger cylinder extends fully but retracts extremely slowly. The directional valve shifts correctly to the retract position and system pressure is adequate. The other three outrigger cylinders retract at normal speed. What is the most likely cause of the slow retraction on the one cylinder?

A. The retract port on the affected cylinder has a restricted fitting, a partially collapsed hose, or debris in the passage that limits the flow rate entering the rod-end chamber during the retraction stroke

B. The cylinder piston seal on the affected outrigger is leaking internally allowing fluid to bypass from the rod-end to the cap-end during retraction reducing the net retraction force and speed significantly

C. The flow control valve for the affected outrigger circuit is set to a lower flow rate than the other three circuits limiting the retraction speed to the valve's restricted setting rather than the full pump flow rate

D. The counterbalance valve on the affected outrigger is not opening fully during the retraction command and is restricting the flow exiting the cap-end of the cylinder as it retracts under the outrigger's own weight

126. A hydraulic system's temperature gauge reads 95°C during normal operation. The maximum recommended operating temperature for the system's petroleum-based hydraulic oil is 82°C. What is the primary concern with operating at this elevated temperature?

A. The hydraulic cylinders will lose their seal integrity because the elevated temperature causes the nitrile rubber O-rings to soften and extrude past the piston groove edges during pressure cycling events

B. The directional control valve spools will seize in their bores because the thermal expansion of the steel spool exceeds the bore clearance at temperatures above the oil's recommended maximum operating temperature

C. The hydraulic hoses will soften and swell from the elevated oil temperature reducing their burst strength to a level below the system's operating pressure creating a rupture risk during normal operation

D. The elevated temperature accelerates oil oxidation and viscosity breakdown, reduces the oil film strength at bearing surfaces, degrades seal materials progressively, and shortens the service life of all system components

127. A dump truck hydraulic system has a pilot-operated check valve (POCV) installed in the raise circuit to hold the dump body in any raised position. The body slowly drifts downward when held at a partial-raise position. What is the most likely cause?

A. The pilot-operated check valve's internal poppet has a worn seal or seat that allows a small amount of fluid to leak past in the reverse direction under the load pressure of the raised dump body

B. The directional valve spool has a slight internal leak in the neutral position that allows pressurized fluid from the hold port to drain slowly to the reservoir port through the spool's internal clearance

C. The pilot-operated check valve is functioning correctly but the hydraulic fluid has thinned from overheating and the reduced viscosity allows the fluid to seep past the valve's designed clearances faster

D. Both the pilot-operated check valve and the directional valve should be investigated because either component could independently cause the drift condition described by the dump body slowly lowering

128. A PTO-driven hydraulic system on a utility truck powers an aerial platform. The PTO has been replaced due to a gear failure. After the replacement, the hydraulic system functions but the pump produces a rhythmic pulsation that was not present with the old PTO. What should be checked?

A. The PTO mounting bolt torque because an unevenly torqued PTO housing creates a slight misalignment between the PTO output shaft and the pump input shaft producing a rhythmic pulsation at the mesh frequency

B. The PTO gear mesh with the transmission gear — the replacement PTO may have a different tooth count, tooth profile, or gear width that creates a pulsating output from an imperfect mesh with the transmission gear

C. The hydraulic pump for coincidental internal damage that occurred during the PTO gear failure event — debris from the failed PTO gear may have entered the pump and damaged the internal components

D. The PTO output shaft coupling alignment with the hydraulic pump input shaft — a new PTO may have different shaft dimensions or runout that creates a misalignment producing the rhythmic pulsation

129. A hydraulic system's return filter has a 10-micron rating. The pump manufacturer specifies a system cleanliness level of ISO 18/16/13. The system has been operating for 2,000 hours and an oil sample shows the cleanliness level at ISO 20/18/15. What action should be taken?

A. The filtration system needs improvement — upgrade the return filter to a finer rating, add a pressure filter if not present, and consider an offline filtration (kidney loop) system to achieve the target cleanliness

B. The current cleanliness level is within acceptable tolerance of the specification and no action is needed — a two-code-number deviation from the target is normal for a system with 2,000 operating hours

C. Drain and replace all the hydraulic fluid with new fluid that meets the ISO 18/16/13 specification — the contaminated fluid has exceeded its useful life and filtration alone cannot restore the required cleanliness

D. The oil sample was likely contaminated during the sampling process and should be retaken using proper clean-sampling procedures before making any system modifications or fluid replacement decisions

130. A hydraulic cylinder is being bench-tested. With 15,000 kPa applied to the cap-end port and the rod-end port blocked, the piston drifts 25 mm in 10 minutes. With the ports reversed (pressure on rod-end, cap-end blocked), the piston drifts 5 mm in 10 minutes. What does the difference in drift rates indicate?

A. The cap-end piston seal is leaking more than the rod-end seal because the higher pressure acting on the larger cap-end area forces more fluid past the worn seal surface during the extension pressure test

B. The rod seal (gland seal) is leaking externally and fluid is escaping from the cylinder during the cap-end pressure test but the leakage is not visible because it is dripping inside the test fixture enclosure

C. The piston seal is leaking internally in both directions but the drift rate is higher with cap-end pressure because the full piston area produces a greater force pushing fluid past the seal than the reduced rod-end area

D. The piston seal leaks at a consistent rate regardless of which side is pressurized — the faster drift during cap-end pressurization occurs because the cap-end volume is larger and the same leak rate displaces the piston further

131. A hydraulic system uses a load-sensing pump that adjusts its displacement based on the work demand. When no function is activated, the pump should destroke to minimum displacement and the system pressure should drop to standby. A technician measures the standby pressure at 3,000 kPa — the specification is 1,500 kPa. What does the elevated standby pressure indicate?

A. The pump's load-sensing circuit has a restriction or contamination that is sending a false load signal to the pump compensator telling it to maintain a higher displacement and pressure than needed at standby

B. The main system relief valve has shifted its setting downward and the pump is responding by increasing its standby pressure to compensate for the perceived lower maximum pressure in the working circuit

C. The load-sensing line between the directional valve and the pump compensator has a restriction or blockage that prevents the compensator from receiving the correct no-load signal to reduce pressure to standby

D. The pump compensator spring has increased in tension from heat cycling and age requiring a higher standby pressure to overcome the stiffer spring force and destroke the swash plate to minimum displacement

132. A parallel hybrid truck's traction motor is mounted between the engine and the transmission. During a transmission replacement, the technician must separate the engine from the transmission. What special consideration applies to the hybrid traction motor during this procedure?

A. The traction motor must be removed from the vehicle separately before the transmission can be unbolted from the engine because the motor is not designed to support its own weight without the transmission

B. The high-voltage system must be fully de-energized following the complete de-energization procedure before any work is performed on the motor or the motor-to-engine/transmission connection is disturbed

C. The traction motor can remain connected to the engine during the transmission replacement as long as the motor's cooling system is disconnected first to prevent coolant spillage during the separation process

D. The traction motor should be tested for residual magnetism before the transmission is separated because permanent magnet motors can generate voltage from any rotation of the rotor during the removal process

133. A battery-electric truck's thermal management system for the high-voltage battery pack uses a liquid coolant circuit with a dedicated pump, heat exchanger, and chiller. The BMS reports battery cell temperatures 15°C above the normal range during highway driving. What should be investigated?

A. The high-voltage battery's internal cell connections for increased resistance that is generating additional heat within the pack beyond the thermal management system's design cooling capacity

B. The vehicle's main engine cooling system for a crossover leak that is transferring heat from the engine to the battery cooling circuit through a shared heat exchanger or common coolant pathway

C. The drive motor inverter for excessive switching losses that are radiating heat into the battery compartment through the shared mounting structure between the inverter housing and the battery enclosure

D. The battery thermal management coolant level, pump operation, heat exchanger condition, and chiller function for a fault that prevents adequate cooling of the battery pack during sustained high-power operation

134. A hybrid truck's regenerative braking system has a fault code indicating the regenerative braking torque is being limited by the BMS. The battery state of charge is at 95%. Why is the BMS limiting regenerative braking?

A. The battery is near full charge and cannot safely accept additional energy from regenerative braking — the BMS limits regen torque to prevent overcharging the cells beyond their maximum voltage specification

B. The battery has degraded to the point where it can no longer accept charge current at any state of charge and the BMS is protecting the cells from any additional energy input regardless of the SOC level

C. The regenerative braking motor has overheated and the BMS is reducing the braking torque to prevent thermal damage to the motor windings rather than to protect the battery from overcharging conditions

D. The ABS system has commanded a reduction in regenerative braking torque because the high SOC creates excessive braking force that would lock the drive wheels during normal deceleration braking events

135. A technician is performing a routine inspection on a battery-electric truck. The inspection checklist includes verifying the condition of the high-voltage interlock loop (HVIL). What is the purpose of the HVIL?

A. The HVIL prevents the vehicle from being driven above a set speed limit when the high-voltage system detects a component temperature above the safe operating range for the battery cells

B. The HVIL is a safety feature that provides an additional lock on the service disconnect plug preventing it from being removed without a special tool to ensure only qualified technicians access the HV system

C. The HVIL is a low-voltage circuit that runs through all high-voltage connectors — if any connector is opened the loop breaks and the system commands the main contactors to open disconnecting HV power

D. The HVIL monitors the high-voltage cable insulation resistance continuously during driving and commands a vehicle shutdown if the insulation resistance drops below the minimum safe threshold value

# Practice Exam 6: Answer Key and Explanations

1. C — Undercoating materials (rubberized coatings, asphalt-based products, and petroleum-based sealants) produce toxic fumes including hydrogen cyanide, carbon monoxide, and other hazardous gases when heated by a welding arc. Additionally, the coating prevents the weld from fusing properly with the base metal. All undercoating must be completely removed from the weld zone and surrounding area before welding.

2. A — Gasoline has an extremely low flash point (-43°C) and produces flammable vapours at any normal shop temperature. These vapours are heavier than air and spread along the floor to ignition sources such as sparks from grinders, electrical equipment, or static discharge. Using gasoline as a cleaning solvent in a shop creates an immediate fire and explosion hazard.

3. D — A driver who suspects unsafe cargo securement must refuse to operate the vehicle until a qualified person evaluates and corrects the situation. Operating with improperly secured cargo puts the driver, other motorists, and the public at risk. The driver has a legal obligation and regulatory protection to refuse to drive until the cargo meets securement standards.

4. B — Confined space entry regulations require a trained standby attendant positioned outside the confined space at all times while anyone is inside. The attendant monitors the entrant, maintains continuous communication, and is prepared to summon emergency rescue if the entrant becomes incapacitated. The attendant must never enter the space to attempt a rescue.

5. A — A gap exceeding 3 mm between the tool rest and the grinding wheel allows the workpiece to be pulled into the space by the wheel's rotational force. The workpiece can jam between the rest and the wheel, shattering the wheel or launching the workpiece at the operator. The tool rest must be adjusted to within 3 mm of the wheel face before operation.

6. D — When brakes have been applied for an extended period in freezing conditions, moisture between the brake linings and drum surface can freeze, bonding them together. Before applying force to move the vehicle (which could damage the brake shoes or drum), the technician should check for this frozen-lining condition and apply controlled heat to thaw the bond.

7. B — The starter motor's B+ terminal carries full battery voltage at all times (it is connected directly to the battery through the main cable). A metal socket resting on the starter can bridge the B+ terminal to

the grounded housing, creating a dead short circuit. This can arc-weld the tool to the starter, melt the battery cables, ignite nearby materials, or cause battery explosion.

8. A — "Brakes OK" provides no specific information about what was inspected, what measurements were taken, or what condition was actually found. Regulatory compliance requires documentation of specific components inspected, measurements compared to specifications, defects identified, and corrective actions taken. Vague entries provide no value for audits or future reference.

9. C — A visibly cooler exhaust manifold on one cylinder during full-load operation indicates that cylinder is producing less combustion heat than the others. The most likely causes are a failed or clogged injector (no fuel delivery), low compression (mechanical failure), or incorrect valve timing on that cylinder — all of which reduce the combustion energy and resulting exhaust temperature.

10. D — Removing 0.25 mm from the cylinder head deck surface reduces the combustion chamber volume at TDC. With the same swept volume but a smaller clearance volume, the compression ratio increases. The change is typically small but must be verified against the manufacturer's maximum resurfacing limit to prevent excessive compression that could damage pistons or head gaskets.

11. B — Pressurizing the coolant side while observing the oil level provides a definitive test. When coolant system pressure causes the oil level to rise, coolant is crossing from the pressurized cooling circuit into the oil circuit. The oil cooler's internal core is the barrier between these two systems, and the rising oil level confirms a breach in the core.

12. A — A sudden, loud ticking from the valve cover area that increases with RPM suggests a catastrophic valve train component failure. A broken rocker arm, collapsed lifter, or fractured pushrod allows one valve to remain closed while the remaining components tick against the valve stem tip. This is distinct from gradual lash increase, which develops over thousands of kilometres.

13. C — During sudden throttle release, the fuel demand drops to near zero but the high-pressure pump's mechanical inertia and the metering valve's response time create a brief overshoot. The pressure relief valve should open to vent this excess pressure. If the valve is sluggish or its cracking pressure has shifted upward, the momentary overpressure spike exceeds the commanded value and sets the fault.

14. D — The power balance test confirms cylinder 3 is not contributing. Disabling an injector that is already not firing produces no RPM change — the engine loses nothing because that cylinder was

already dead. The cause is either a failed injector (not delivering fuel) or a mechanical failure (low compression, valve timing) preventing combustion on that cylinder.

15. B — Ethylene glycol coolant has a counterintuitive property: increasing the glycol concentration beyond approximately 60% actually raises the freeze point rather than lowering it. A 70% glycol mixture freezes at approximately -55°C... except that it also significantly reduces the coolant's heat transfer efficiency, making the engine more prone to overheating. The optimal range is 50-60%.

16. A — Intermittent black smoke puffs after a charge air cooler replacement point to a connection issue in the newly installed components. A slight misalignment, improperly seated boot, or a clamp that is not fully tightened on the new charge air cooler piping can create a boost leak that whistles briefly during peak boost demand, losing pressurized air and causing momentary rich combustion.

17. D — With normal blow-by confirmed by the breather tube measurement and a new CCV filter installed, the crankcase ventilation system is functioning correctly. The fault code for high crankcase pressure is most likely caused by a faulty crankcase pressure sensor or a wiring issue producing an inaccurate reading that triggers the code despite actual conditions being normal.

18. C — Active regeneration burns soot (carbon) but cannot remove ash. Ash is the non-combustible mineral residue from engine oil additives (calcium, zinc, phosphorus, magnesium) that accumulates in the DPF over the engine's life. No amount of regeneration removes ash — it must be removed by physical cleaning (typically pneumatic or water-based cleaning at a specialized facility).

19. B — A whistle during acceleration that disappears at steady state, with normal boost pressure, is most commonly a small leak in the pressurized intake plumbing. During the transient pressure buildup of acceleration, high-velocity air escapes through the small gap. At steady state, the stable pressure may seal the gap or the flow velocity changes eliminate the whistle frequency.

20. A — With identical engines, transmissions, axle ratios, tires, and maintenance, the most significant vehicle-related variable affecting fuel economy is aerodynamic condition. Missing, damaged, or misaligned aerodynamic devices (roof fairings, side extenders, chassis fairings, trailer skirts) increase drag and can reduce fuel economy by 10-15% on highway routes.

21. D — Oil consumption of 0.25 litres per 1,000 km is well within the OEM's maximum acceptable rate of 0.5 litres per 1,000 km. At 400,000 km, some oil consumption is expected from normal ring and

guide wear. The rate should be documented, tracked at each PM service, and used to plan for an overhaul when it approaches the maximum threshold.

22. C — The DEF quality sensor detected off-specification fluid immediately after refilling from a bulk source. The most likely cause is contaminated, diluted, expired, or incorrect-concentration DEF from the bulk supply. DEF degrades from heat exposure, contamination with other fluids, or dilution with water — all of which alter the 32.5% urea concentration the sensor monitors.

23. B — Some compression brake systems monitor engine oil pressure and disengage the retarder if oil pressure drops below a minimum threshold. During extended continuous use, the oil temperature rises, viscosity decreases, and oil pressure at the slave pistons may drop below the minimum needed to hold the exhaust valves open. The system disengages as a protection measure.

24. A — After pressing a new injector cup into the head bore, the cup must be pressure-tested to verify the seal between the cup and the head is watertight. Coolant circulates around the outside of the cup, and if the press-fit seal is inadequate, coolant will leak into the combustion chamber or the cup will eject under combustion pressure. Testing before reassembly prevents a repeat teardown.

25. D — White smoke during DPF regeneration results from the late-post fuel injection delivering more unburned hydrocarbons to the exhaust than the DOC can fully oxidize. The excess fuel vapour passes through the DPF and exits the tailpipe as white smoke. An oversized late-post injection, a degraded DOC, or a faulty fuel injector can all contribute to this condition.

26. C — A shorter-than-specification relief valve spring exerts less force on the valve poppet. Since the valve opens when oil pressure overcomes the spring force, a weaker spring allows the valve to open at a lower pressure than the design specification. The pump's output is bypassed back to the sump at this lower threshold, and the engine runs with reduced oil pressure.

27. B — An engine that starts, runs for 10 seconds, and stalls repeatedly with no fault codes and normal fuel pressure during the brief running period suggests a fuel supply interruption. A blocked fuel tank vent creates a vacuum as fuel is consumed. The engine runs until the vacuum overcomes the transfer pump's suction capability, then stalls. Air entering through the fuel cap or filler neck briefly relieves the vacuum, allowing a restart.

28. A — A recurring fault for an implausible pressure sensor signal that persists after sensor replacement points to a problem at the sensor's measurement point. The rail pressure sensor mounting

port can accumulate carbon deposits, develop micro-cracks, or have debris that introduces pressure pulsations or signal noise the sensor faithfully reports but the ECM interprets as implausible.

29. B — After replacing the VGT actuator, a calibration procedure teaches the ECM the new actuator's physical endpoints — fully open and fully closed vane positions. Each actuator has slight manufacturing variations in travel range. Without calibration, the ECM cannot accurately command intermediate vane positions because it does not know the new actuator's actual mechanical limits.

30. A — A twin air dryer system operates on an alternating regeneration principle. While one cartridge actively dries the incoming compressed air, a portion of the dried air is routed through the second cartridge to purge it of accumulated moisture — regenerating the desiccant. On the next governor cycle, the cartridges swap roles. This provides continuous drying without the pressure loss of a full purge cycle.

31. C — When spring brakes are caged, the mechanical springs are compressed and held by the caging bolts — the brakes are released mechanically and cannot be applied by the spring mechanism. If air supply is lost during towing, the trailer has no parking brake capability. The trailer will roll freely without any means of self-braking, creating an extreme hazard on any grade.

32. B — One or more brake chambers with excessive pushrod stroke (from worn linings, maladjusted automatic slack adjusters, or drum expansion) require more air volume to fill the additional chamber travel before the diaphragm pushes the lining into contact with the drum. The pedal travels further before braking begins because the extra chamber volume must be pressurized first.

33. B — Brake squeal during light disc brake applications with adequate pad material and smooth rotors is most commonly caused by a missing, damaged, or improperly installed anti-squeal shim. The shim dampens the high-frequency vibration between the pad backing plate and the caliper piston. Without this dampening, the pad vibrates against the piston at an audible frequency.

34. A — Disconnecting the trailer and retesting isolates each unit. The tractor alone leaks at 7 kPa/min (within the 7 kPa/min limit for a tractor alone), and the combined test showed 20 kPa/min. The difference of 13 kPa/min is attributable to the trailer's air system. The trailer has leaks that must be found and repaired.

35. C — Both drums should be replaced as a matched pair. The 3.5 mm diameter difference between left (416.5) and right (420.0) means the drums have significantly different wall thicknesses and thermal

mass. Different wall thicknesses cause unequal heat absorption during braking, producing unequal braking force side-to-side and potentially dangerous pulling during stops.

36. B — The ABS commands the modulator to release pressure, but the wheel continues decelerating toward lockup. The modulator valve is stuck in the apply position — it cannot physically shift to the release position despite receiving the electrical command. The trapped pressure continues to apply the brake at full force, and the ABS cannot intervene.

37. A — The dual-circuit system is designed so that each circuit operates independently. If the primary circuit loses all pressure, the secondary circuit's one-way check valve isolates it from the failed primary side. The secondary continues providing braking on its designated axle group. If supply pressure also drops, the spring brakes apply automatically as a final backup.

38. B — ABS rapid-cycling the front brake pressure creates a pulsating drag force on the steer tires. Each pressure pulse applies and releases brake force at the steer wheels, and this alternating drag is transmitted mechanically through the steering linkage — king pins, tie rod, drag link, and steering gearbox — to the steering wheel as a rapid vibration the driver feels.

39. D — Hard spots form when specific areas of the cast iron drum surface are heated to a temperature that causes a metallurgical phase change (transformation to martensite). These hardened areas resist wear differently than the surrounding softer material, creating raised spots that develop over thousands of braking cycles and produce a pulsation during braking.

40. A — The primary circuit reads 825 kPa (normal) but the secondary reads 350 kPa — below the low-pressure warning threshold of 380-415 kPa. The warning activates because the secondary circuit has lost pressure while the primary remains normal. This pattern indicates a leak isolated to the secondary circuit that must be found and repaired.

41. B — The initial clock position of a Haldex automatic slack adjuster on the S-cam splines establishes the internal gear mesh relationship that determines the adjustment direction. Installing the adjuster at the wrong clock position can cause it to adjust in the wrong direction — loosening the brake rather than tightening it — or to bind mechanically during the adjustment cycle.

42. D — The driver needs increasingly frequent brake applications to maintain the same speed because each application generates less braking force than the previous one. The drums are heating from

repeated use, and the friction material's coefficient of friction decreases with rising temperature — the defining characteristic of brake fade.

43. A — The emergency relay valve protects the tractor's air supply by automatically closing if a severe air loss occurs in the trailer circuit. A cracked housing could allow the tractor's supply air to drain through the trailer's damaged component instead of being contained on the tractor side, potentially leaving the tractor without adequate braking pressure.

44. A — The ATC lamp on with ABS lamp off indicates a fault specific to the traction control system components or its interface with other systems. The ATC uses the ABS wheel speed sensors and modulators plus additional features (engine torque reduction, differential brake application). A fault in the ATC-specific components disables traction control while the base ABS continues operating.

45. B — Although the drum diameter of 418 mm is within the 422 mm maximum, the wall thickness of 7 mm is below the 8 mm minimum specification. A drum with insufficient wall thickness cannot safely absorb the thermal energy of braking — it may crack, distort, or fail under the heat of normal braking. Both diameter and wall thickness must meet specification simultaneously.

46. D — The hissing sound during brake release is the normal exhaust of application air through the quick-release valves. Quick-release valves are positioned near the brake chambers specifically to provide a rapid local exhaust path for the compressed air, avoiding the delay of sending the air back through the long supply lines to the foot valve.

47. C — The returning active code represents a current, ongoing fault that the road test reproduced. The three codes that stayed cleared were caused by a previous condition that no longer exists — they may have been transient faults from a temporary condition (low voltage, vibration, temperature) or secondary effects of the active fault that were resolved when the codes were cleared.

48. B — Beyond failed rectifier diodes, a stator phase winding with intermittent continuity can produce excessive ripple. When the intermittent winding drops out momentarily, the three-phase output becomes temporarily two-phase, creating large gaps in the rectified DC waveform that appear as elevated AC ripple. The winding reconnects and drops out cyclically.

49. A — A single-pole double-throw (SPDT) dimmer switch has a common input terminal and two output positions — low beam and high beam. The switch physically connects battery power to one or

the other but never both simultaneously. Selecting high beam disconnects the low beam circuit at the switch, dropping its voltage to zero.

50. B — The solenoid tests good on the bench (coil and mechanism are functional). In the vehicle circuit, the solenoid doesn't energize with the key on. The fuel shutoff solenoid on many mechanically-injected diesels is energized through a circuit that includes the ignition switch run position, a fuse, possibly a relay, and the wiring. An open in any of these prevents voltage from reaching the solenoid.

51. D — An inverted fuel gauge reading — full when empty and empty when full — indicates the sending unit's resistance range is opposite to what the gauge or ECM expects. The most common cause is an incorrect replacement sending unit that has the reversed resistance characteristic (high at empty / low at full instead of the vehicle's specified low at empty / high at full, or vice versa).

52. C — Gradual cranking speed decrease over months with consistently good battery tests and acceptable voltage drop readings suggests a slowly increasing resistance somewhere in the starter circuit that is not detectable during standard terminal inspections. Corrosion building under the cable insulation jacket near the terminal crimps is invisible but progressively increases resistance.

53. A — PLC signals are high-frequency data signals superimposed on the DC power wiring. These signals require clean, low-resistance connections to transmit successfully. The seven-pin connector's pin 7 may pass enough DC power to operate the ABS module (the module needs only a few amps) but the high-frequency PLC data signal is attenuated by the connector resistance below the receiver's detection threshold.

54. D — With correct belt tension and alignment, intermittent squealing during acceleration points to a momentary mismatch between belt grip and the load spike. The alternator's front bearing developing increased friction creates a higher torque demand that exceeds the belt's grip capacity during the brief acceleration transient, causing the belt to slip and squeal momentarily.

55. A — A high-resistance ground shared between the turn signal circuit and the interior light circuit creates a common impedance. When the turn signal draws current through the shared ground, the resulting voltage drop at the ground point affects the voltage available to the interior lights, causing them to dim in rhythm with the turn signal flashing.

56. C — FMI 7 (mechanical system not responding) indicates the ECM is commanding an actuator position but the mechanical system is not achieving it. The sensor is reporting accurately — the valve

physically is at 12% when 50% is commanded. The valve mechanism is stuck from carbon deposits, corrosion, or mechanical failure preventing it from moving to the commanded position.

57. A — Progressive image darkening over months on a backup camera is consistent with CCD/CMOS sensor degradation from prolonged UV and direct sunlight exposure. The light-sensitive elements on the imaging chip degrade permanently, reducing their sensitivity over time. This is a known failure mode for externally mounted cameras without adequate UV filtering.

58. C — If a battery disconnect switch completely removes all battery power when open, the vehicle should have zero parasitic drain and the batteries should not die. If the batteries died with the switch off, the batteries themselves likely had a pre-existing condition (weak cells, internal self-discharge, or sulfation) that caused them to drop to zero independently.

59. A — An injector coil reading 0.5 ohms against a specification of 0.8-1.2 ohms has fewer effective turns due to shorted windings. The reduced resistance causes the injector to draw more current than the ECM driver circuit was designed to supply, which can overheat and damage the ECM driver transistor and cause incorrect fuel delivery from altered solenoid response timing.

60. B — In a multiplexed system, individual fuses still protect the high-current output circuits between the body controller and the lamps. With one headlamp working and the other not (same switch, same controller), the most common cause is a blown fuse for the non-functioning headlamp's dedicated output circuit. Check the fuse before investigating the controller or CAN bus.

61. D — A single loud click followed by no cranking with 12.6V resting voltage can indicate the solenoid pulls in (click) but cannot hold. If the hold-in winding fails, only the pull-in winding energizes — it pulls the plunger in but cannot maintain it. The plunger immediately releases, producing a single sharp click. With both windings, the hold-in maintains engagement after pull-in starts the movement.

62. A — The scan tool reading of 185°C does not correspond to a realistic coolant temperature for a normally operating engine, and the dash gauge reads in the normal range at 88°C. The most likely explanation is a units error — 185°F converts to approximately 85°C, which aligns with the dash gauge. The scan tool may be displaying the parameter in Fahrenheit.

63. C — Individual wire repairs with sealed crimps address the conductor damage, but the harness section also needs its mechanical and environmental protection restored. Re-wrapping with harness tape

and installing split-loom or protective conduit over the repaired area restores the original protection against abrasion, moisture, road debris, and UV degradation.

64. A — An intermittent fault (SPN 84, FMI 2 — erratic) with brief dropout periods that self-resolve points to an intermittent connection. A corroded connector pin, chafed wire, or loose terminal in the speed sensor circuit makes and breaks contact with vehicle vibration or temperature changes, producing momentary signal loss that the ECM logs as an erratic/intermittent fault.

65. D — The EPS motor temperature exceeding its maximum indicates the motor is generating more heat than it can dissipate. Excessive internal resistance from worn brushes, corroded commutator segments, or bearing friction causes the motor to convert more electrical energy to heat rather than mechanical output. The degraded motor works harder for the same steering assist, generating excessive heat.

66. A — Standard automotive fuses are designed with a time-current characteristic — they tolerate brief overloads but blow under sustained overcurrent. A 20-amp fuse carrying 22 amps continuously will gradually heat up from the excess current. The accumulated heat will eventually melt the fuse element, but not instantaneously. The fuse will fail after a period of operation.

67. A — Pulling the ECM fuse removes power not only from the ECM but from every sensor, actuator, and accessory powered through that fuse circuit. The 2.2-amp draw could be from the ECM itself, or from any component on that circuit — a fuel solenoid, a relay coil, a sensor heater, or an aftermarket device tapped into the ECM power supply. Further isolation is needed.

68. A — Replacing the timer relay with a unit that has a longer activation cycle addresses the complaint directly. The timer's purpose is to prevent the heating elements from overheating, and a relay rated for a longer cycle time by the manufacturer is designed to operate safely for the extended period. Bypassing the timer entirely removes the overheat protection.

69. D — A noise present in all high-range gears but absent in all low-range gears must originate from a component that is loaded differently between the two ranges. In a range-type auxiliary section, the power path changes between low and high range, loading different bearings and gears. The auxiliary section input gear bearing is loaded in high range but bypassed in low range.

70. B — A clutch pedal that slowly sinks to the floor under sustained pressure and recovers on re-application is the classic symptom of a master cylinder with worn internal piston seals. Under sustained pressure, fluid bypasses the worn seal and the pedal sinks. Releasing and quickly reapplying repositions the seal momentarily, restoring pedal height temporarily.

71. A — The AMT controller continuously measures the clutch engagement point (touch point) position. As the friction disc wears, the engagement point shifts progressively. When the shift reaches a threshold that indicates the disc is approaching its wear limit, the controller sets the wear indicator code to alert maintenance that clutch replacement should be planned.

72. C — A 3 mm dent in a driveshaft tube changes the shaft's critical speed, creates a rotational imbalance, and introduces a stress concentration at the dent. Under the torsional and centrifugal loads of highway operation, the stress concentration can fatigue and crack. The shaft should be replaced rather than returned to service with the dent.

73. D — Carrier bearing preload is increased by removing shims equally from both sides of the carrier bearing cap assemblies. Removing equal amounts from each side squeezes the carrier tighter into the housing bore, increasing the lateral load on both carrier bearings simultaneously without changing the backlash setting.

74. A — Fine metallic particles on the drain plug magnet combined with a speed-dependent whine in four-wheel drive confirm progressive internal wear. The particles are from gear teeth or bearing surfaces that are deteriorating under the loads of four-wheel-drive operation. The transfer case internals require inspection and likely rebuilding or replacement.

75. C — Deep blue discolouration indicates the flywheel surface reached temperatures above 300°C, which changes the cast iron's metallurgical structure. The surface may develop hard spots, heat checks (surface cracks), and altered hardness characteristics. Machining alone may not remove the depth of heat-affected material. The flywheel should be replaced to ensure reliable clutch engagement.

76. D — The scan tool shows the lockup solenoid is commanded on, but lockup doesn't occur. The solenoid's electrical connection, the solenoid's mechanical function (whether it actually moves the valve), and the valve body's hydraulic lockup circuit must all be checked. The command chain from ECM to solenoid to valve to clutch piston has multiple potential failure points.

77. B — Changing the rear axle ratio changes the relationship between transmission output speed and vehicle speed. The ECM or instrument cluster calculates vehicle speed from sensor pulses — if the axle ratio changes but the calibration stays the same, the speed calculation is incorrect. The tire revolutions per kilometre parameter must be updated to reflect the new ratio.

78. A — Milky grey gear oil is the diagnostic hallmark of water contamination. Water enters the axle through failed axle shaft seals (which are submerged during rain and water crossings), a compromised axle housing vent, or a cracked housing. The churning gears emulsify the water with the oil, producing the characteristic milky grey appearance.

79. B — A worn pivot ball stud allows the clutch release fork to move laterally. This changes the fork's effective position on the stud with each pedal cycle, which changes the geometry between the fork, the release bearing, and the pressure plate fingers. The result is inconsistent pedal free play — it varies depending on where the fork settles on the worn stud.

80. B — A drive-side contact pattern at the heel indicates the ring gear is too close to the pinion. Decreasing the backlash moves the ring gear closer — which worsens the heel pattern. The correct adjustment is the opposite: increase backlash by moving the ring gear away from the pinion, which shifts the drive-side pattern from the heel toward the centre.

81. D — Repeated "clutch overheat" warnings during normal stop-and-go driving with correct driver technique suggest the AMT's clutch cooling capacity is insufficient for the duty cycle. A restricted air passage in the bell housing cooling system prevents adequate airflow to dissipate the heat generated during the frequent low-speed clutch engagements.

82. C — The inter-axle differential (power divider) functions like any open differential — it sends torque to the axle with the least resistance. Without the lock engaged, the spinning axle in the mud receives all the torque while the axle with traction receives none. Engaging the inter-axle differential lock forces both axles to turn together, distributing torque to the axle with traction.

83. A — With correct fluid level and clean fluid, a "main pressure low" code points to the transmission oil pump. A worn pump with enlarged internal clearances cannot maintain the required main line pressure, especially at lower engine RPM when pump output is reduced. The worn pump allows excessive fluid to leak internally rather than building pressure.

84. D — A howl present during both acceleration and coast but with different pitch characteristics indicates the gear mesh is affected in both loading directions. The pitch changes because the contact point on the teeth shifts between the drive face (under power) and the coast face (during deceleration). This pattern indicates a general backlash or pinion depth setup error.

85. A — The butterfly valve operates correctly when tested, but the exhaust brake is less effective. An exhaust leak between the turbocharger outlet and the butterfly valve allows exhaust gas to escape the system before reaching the closed valve. This bypass reduces the exhaust restriction that creates the backpressure needed for effective exhaust braking.

86. C — With all external linkage components, king pins, and wheel bearings verified tight, the remaining source of free play is inside the steering gearbox. Internal wear in the recirculating ball mechanism, worn worm shaft bearings, or worn sector shaft bushings create play that is only detectable by testing the gearbox independently of the external components.

87. B — All steering components are mechanically within specification, but the driver reports a vague feel during highway driving. A failed or worn steering damper allows the steer wheels to react to every road surface irregularity without any hydraulic resistance, creating a subjective sensation of imprecise or wandering steering that the driver perceives as instability.

88. A — Frame rail splice welds that crack within 6 months indicate the weld procedure was deficient. Common deficiencies include wrong electrode type for HSLA steel, insufficient preheat, poor joint preparation, inadequate penetration, or improper weld profile. Even in a low-stress zone, a defective weld will crack under the continuous dynamic loading of a truck frame.

89. C — Centre tread wear with adequate edge depth is the signature of chronic over-inflation. Excessive pressure causes the tread to crown outward, concentrating all ground contact on the centre of the tread. The edges carry no load and show minimal wear. The tire may show correct pressure at the current check because inflation fluctuates with temperature and was historically set too high.

90. B — An air spring with a visible bulge in its sidewall has an internal structural failure — the reinforcing cords have separated or broken, allowing the rubber to deform outward under pressure. This bulge will grow and eventually rupture, causing sudden loss of support at that wheel position under load. The spring must be replaced before it fails catastrophically.

91. A — The rack support yoke (also called a slider bearing or wear pad) maintains the rack bar in firm contact with the pinion gear. When this yoke wears, the rack bar develops clearance in its housing. Road impacts push and pull on the tie rod ends, and the loose rack bar shifts in its housing, producing the clunking noise.

92. A — Rubber spring eye bushings harden over time from heat cycling, ozone exposure, and chemical degradation. Hardened bushings lose their original compliance and can no longer absorb the initial bump energy the way soft rubber does. The stiffer bushings transmit more road impact force to the frame, making the ride feel progressively harsher.

93. C — Vertical movement of the king pin inside the fifth wheel throat with both components measuring within diameter specification indicates the king pin flange has worn on its underside. The reduced flange thickness creates a gap between the bottom of the flange and the fifth wheel plate surface, allowing the pin to lift vertically.

94. C — The 295/75R22.5 and the 11R22.5 are generally considered equivalent sizes in the commercial tire industry. Both have approximately the same overall diameter, section width, and load capacity when comparing equivalent load range ratings. This substitution is widely accepted and should not cause operational issues.

95. D — The bearing adjustment was performed correctly and the hub oil level may be correct, but the bearings were reinstalled without inspecting the races for pre-existing damage. Spalling, pitting, or brinelling on the bearing race surfaces would not have been detected visually during a standard adjustment procedure. The pre-existing damage has now progressed to produce noise.

96. B — Circular scuff marks on the wheel mounting surface indicate the wheel has been rotating on the hub pilot. The hub pilot surface has worn from years of service, and the pilot diameter is now slightly undersize. The wheel cannot center tightly on the worn pilot, and under dynamic loads, the wheel shifts and rotates despite properly torqued nuts.

97. D — Torque rods (control arms) locate the drive axle relative to the frame in all directions. A worn bushing allows the axle to shift position under dynamic loads (acceleration, braking, cornering), changing the axle alignment, driveline working angles, and tire tracking. The result is accelerated tire wear, potential vibration, and compromised vehicle stability.

98. B — A vehicle that pulls only during acceleration but tracks straight during cruise and braking has an asymmetric torque delivery issue. Unequal torque split between the left and right wheels — from a worn or damaged U-joint, an axle shaft issue, or a differential condition — creates a steering moment that is present only when drive torque is applied.

99. A — The sensor is new, the air gap is correct, and resistance is within specification. The fault returning immediately suggests the problem is with what the sensor reads — the tone ring. A damaged ring (missing or chipped teeth), an incorrect ring (wrong tooth count for the ABS calibration), or an improperly installed ring produces a signal the ABS module cannot process correctly.

100. C — The ATI system maintains pressure through rotary seals at each wheel end. A worn or damaged rotary seal on the affected wheel allows air to escape at the spindle-to-hub interface faster than the ATI system can replenish it. The other wheels maintain correct pressure because their seals are intact.

104. C — The broken sun visor has exposed a sharp metal mounting bracket edge. The immediate safety concern is not regulatory or aesthetic — it is physical injury. During a sudden stop or collision, the driver or passengers may be thrown against the headliner area. A sharp metal edge creates a serious laceration hazard that must be addressed before the vehicle operates.

105. A — With a replacement regulator unavailable, the driver needs to be able to raise the window. The most appropriate temporary measure is to remove the door panel, manually raise the glass, and physically secure it in the closed position with a wooden wedge, prop, or clamp. This keeps the window closed for weather and security until the part arrives.

106. D — The SRS warning lamp must illuminate during the ignition-on bulb check to confirm the lamp circuit is functional. If the lamp does not illuminate during the bulb check, the technician cannot verify whether the SRS system is operational — a failed lamp could mask an SRS fault that would otherwise alert the driver to a non-functional airbag system.

107. B — The cab anti-roll stabilizer bar (sway bar) resists lateral body roll during cornering and lane changes. If the bar, its bushings, or its end links are worn, damaged, or disconnected, the cab has no roll resistance beyond what the air springs provide. Correct air pressure maintains ride height but does not control roll — that is the stabilizer bar's function.

108. C — The cab tilt latch mechanism is a mechanical device with pivot points, engagement surfaces, springs, and a striker. Corrosion, lack of lubrication, wear on the engagement surfaces, or misalignment between the latch and striker all increase the release force required. Lubricating the pivot points and cleaning the engagement surfaces typically resolves the complaint.

109. C — Low suction pressure with a running compressor and clean coils has two primary causes: insufficient refrigerant (low charge from a leak reduces the mass of refrigerant in the evaporator, dropping suction pressure) or a restricted expansion valve (the TXV is not opening adequately to meter refrigerant into the evaporator, starving it). Both conditions produce the same low-suction-pressure symptom.

110. A — The trailer was pre-cooled to -20°C, then the doors were opened for loading. Warm moist air entered the trailer during loading, and the moisture condensed and froze on the cold evaporator coil as a heavy ice layer. This ice insulates the coil surface and blocks airflow, dramatically reducing cooling capacity. A defrost cycle should be run and the evaporator inspected.

111. D — Doors that open to 180° but not to 270° need extended-rotation hinges (also called 270-degree hinges). Standard 180-degree hinges physically cannot rotate past the 180-degree position. If the trailer was equipped with standard hinges instead of the correct 270-degree type (common during hinge replacement), the doors cannot fold flat against the sides.

112. B — The electric motor runs freely, confirming the motor works. But the landing gear doesn't move, confirming the mechanical connection between the motor and the gear mechanism is broken. A stripped gear, broken shaft, or failed coupling in the gear reduction between the motor output and the landing gear screwjack prevents torque transmission to the legs.

113. A — Over-adjusted brakes with very short pushrod stroke and dragging shoes on both sides of one axle indicate the automatic slack adjusters are tightening excessively. Severely out-of-round drums cause the shoes to alternately contact (tight spot) and clear (loose spot) with each rotation. The adjusters interpret the loose spot as excessive stroke and ratchet tighter, but the tight spot creates drag.

114. D — The trailer is overloaded by 1,000 kg beyond the axle group's rated capacity. This overstresses every component — tires operate above their load rating (increasing blowout risk), bearings carry loads exceeding their design capacity, suspension components are overstressed, and brakes must stop more weight than they are designed for. The load must be reduced to comply with the rating.

115. A — Yellowed, opaque marker lamp lenses reduce the light output below the level the new lenses provided. Regulatory standards specify minimum candela (brightness) requirements. If the degraded lenses reduce output below this minimum, the trailer is non-compliant. The lens colour filtering may also be affected, potentially altering the required amber or red colour output.

116. B — Both cylinders extend, but one side lifts higher than the other. If both sides receive equal pressure, the side that lifts less has a cylinder that cannot generate full force — an internal piston seal leak allows fluid to bypass the piston, reducing the effective extension force and speed on that side while the intact cylinder lifts normally.

117. A — The replacement compressor shipped with mineral oil is incompatible with the R-134a system's required PAG oil. Mineral oil does not mix with PAG or with R-134a refrigerant — the incompatible oils separate, reducing lubrication at the compressor's bearing and sealing surfaces. The resulting metal-to-metal contact produces the humming noise during operation.

118. D — The blend door reaches the full cooling position (maximum A/C works in mid-range) but the heater control valve is not fully closing in the max-cool position. A small amount of hot engine coolant continues flowing through the heater core, and the air passing through the core absorbs heat before mixing with the cooled air from the evaporator.

119. B — The auxiliary heater output is 75°C and the thermostat opens at 82°C. Since the heater output is below the thermostat's opening temperature, the thermostat should remain closed, directing all coolant through the heater core without radiator bypass. At 75°C, the heater core should produce adequate heat for cab warming — the auxiliary heater needs its combustion system serviced to increase output.

120. B — The system was properly evacuated (200 microns, held at 210) and correctly charged. Initial good cooling that deteriorates after 20 minutes with low-side dropping and high-side rising is the classic signature of moisture freezing at the expansion valve. Despite the thorough evacuation, trace moisture remained and progressively blocks the TXV orifice as ice builds.

121. C — Both heater hoses cool at the firewall confirms zero coolant flow through the heater core. With the engine at operating temperature (hot coolant available), the blockage must be at the entry point. A closed heater control valve (cable-operated, vacuum-operated, or electrically actuated) is preventing any hot coolant from entering the core circuit.

122. A — The clutch engages with direct power (proving the mechanism works) but not during normal operation. The A/C protection circuit includes low and high-pressure switches wired in series with the clutch relay control. If either switch is open (low refrigerant pressure opens the low-pressure switch, or high system pressure opens the high-pressure switch), the relay cannot energize and the clutch stays off.

123. C — The heater's exhaust pipe is intact and routed outside, but the heat exchanger inside the heater unit separates the combustion gases from the coolant circuit. If the heat exchanger develops a crack, combustion exhaust gases (including carbon monoxide) can enter the coolant, which then carries the dissolved gases to the cab heater core where they are released into the cab air.

124. B — Sluggish response from a variable-displacement piston pump with normal deadhead pressure points to a displacement control issue. The pump compensator, load-sensing circuit, or swash plate mechanism may be limiting the pump to less than maximum displacement during work demand. The pump can build pressure (deadhead proves this) but cannot deliver adequate flow.

125. A — One outrigger cylinder retracting slowly while the other three operate normally isolates the problem to that specific cylinder's circuit. A restricted fitting, partially collapsed hose, or debris in the rod-end port passage limits the flow rate into the rod-end chamber during retraction, slowing only that cylinder while the others receive unrestricted flow.

126. D — Operating at 95°C (13°C above the 82°C maximum) accelerates every failure mechanism in the system. Oil oxidation rate doubles with every 10°C temperature increase, viscosity drops reducing the lubricating film at bearing surfaces, seal materials degrade from the sustained heat exposure, and the progressive damage shortens the service life of pumps, cylinders, valves, and hoses.

127. D — Both the pilot-operated check valve and the directional valve could independently cause drift. The POCV's worn seat allows a slow trickle of fluid past the check poppet under load pressure, and a slight internal leak in the DCV neutral position allows fluid to drain from the cylinder port to the reservoir port. Both should be investigated to identify the actual leak source.

128. B — The PTO was replaced and a new rhythmic pulsation appeared. The replacement PTO may have a slightly different gear tooth profile, module, or tooth count that creates an imperfect mesh with the transmission's mating gear. The resulting gear mesh variation produces a rhythmic pressure pulsation in the pump output at the mesh frequency.

129. A — The actual cleanliness (ISO 20/18/15) exceeds the target (ISO 18/16/13) by two code numbers at each particle size, meaning the fluid contains significantly more particles than the system is designed to tolerate. The filtration system must be improved — finer filter elements, additional filtration stages, or an offline kidney-loop filtration system to bring the cleanliness to the target.

130. D — The piston seal leaks internally in both directions, but the drift rate differs because the effective area differs. With cap-end pressure, the full piston area pushes the fluid past the seal. With rod-end pressure, only the annular area (piston minus rod) pushes fluid past the same seal. Same seal leak — different force — different drift rate. The faster cap-end drift is a geometry effect, not a seal asymmetry.

131. C — The load-sensing line transmits the work demand signal from the directional valve to the pump compensator. A restriction or blockage in this line prevents the no-load (zero demand) signal from reaching the compensator. The compensator interprets the blocked signal as continued load demand and maintains the pump at higher displacement and pressure than needed at standby.

132. B — The high-voltage system must be fully de-energized before any work is performed on or near the traction motor or its connections. Separating the engine from the transmission involves disturbing the motor's physical mounting and electrical connections. Even with the vehicle off, the battery pack may have voltage present at the motor terminals through the main contactors.

133. A — Battery cell temperatures 15°C above normal during highway driving indicate the thermal management system cannot adequately cool the pack under sustained power demand. The coolant level, pump operation, heat exchanger, and chiller must all be inspected for faults that reduce cooling capacity — low coolant, a failed pump, a restricted heat exchanger, or a non-functioning chiller.

134. A — At 95% SOC, the battery is nearly full and has limited capacity to safely absorb additional energy. The BMS limits regenerative braking torque to prevent the cells from being overcharged beyond their maximum voltage specification. Overcharging lithium-ion cells causes lithium plating, gas generation, and thermal instability — the BMS protects against this by reducing regen.

135. C — The HVIL is a low-voltage safety circuit that runs through every high-voltage connector in the system. If any connector is opened (disconnected, improperly seated, or damaged), the loop breaks. The BMS detects the broken loop and commands the main contactors to open, disconnecting high-voltage power. This ensures that any opened connector is de-energized before a technician can contact the terminals.