PRACTICE EXAM 10: RED SEAL TRUCK AND TRANSPORT MECHANIC SIMULATION (135 QUESTIONS)

1. A technician is preparing to perform a clutch replacement on a Class 8 tractor. The transmission weighs approximately 400 kg. The shop has a transmission jack rated at 500 kg and a second jack rated at 250 kg. Which jack must be used?

A. The 500 kg rated jack because it exceeds the transmission weight and provides a safety margin — the 250 kg jack would be overloaded and could fail during the removal procedure

B. Either jack is acceptable because the transmission's weight is supported by the bell housing during removal and the jack only guides the unit — it does not carry the full weight at any point

C. The 250 kg jack with a helper technician assisting because two people and a lighter jack are safer than one person with a heavier jack during the confined space of a transmission removal

D. The 500 kg jack must be used but only after the clutch housing is unbolted first to reduce the combined weight of the transmission and clutch assembly below the 500 kg jack's capacity

2. A technician discovers that a truck's air tank has a manufactured date stamp of 2006. The tank shows surface corrosion on the exterior but no visible cracks or dents. Provincial regulations require air tanks to be inspected or replaced at specific intervals. What should the technician do?

A. Replace the tank immediately because any air tank over 10 years old is automatically condemned regardless of its physical condition under all provincial air brake safety regulations

B. The surface corrosion is only cosmetic and the tank is serviceable indefinitely as long as there are no visible cracks and the tank passes the standard air leak test during annual inspection

C. Verify the applicable provincial regulation for air tank inspection and replacement intervals and inspect or replace the tank according to the jurisdiction's specific requirements for the tank's age and condition

D. Drain the tank and perform a hydrostatic pressure test at 150% of the working pressure to verify the tank's structural integrity before returning it to service for another inspection cycle

3. During a brake job on a trailer, a technician drops a brake shoe and the shoe falls onto the concrete floor, chipping the friction material at one corner. The chip is approximately 20 mm × 10 mm. Can this shoe be installed?

A. The shoe can be installed because the chipped area is small relative to the total lining surface area and will wear smooth during the first few brake applications without affecting braking performance

B. The shoe can be installed in the trailing shoe position only where it carries less braking force and the chipped area will not significantly affect the braking performance on that axle position

C. The shoe can be installed if the chipped edge is filed smooth to prevent the sharp edge from scoring the brake drum surface during the initial bedding-in contact between the lining and drum

D. The shoe should not be installed because the chipped lining may have internal cracking from the impact that could cause a larger section to separate from the shoe table during braking under load

4. A technician is assigned to repair a hydraulic hose on a truck-mounted crane. The crane was in operation when the hose failed and the boom is currently extended and holding a load suspended approximately 3 metres above the ground. What is the first priority before beginning the hose repair?

A. Release the hydraulic pressure from the system by opening the manual bleed valve at the pump to depressurize the circuit before disconnecting any hydraulic fittings for the hose replacement

B. Lower the load safely to the ground using the crane's emergency lowering procedure before beginning any work on the hydraulic system that could release the boom's holding pressure unexpectedly

C. Support the boom with a chain sling attached to an overhead structure to prevent the boom from dropping if the holding valve releases during the hose disconnection and replacement procedure

D. Barricade the area under the suspended load and proceed with the hose repair quickly because the counterbalance valve will hold the load in position independently of the failed hose circuit

5. A shop uses a centralized lubrication system that delivers grease to multiple service bays through overhead reels. A technician notices that the grease dispensed from the reel has changed from its normal amber colour to a grey colour. What should the technician investigate?

A. The grease has been contaminated — either the bulk grease supply has been mixed with a different grease type, or moisture and metal particles from a worn pump have contaminated the grease in the distribution system

B. The grey colour indicates the grease has aged beyond its shelf life in the distribution system and has oxidized — the entire system should be purged and refilled with fresh grease from a new bulk container

C. The colour change is normal for grease that has been pumped through the distribution system and the shearing action of the pump and hoses changes the grease's thickener structure producing the colour shift

D. The grease reel hose inner liner has deteriorated and rubber particles from the degraded hose are mixing with the grease during dispensing — the reel hose should be replaced before the contaminated grease is used

6. A technician is removing the drive axle differential carrier from the axle housing. The carrier weighs approximately 180 kg. The technician plans to use a floor jack and a length of chain to support the carrier during removal. What is wrong with this plan?

A. A floor jack is rated for vertical lifting only and cannot safely support a differential carrier at the angle required to slide it horizontally out of the axle housing during the removal procedure

B. The chain may slip off the carrier during the removal because the carrier has no engineered lifting points and the smooth cast housing surface does not provide a secure chain attachment location

C. The floor jack will block the technician's access to the carrier bolts requiring the technician to reach around the jack during the removal which creates an ergonomic hazard from the awkward working position

D. A purpose-built differential carrier stand or a suitable fixture should be used because an improvised setup with a floor jack and chain risks the heavy carrier shifting or falling during the removal procedure

7. A technician observes another technician using a brass drift punch to drive a steel bearing race into an aluminium housing. The brass punch has developed a mushroomed head from repeated impacts. What is the safety concern with the mushroomed punch?

A. The mushroomed brass head has a larger contact surface that spreads the hammer force and may not drive the bearing race straight into the bore causing the race to cock and damage the housing

B. The brass mushroom will break off during the next hammer impact sending brass fragments into the work area that could contact the technician's eyes or skin causing injury from the flying debris

C. The mushroomed head can cause the hammer to glance off the punch at an angle deflecting either the hammer or the punch sideways and striking the technician's hand or the workpiece unpredictably

D. The mushroomed brass contaminates the bearing race seating surface with brass deposits that prevent proper bearing race-to-housing contact and create a galvanic corrosion cell between the dissimilar metals

8. A fleet shop has a technician who has developed a persistent skin rash on both hands. The technician works primarily on fuel systems and uses nitrile gloves occasionally but not consistently. What is the most likely occupational cause and what should be done?

A. The rash is caused by an allergic reaction to the nitrile glove material and the technician should switch to latex gloves which are hypoallergenic and provide better chemical protection than nitrile

B. Repeated exposure to diesel fuel, solvents, and cleaning chemicals without consistent glove use has caused occupational contact dermatitis — the technician should use chemical-resistant gloves consistently

C. The rash is from a bacterial infection caused by contaminated fuel that has entered the skin through micro-cuts on the hands — the technician should apply antibiotic ointment and continue working normally

D. The technician has developed a latex sensitivity from cross-contamination between latex and nitrile gloves in the shop supply and should be tested by an allergist before resuming work with any glove type

9. A heavy-duty diesel engine has been rebuilt with oversized pistons and honed liners. During the first 500 km of break-in operation, the oil consumption is 1.5 litres per 1,000 km. The OEM maximum acceptable rate after break-in is 0.5 litres per 1,000 km. Should the technician be concerned about the high initial consumption rate?

A. Yes — the consumption rate is three times the OEM maximum and indicates the pistons were installed with incorrect ring end gap clearance that will not improve with further break-in operation

B. Yes — the oversized pistons may be the wrong oversize for the honed liner bore diameter creating excessive piston-to-liner clearance that allows oil to pass the rings at a rate that will not improve

C. No — higher oil consumption is expected during the first 500 km while the new rings are seating against the freshly honed crosshatch pattern and will decrease as the ring faces conform to the bore surface

D. No — elevated oil consumption during break-in is normal for rebuilt engines as the new rings seat against the honed liner surface — the rate should decrease progressively over the first 5,000 to 10,000 km

10. A diesel engine equipped with a wastegate-type turbocharger has a complaint of reduced power at altitude. The truck operates at sea level normally but loses approximately 15% power when driving through mountain passes at 2,500 metres elevation. What is the cause?

A. The reduced atmospheric pressure at altitude decreases the air density at the compressor inlet — the turbocharger must compress thinner air to achieve the same boost pressure which reduces the mass of air delivered to the engine

B. The fuel injection system delivers less fuel at altitude because the barometric pressure sensor commands a fuel reduction to prevent the exhaust gas temperature from exceeding the turbocharger's thermal limit

C. The wastegate opens earlier at altitude because the reduced atmospheric pressure on the wastegate actuator diaphragm changes the reference pressure causing premature boost pressure relief during full load

D. The engine coolant boils at a lower temperature at altitude which triggers the ECM to reduce engine power through a thermal derate strategy to protect the engine from overheating during sustained high-altitude operation

11. A diesel engine's crankcase ventilation system routes gases through a heated hose from the valve cover to the intake manifold. During extreme cold weather operation (-35°C), the driver reports that the engine develops an oil leak at the rear main seal after 4 hours of driving. The leak stops when the ambient temperature rises above -15°C. What is the most likely cause?

A. The rear main seal material hardens in extreme cold losing its flexibility and the rigid seal lip lifts away from the crankshaft surface allowing oil to pass until the engine heat warms the seal material

B. The engine block contracts more than the crankshaft in extreme cold temperatures creating a clearance increase at the seal bore that allows oil to bypass the seal until the differential expansion equalizes

C. The CCV heated hose is not maintaining adequate temperature in extreme cold and the crankcase vent is freezing shut — the resulting crankcase pressure forces oil past the rear main seal until the vent thaws

D. The engine oil viscosity is too high for extreme cold operation and the thick oil creates excessive pressure in the crankcase during the extended warm-up period forcing oil past the rear seal until the oil reaches operating temperature

12. A technician is diagnosing a diesel engine that has adequate compression and fuel delivery but will not start in cold weather (-20°C). The glow plug system activates for the programmed duration and all glow plugs draw the correct current. The intake air heater (grid heater) is also confirmed functional. What else could prevent cold-weather starting?

A. The battery CCA capacity has decreased from cold temperature to the point where the starter cranks the engine too slowly for adequate compression heating of the intake air charge during the starting cycle

B. The engine oil viscosity is too heavy for the ambient temperature creating excessive cranking resistance that slows the engine below the minimum RPM needed for the fuel system to achieve injection pressure

C. The fuel has gelled from the cold temperature — the wax crystals in the diesel fuel have plugged the fuel filter and the engine cannot receive adequate fuel despite the injection system being mechanically functional

D. The engine coolant temperature sensor is reading warmer than actual because of a calibration drift causing the ECM to shorten the glow plug activation time below what is needed for -20°C cold starting conditions

13. A heavy-duty diesel engine's turbocharger shaft has 0.15 mm of radial play measured with a dial indicator at the compressor wheel. The OEM specification maximum is 0.08 mm. The turbocharger currently shows no oil leaks and the engine performs normally. What should be recommended?

A. Continue to operate and monitor — the turbocharger is still performing and the slightly elevated play will not cause immediate failure as long as the engine performance remains normal during daily operation

B. Increase the engine oil change frequency to provide cleaner oil to the turbocharger bearings which will slow the wear rate and extend the turbocharger's remaining service life before replacement is needed

C. Schedule an oil analysis to determine if the turbocharger bearing material is showing up in the oil sample before deciding whether to replace the turbocharger at this time or continue monitoring

D. Replace the turbocharger because the radial play exceeds the specification by nearly double — continued operation risks sudden shaft contact with the housings which can cause catastrophic turbo failure and engine damage

14. A diesel engine has an intermittent misfire that the technician has isolated to one cylinder through a contribution test. The injector has been replaced and the compression is normal. During further testing, the technician performs a relative compression test (cranking RPM variation) and notices that the affected cylinder shows a slightly earlier-than-expected RPM acceleration compared to the adjacent cylinders. What does this subtle timing difference suggest?

A. The camshaft lobe for the intake valve on that cylinder has worn reducing the valve lift and duration which changes the cylinder's volumetric efficiency and affects the compression event timing relative to the other cylinders

B. The cylinder head gasket on that cylinder has a micro-leak between the combustion chamber and the water jacket that reduces the effective compression slightly without being detectable on a standard compression test

C. The fuel injector calibration code was not updated after the injector replacement and the ECM is applying the old injector's correction factor to the new injector creating a timing mismatch during combustion

D. The exhaust valve timing on that cylinder is slightly advanced from a worn cam follower which allows a small amount of compression to escape early creating the earlier RPM rise during the cranking test rotation

15. A common rail diesel engine has been running for 500,000 km. The high-pressure fuel pump is producing adequate rail pressure but the pump is consuming 15% more engine power than when new, as measured by a parasitic load test. What is happening inside the pump?

A. The high-pressure pump's internal check valves have carbon buildup that requires more force to open and close during each compression cycle increasing the pump's parasitic power consumption on the engine

B. The pump's drive gear has developed excessive backlash from wear which creates a hammering effect during each rotation cycle that absorbs additional energy from the engine beyond normal pump driving requirements

C. The pump's internal pistons and barrels have worn to the point where internal leakage has increased — the pump must work harder to build the same rail pressure because more fuel bypasses the worn components

D. The pump's inlet metering valve has developed increased friction from contamination and requires more force from the ECM's solenoid driver to operate which increases the electrical load on the engine's alternator

16. A diesel engine has a rhythmic ticking noise that occurs at exactly half the engine RPM. The noise is consistent at all engine speeds and does not change with load. What does the half-engine-speed relationship indicate about the noise source?

A. The noise originates from the crankshaft main bearings because the main bearings rotate at crankshaft speed and the ticking is heard once every two crankshaft revolutions from a single damaged main bearing

B. The noise originates from a component that rotates at camshaft speed — since the camshaft turns at half the crankshaft speed, the source is likely a worn cam lobe, a valve train component, or the fuel injection pump drive

C. The noise originates from the oil pump because the oil pump's driven gear rotates at half the engine speed through its gear reduction and a damaged tooth produces one tick per pump revolution

D. The noise originates from the air compressor because the compressor is typically driven at half the engine speed through a gear reduction and a worn piston or valve produces the rhythmic ticking sound

17. A diesel engine's EGR cooler efficiency test shows the cooler is only reducing the exhaust gas temperature by 60°C instead of the specified 200°C reduction. What has caused this dramatic reduction in cooler efficiency?

A. The EGR cooler's exhaust-side tubes are blocked with carbon soot deposits that insulate the tubes from the coolant flow preventing adequate heat transfer from the exhaust gas to the coolant circuit

B. The EGR cooler's coolant-side passages are restricted from scale and corrosion buildup that reduces the coolant flow rate through the cooler and limits the heat absorption capacity of the coolant circuit

C. The engine thermostat is stuck partially open allowing coolant to bypass through the radiator before reaching the EGR cooler which raises the cooler's inlet coolant temperature reducing the temperature differential

D. The EGR cooler has internal fouling on the exhaust gas passages from carbon and soot deposits that insulate the heat transfer surfaces or the coolant passages have scaled reducing the coolant's heat absorption capacity

18. A heavy-duty diesel engine produces excessive black smoke during sudden acceleration but clears within 2 seconds and does not smoke during steady-state operation. The engine makes rated power. What is the most likely cause of the transient smoke?

A. The turbocharger has normal spool-up lag during sudden acceleration — the fuel system delivers full fuel before the turbocharger can produce adequate boost creating a brief rich condition that produces black smoke

B. The injector nozzles are worn and produce poor atomization during the sudden fuel pressure increase of acceleration creating larger fuel droplets that cannot burn completely in the available combustion time

C. The EGR valve is slow to close during acceleration and the recirculated exhaust gas displaces fresh air in the intake manifold during the transient period creating a momentary oxygen deficit for the fuel charge

D. The charge air cooler has an internal restriction that limits airflow during the sudden demand increase of acceleration creating a momentary temperature spike that reduces air density below the combustion requirement

19. A diesel engine has been running on a biodiesel blend (B20) for 50,000 km. During a PM service, the technician notices that the engine oil has thinned significantly — the oil viscosity is well below the minimum specification for the grade. The oil change interval has not been exceeded. What is the most probable cause?

A. The biodiesel blend is contaminating the fuel supply with water that enters the crankcase through blow-by and the water dilutes the oil viscosity below the minimum specification for the operating grade

B. The biodiesel's higher boiling point components are not fully combusted during cold-weather operation and accumulate in the crankcase as fuel dilution reducing the oil viscosity progressively between changes

C. Biodiesel has a stronger solvent effect on engine oil than petroleum diesel — the biodiesel components that pass the rings during combustion dissolve into the engine oil and reduce its viscosity faster than standard diesel

D. The engine's fuel injectors have developed a dribble condition from biodiesel's chemical attack on the injector nozzle seat material and the post-injection dribble washes past the rings diluting the crankcase oil

20. A truck's engine coolant temperature gauge reads normal but the driver reports that the cab heater output has decreased noticeably over the past month. The coolant level is correct. What should be checked first?

A. The heater hoses at the firewall to determine if the coolant is circulating through the heater core — check both hoses for temperature difference indicating flow restriction or blockage

B. The heater core flow rate by measuring the temperature difference between the inlet and outlet heater hoses — a core with internal restriction will show a large temperature drop from inlet to outlet under reduced flow

C. The engine thermostat for a stuck-partially-open condition that allows coolant to circulate through the radiator at low engine load reducing the coolant temperature below the heater core's effective heating range

D. The blower motor speed on all settings because a failing blower motor runs at reduced speed and moves less air across the heater core producing the gradual decrease in perceived heat output over the past month

21. A diesel engine equipped with a DPF has completed 10 regeneration cycles in the past 1,000 km. The normal interval between regenerations for this engine is approximately 500 km. What does this 5× increase in regeneration frequency indicate?

A. The DPF substrate has physically deteriorated from the repeated high-temperature cycles and can no longer hold soot uniformly requiring more frequent regeneration to prevent the differential pressure from exceeding threshold

B. The DOC upstream of the DPF has lost catalytic efficiency and can no longer provide passive soot oxidation during normal driving which was previously reducing the soot load between active regeneration events

C. The aftertreatment temperature sensors have drifted low causing the ECM to underestimate the exhaust temperature and command regeneration events more frequently than the actual soot loading requires

D. The engine is producing excessive soot from a combustion-related problem — such as worn injectors, low boost, intake restriction, or EGR system fault — that loads the DPF faster than the designed regeneration interval

22. A diesel engine's oil pressure fluctuates between 200 and 350 kPa at idle — rhythmically pulsing approximately once per second. At higher RPM, the pressure stabilizes at 380 kPa with no fluctuation. What is the most likely cause?

A. The oil pressure relief valve spring is weak and the valve is oscillating between open and closed at idle where the pump output is just above the relief valve's cracking pressure creating the rhythmic pulsation

B. The oil pump's internal gears have worn to the point where they produce a pulsating output at idle speed — the reduced pump volume at low RPM creates individual pressure pulses from each gear tooth mesh

C. The oil pick-up tube has a crack near the oil level surface that alternately draws oil and air as the oil rocks in the sump at idle — the air pocket compresses and expands creating the rhythmic pressure fluctuation

D. The main bearing clearances have increased from wear and the bearings alternately load and unload from the engine's firing impulses at idle creating a pulsating oil demand that the pump cannot smooth at low RPM

23. A diesel engine has had its fuel rail pressure sensor replaced due to a fault code. After installation, the engine starts but the scan tool shows the rail pressure reading 80 bar higher than the commanded value at all operating conditions. The fuel system operates normally with no driveability complaints. What is the most likely cause?

A. The fuel rail pressure relief valve is stuck partially closed creating a restriction in the pressure regulation circuit that adds 80 bar to the actual rail pressure above the ECM's commanded target at all operating points

B. The high-pressure pump's metering valve calibration has drifted and is delivering more fuel than commanded — the 80 bar overshoot represents the pump's excess delivery beyond the ECM's control range

C. The replacement fuel rail pressure sensor has a different calibration offset than the original sensor and is reading 80 bar higher than the actual pressure — the actual rail pressure is correct but the sensor reports it inaccurately

D. The fuel return circuit has a partial restriction that creates backpressure on the rail adding 80 bar to the actual pressure — the pump's output combines with the return restriction to produce the elevated reading

24. A diesel engine has been serviced with a new air filter. After installation, the engine produces slightly more black smoke than before the filter change at full load. The new filter is the correct part number. What could cause this unexpected result?

A. The new air filter is more restrictive than the slightly used old filter because new filter media is tighter than media that has been in service for a period and has opened slightly from airflow and vibration

B. The new air filter element was manufactured with a defect — a fold, pleat, or media tear that allows unfiltered air to bypass the filter element and enter the engine's intake tract carrying contaminants

C. The new air filter has a different flow coefficient than the old filter because the old filter was partially restricted and the engine's ECM had adapted its fuel delivery to match the restricted airflow condition

D. The engine's ECM has learned the old filter's restriction level and is still delivering the fuel quantity calibrated for the restricted air supply — the additional air from the new filter creates a temporary rich condition

25. A heavy-duty diesel engine has a vibration that the technician suspects is a cylinder-specific misfire. The technician disables each injector one at a time through the scan tool while monitoring the engine RPM and vibration. When injector number 5 is disabled, the vibration does not change and the engine RPM does not drop. What does this confirm?

A. The wiring harness to injector number 5 has an intermittent open circuit that prevents the ECM from controlling the injector and the injector may be firing randomly from the intermittent connection

B. Cylinder number 5 was already not contributing to engine power — disabling the injector makes no difference because that cylinder is already dead from a combustion-related or fuel delivery fault

C. The ECM driver circuit for injector number 5 has a software calibration error that commands zero fuel delivery regardless of the operating condition making the physical injector disable test meaningless

D. Cylinder number 5 is contributing normally but the scan tool's injector disable function is not communicating with the ECM correctly creating a false impression that the cylinder is not contributing power

26. A technician is checking the timing on a mechanically governed diesel injection pump by measuring the pump plunger lift at the number 1 cylinder's port closure point. The measured lift is 2.5 mm. The specification is 3.0 mm ± 0.1 mm. What effect does this under-specification plunger lift have on injection timing?

A. The injection timing is retarded because the plunger starts the effective injection stroke too late in the pump's rotation cycle — the fuel is delivered later than designed relative to the piston's position in the cylinder

B. The injection timing is advanced because the lower lift means the plunger reaches the port closure point earlier in the rotation allowing fuel delivery to begin before the designed injection point in the cycle

C. The plunger lift measurement has no direct relationship to injection timing — the timing is determined by the pump drive gear mesh and the plunger lift only affects the fuel delivery volume per injection event

D. The injection timing is correct but the fuel delivery quantity is reduced because the shorter plunger lift produces a smaller effective stroke that delivers less fuel per injection compared to the specification

27. A diesel engine equipped with EGR has a complaint of rough idle. The EGR valve is commanded closed at idle. A scan tool actuator test commands the EGR valve to 0% but the actual position reads 3% open. Is this 3% opening significant enough to cause rough idle?

A. No — 3% EGR valve opening is within the normal manufacturing tolerance for EGR valve zero-point calibration and would not introduce enough exhaust gas to cause a perceptible idle quality change

B. No — the 3% opening would only affect the engine at high load when the intake manifold pressure is low enough to create a pressure differential that could draw exhaust gas through the 3% opening

C. Yes — even a small amount of exhaust gas entering the intake manifold at idle significantly reduces the oxygen concentration in the combustion chamber and the reduced oxygen causes incomplete combustion and rough idle

D. Yes — the 3% opening does not directly cause rough idle but it indicates carbon deposits on the valve that also affect other surfaces in the EGR circuit creating multiple points of contamination that collectively degrade idle quality

28. A diesel engine's aftertreatment system has a NOx conversion efficiency of 75%. The OEM specification requires a minimum of 90% conversion. The DEF quality is verified at the correct 32.5% concentration and the dosing rate is correct. What should be investigated?

A. The DEF injector spray pattern for a degraded nozzle that produces large droplets instead of fine mist — large droplets do not fully decompose into ammonia before reaching the SCR catalyst reducing the available ammonia

B. The SCR catalyst substrate for contamination or thermal degradation that has reduced the number of active catalytic sites available for the NOx-to-nitrogen conversion reaction below the minimum needed for 90% efficiency

C. The upstream NOx sensor for a calibration drift that reports lower-than-actual NOx levels at the SCR inlet causing the ECM to command a lower DEF dosing rate than needed for the actual NOx concentration

D. The SCR catalyst for thermal degradation, contamination from fuel or oil exposure, or sulphur poisoning that has reduced its catalytic activity below the minimum needed for the specified 90% NOx conversion efficiency

29. A diesel engine has a complaint that it produces a visible puff of blue-grey smoke when the driver releases the throttle after pulling a grade at full load. The smoke occurs only during the deceleration transition. What is causing this momentary smoke puff?

A. The turbocharger oil seals allow a small amount of oil to leak into the compressor housing during the high-vacuum condition that occurs in the intake manifold when the throttle closes after full-load boost operation

B. The valve stem seals have hardened and during the high intake manifold vacuum of deceleration they cannot prevent engine oil from being drawn past the valve guides into the combustion chambers momentarily

C. The piston rings cannot seal adequately during the sudden deceleration because the ring tension is designed for the positive pressure of combustion and the reverse pressure differential during deceleration lifts the rings momentarily

D. The EGR valve opens briefly during the deceleration transition and the exhaust gas entering the intake manifold carries oil mist from the turbocharger bearing housing that burns in the cylinders producing the blue-grey puff

30. A truck's air compressor discharge line is routed to the air dryer before reaching the supply tank. During an inspection, the technician finds the discharge line between the compressor and the air dryer is extremely hot — too hot to touch. Is this normal?

A. Yes — the compressed air exits the compressor at 150 to 200°C and the discharge line is designed to withstand this temperature — the heat is normal and helps the air dryer operate more efficiently

B. No — the discharge line should be warm but not too hot to touch because the air compressor has a built-in aftercooler that reduces the discharge temperature to approximately 50°C before it leaves the compressor

C. No — the extreme heat indicates the air compressor is overworking from a restricted discharge line or a seized air dryer check valve creating backpressure that forces the compressor to work harder and run hotter

D. Yes — the discharge line temperature is not relevant to system operation because the air dryer's internal cooling coil reduces the air temperature before it reaches the desiccant regardless of the inlet temperature

31. A truck's brake pedal feels spongy and requires more pedal travel than normal to achieve adequate braking. The air system pressure is normal at governor cut-out. A soap bubble test of all external fittings, chambers, and valves reveals no leaks. What should be checked internally?

A. The brake chamber pushrod stroke on all wheels for excessive travel that requires more air volume to fill the additional chamber length before the linings contact the drum creating the spongy extra-travel feel

B. The air dryer for moisture contamination that has entered the brake valve bodies and created internal corrosion affecting the valve seats and piston seals which delays the pressure delivery response at the pedal

C. The foot valve for an internal leak that allows air to bypass the delivery piston seals during the initial pedal stroke before the seals seat under higher pressure and begin delivering application air to the circuits

D. The relay valves for internal contamination that raises their crack pressure — the higher crack pressure requires more pedal travel to generate the signal pressure needed to begin delivering air to the chambers

32. A truck's air brake system has been serviced and all brake components are within specification. During a road test, the technician performs an emergency stop from 90 km/h. The ABS activates on the rear drive axle but not on the front steer axle. The stop is straight and controlled. Is this normal?

A. No — during an emergency stop on dry pavement the ABS should activate on all axles simultaneously because all tires reach the lockup threshold at the same deceleration rate regardless of the axle loading

B. No — the front steer axle ABS should activate first because the dynamic weight transfer shifts the majority of the braking force to the front axle during hard deceleration which should cause front lockup before rear

C. Yes — the front steer axle receives less braking force proportionally than the rear drive axle and the higher static weight of the loaded rear axle creates more braking demand at the rear making rear ABS activation normal

D. Yes — during hard braking the dynamic weight transfer to the front axle increases front tire traction while the lightened rear axle has reduced traction making the rear wheels more likely to approach lockup first

33. A trailer equipped with ABS has been disconnected from the tractor and is sitting alone in the yard. A technician needs to test the trailer ABS by rolling the trailer with a yard tractor at low speed and applying the brakes. The trailer ABS lamp completed its normal power-on self-test when the tractor was connected. Can the ABS be fully tested this way?

A. Yes — rolling the trailer at any speed above 5 km/h and applying the brakes will activate the ABS if the wheel speed sensors detect a lockup condition allowing the technician to verify ABS modulation

B. No — trailer ABS systems require a minimum vehicle speed (typically 7 to 10 km/h) before the ABS activates and the yard test speed must exceed this threshold for the ABS to modulate during a brake application

C. Yes — the ABS self-test during power-up confirmed the system is functional and no additional driving test is needed because the self-test exercises all solenoids and verifies all sensor circuits automatically

D. No — the ABS system on most trailers will not activate during yard moves because the low-speed brake application does not generate enough pressure differential to trigger the modulator valve operation

34. A truck's front disc brake caliper has a single piston (floating caliper design). The technician measures the brake pad thickness and finds the inboard pad (piston side) has 3 mm remaining while the outboard pad has 7 mm remaining. What does this uneven wear indicate?

A. The caliper slide pins are seized preventing the caliper from floating freely — the piston pushes the inboard pad against the rotor but the caliper cannot pull the outboard pad into contact with equal force

B. The brake rotor has a manufacturing defect that concentrates the braking force on the inboard surface and requires replacement to restore even pad wear across both the inboard and outboard braking surfaces

C. The brake proportioning valve is delivering excessive pressure to the front circuit which overloads the inboard pad through the piston while the outboard pad experiences reduced loading from the floating caliper action

D. The caliper piston bore has developed corrosion that prevents the piston from retracting fully and the inboard pad drags against the rotor continuously while the outboard pad only contacts during active brake application

35. A truck's spring brake chamber has been replaced. During testing, the technician discovers that the service brake (front diaphragm) functions correctly but the spring brake (rear section) does not apply when the parking brake valve is pulled. Air pressure to the spring section is confirmed. What is the most likely installation error?

A. The spring brake supply line was connected to the wrong port on the chamber — the supply is pressurizing the spring but not the diaphragm that compresses the spring to release the parking brake mechanism

B. The replacement chamber was shipped with the caging bolt still engaged (the spring is mechanically compressed by the caging bolt) and the spring cannot apply because it is held in the compressed position by the bolt

C. The spring brake chamber was installed with the pushrod facing the wrong direction and the spring force is pushing the rod away from the slack adjuster instead of toward it during the parking brake application cycle

D. The spring brake chamber's internal check valve was not removed from the shipping position and the check valve prevents the air from exhausting through the parking brake valve's exhaust port when the valve is pulled

36. A truck's brake drum temperature after a series of controlled stops from 50 km/h averages 200°C on the left rear and 120°C on the right rear. Both brakes are adjusted to the same pushrod stroke. Both brake chambers are the same type and size. What is the most probable cause of the temperature difference?

A. The brake linings on the left side have a higher friction coefficient from a manufacturing variation that produces more braking force on the left creating the higher temperature from the increased energy absorption

B. The relay valve for the rear circuit has an internal bias that delivers slightly higher pressure to the left side chamber than the right side during each application creating an unequal braking force between the two sides

C. The automatic slack adjuster on the right side is over-adjusting the brake creating a clearance so tight that the shoe drags on the drum continuously pre-heating it and making the temperature appear lower relative to left

D. The right side brake lining has oil contamination from an axle seal leak that reduces the friction coefficient — the contaminated lining produces less braking force and absorbs less energy resulting in the lower drum temperature

37. A truck equipped with an electronic braking system (EBS) has the scan tool showing a fault code for the brake pedal travel sensor. The driver reports the braking feels normal. What function does the pedal travel sensor serve in an EBS system?

A. The pedal travel sensor is the primary input that commands the EBS controller — a failed sensor means the system is operating in a backup pneumatic mode which provides adequate but less precisely controlled braking

B. The pedal travel sensor provides the EBS controller with the driver's braking demand signal — the controller uses this input to calculate and deliver the optimal brake pressure to each axle proportionally for the load condition

C. The pedal travel sensor only monitors the pedal for the ABS system and a failure does not affect the service brake operation because the foot valve delivers air pressure directly to the brakes independently of the sensor

D. The pedal travel sensor provides diagnostic data to the scan tool only and does not affect the braking system's operation because the actual brake control is performed by the foot valve's pneumatic output signal alone

38. A trailer's air ride dump valve has been activated to lower the trailer for loading dock height. The trailer drops to the bump stops as designed. When the driver attempts to reinflate the air bags by deactivating the dump valve, the bags inflate but the trailer only rises to approximately 80% of the normal ride height. What is the most likely cause?

A. The height control valve's supply port has a flow restriction that limits the air volume reaching the bags during the reinflation cycle — the valve reaches its neutral position before full ride height is achieved due to the restricted flow rate

B. The dump valve is not fully closing and a small residual air leak through the partially open valve prevents the air bags from reaching full pressure and achieving the designed ride height during the reinflation cycle

C. The air reservoir supplying the suspension has partially depleted during the dump cycle and has not fully recharged — the reduced reservoir pressure limits the air volume available to reinflate the bags to full height

D. One or more air bags have developed a slow leak that was not apparent at full pressure but manifests during the reinflation when the bags must overcome the trailer's weight and the leak prevents reaching full inflation pressure

39. A tractor-trailer combination has been driven through a deep water crossing. After the crossing, the driver notices the brakes are not as effective as before. The air system pressure is normal. What has the water likely affected?

A. The water has entered the air system through the compressor intake and saturated the air dryer desiccant beyond its capacity reducing the air system's moisture removal ability and allowing water into the brake valve bodies

B. The wheel speed sensor air gaps have changed from debris and water carried into the sensor mounting area during the crossing and the ABS is limiting braking force based on corrupted wheel speed data from the wet sensors

C. The exhaust brake or engine retarder has shorted from water exposure and is no longer providing supplemental braking force that the driver normally relies on during stopping events in combination with the service brakes

D. Water has entered the brake drums and coated the brake lining friction surfaces — the water film reduces the friction coefficient between the linings and drums until the water evaporates from the braking heat during subsequent stops

40. A truck's trailer protection valve (tractor protection valve) has been tested. When the trailer supply line is disconnected and the trailer supply valve (red button) is pushed in, the valve opens and air flows freely. When the system pressure is pumped down to 420 kPa, the valve should automatically close. During the test, the valve does not close until the pressure drops to 275 kPa. What is the consequence of this late-closing valve?

A. The late-closing valve allows the tractor's air supply to drain to a dangerously low level before isolating the trailer circuit — the tractor may not have adequate air pressure remaining for its own braking needs

B. The late-closing valve has no safety consequence because the spring brakes will apply automatically at 415 kPa regardless of the protection valve's closing point providing adequate emergency braking from the springs

C. The late-closing valve will cause premature trailer spring brake application during normal driving because the valve closes at a pressure higher than the normal operating range creating false emergency brake events

D. The late-closing valve extends the trailer's braking time during an emergency because the trailer receives air longer than designed before the valve closes which delays the spring brake application on the trailer

41. A truck's brake chambers on one axle have been upgraded from Type 30 to Type 30/30 (piggyback spring brake chambers). After the upgrade, the technician notices that the service brake stroke on that axle is longer than the opposite axle's Type 30 chambers at the same lining thickness. Is this expected?

A. No — Type 30 service diaphragms produce the same stroke regardless of whether the chamber is a straight Type 30 or a Type 30/30 combination unit because the service section is identical between the two designs

B. The stroke difference is expected because the Type 30/30 combination chamber has a different internal geometry that changes the effective diaphragm area and stroke relationship compared to a straight Type 30 chamber

C. The stroke difference indicates the automatic slack adjuster on the upgraded axle needs to be readjusted because the different chamber mounting position changes the pushrod geometry relative to the S-cam arm angle

D. No — the service section of a Type 30/30 combination has the same effective area and stroke as a Type 30 but the combined weight of the spring section shifts the chamber mounting angle which may appear as a longer stroke

42. A truck driver complains that the parking brake does not hold the loaded vehicle on a 15% grade. The spring brakes apply correctly and the pushrod stroke is within specification. What should be checked?

A. The spring brake chamber spring force specification against the vehicle's GVW and the grade percentage — the chambers may be undersized for the vehicle's weight and the grade steepness exceeds their holding capacity

B. The brake drum condition for an oversized diameter that has moved the linings beyond the effective contact range for the spring brake's limited pushrod stroke reducing the mechanical clamping force at the drums

C. The brake lining friction coefficient for a value below the minimum needed for the spring brake force to produce adequate holding force on the loaded vehicle at the 15% grade steepness through the friction contact area

D. The foundation brake components, lining condition, drum diameter, spring chamber force rating, and the overall system capacity for the vehicle's GVW because multiple factors contribute to parking brake holding ability

43. A truck equipped with disc brakes on all positions has a complaint that the brake pedal pulsates during every stop. The brake pad thickness is adequate and even across all positions. The brake rotor surfaces appear smooth. What measurement must be performed on the rotors to diagnose the pulsation?

A. The rotor must be measured for diameter to verify it has not been machined below the minimum thickness specification creating a weakened rotor that flexes under clamping force producing the pulsation

B. The rotor must be measured for surface hardness using a portable hardness tester to identify hard spots from metallurgical transformation that resist wear differently and create high spots that produce pulsation

C. The rotor must be measured for radial runout using a dial indicator mounted to the caliper bracket to determine if the rotor's mounting surface is causing the rotor to wobble during rotation through the brake pads

D. The rotor must be measured for lateral runout and thickness variation (parallelism) at multiple points around its circumference because either condition forces the caliper piston in and out during rotation producing the pedal pulsation

44. A heavy-duty truck's ABS fault code indicates the right rear wheel speed sensor has an intermittent signal. The sensor has been replaced with a new unit and the air gap is correct. The code returns within 50 km of driving. What should the technician investigate next?

A. The ABS module's internal input circuit for the right rear channel because the module may have a damaged input that produces the intermittent reading regardless of which sensor is installed at that position

B. The tone ring on the right rear hub for cracks, contamination, or damaged teeth that produce an intermittent signal interruption as the damaged section passes the sensor during each wheel revolution cycle

C. The sensor wiring harness between the sensor connector and the ABS module for chafing, pinching, or connector damage that creates an intermittent open or short in the signal circuit during driving vibration

D. The tone ring condition and the sensor wiring harness — both must be inspected because either a damaged ring or a damaged harness can independently produce the intermittent signal fault that returns after sensor replacement

45. A truck's air dryer is cycling (purging) every 30 seconds during normal driving. The normal purge interval is 3 to 5 minutes. The compressor has been verified as having acceptable oil carry-over. What should be checked on the air dryer?

A. The air dryer heater circuit for a failure that allows the desiccant to freeze in cold weather creating a restriction that forces the system to cycle more frequently to maintain pressure through the restricted dryer

B. The air dryer purge valve for a malfunction that is not fully closing between purge cycles — the partially open valve continuously vents a small amount of air causing the governor to signal frequent compressor loading

C. The air dryer desiccant cartridge for saturation from age or contamination that prevents it from absorbing moisture effectively requiring more frequent purge cycles to attempt to regenerate the saturated desiccant

D. The governor cut-in and cut-out settings for a narrow pressure band that causes the system to cycle rapidly between loaded and unloaded states — the frequent cycling triggers a purge on each unload cycle

46. A trailer's service brakes drag on one axle after the foot valve is released. The air system has no leaks and the brake adjustment is within specification. The relay valve for that axle exhausts air normally when tested by hand. What should be checked?

A. The brake shoe return springs on that axle for broken or weak springs that cannot overcome the residual friction between the linings and drum after the application pressure is released from the brake chambers

B. The automatic slack adjusters on that axle for an over-adjusted condition that has moved the linings too close to the drums creating a zero-clearance condition that allows the shoes to drag after each application

C. The relay valve exhaust port for a restriction from debris or corrosion that slows the air exhaust rate from the brake chambers on that axle keeping residual pressure in the chambers longer than the designed release time

D. The air line between the relay valve and the brake chambers on that axle for a restriction or kink that traps air in the chambers after the relay valve exhausts — the trapped air keeps the brakes partially applied

47. A truck's battery has been load-tested at the beginning of winter and failed the test. The battery is 3 years old. Before condemning the battery, what condition must be verified to ensure the load test result is valid?

A. The battery must be tested at room temperature (20°C) because cold battery temperatures reduce the CCA capacity and can produce a false fail result on a battery that would pass at normal testing temperature

B. The battery must be tested immediately after a 12-hour drive to ensure the battery is at its maximum capacity from the alternator's sustained charging during the drive before the load test is performed

C. The battery must have been disconnected from the vehicle for at least 4 hours before testing to allow the surface charge to dissipate and the battery's resting voltage to stabilize at its true state of charge level

D. The battery must be fully charged before load testing — a partially discharged battery will fail a load test even if its internal condition is good because the test requires the battery to start from a full charge state

48. A truck's scan tool shows the engine coolant temperature sensor reading -40°C with the engine at full operating temperature. The dash gauge shows normal temperature. The sensor is a two-wire NTC thermistor. What explains the -40°C reading on the scan tool?

A. The dash gauge receives its temperature signal from a separate dedicated sender unit that is functioning correctly while the ECM sensor has an open circuit producing the -40°C reading from the unloaded reference voltage

B. The ECM is receiving the correct temperature data internally but the scan tool is reading a different data stream that has been corrupted by a CAN bus noise source creating the false -40°C display value

C. The ECM sensor signal wire has an open circuit — the ECM reads the full 5-volt reference voltage which corresponds to maximum resistance (minimum temperature) on the NTC sensor scale registering as -40°C

D. The coolant temperature sensor and the separate dash gauge sender are both NTC type but the ECM sensor has failed open while the dash gauge sender continues to function correctly providing the normal temperature reading

49. A truck's charging system test shows the alternator producing 14.4 volts at the B+ terminal. However, the voltage at the battery terminals is only 13.2 volts. A voltage drop test of the charging circuit positive cable shows 0.8 volts. A voltage drop test of the ground circuit shows 0.4 volts. What is the total circuit voltage drop and what does it indicate?

A. The total voltage drop is 1.4 volts (0.8 + 0.4 + 0.2 residual) which exceeds the 0.5-volt maximum for the charging circuit and indicates the circuit needs cable and connection maintenance to restore proper charging

B. The total voltage drop is 1.2 volts (0.8 + 0.4) which significantly exceeds the maximum allowable specification and the high-resistance connections must be cleaned or the cables replaced to restore proper charging voltage

C. The total voltage drop is 0.8 volts because only the positive cable drop is relevant — the ground side drop does not affect the charging voltage since the alternator and battery share a common chassis ground path

D. The total voltage drop is 1.2 volts but this is within the acceptable range for a heavy-duty truck's charging circuit because the longer cable runs and higher current loads create more voltage drop than light-duty vehicles

50. A truck's engine ECM sets a fault code for the intake manifold pressure sensor — SPN 102, FMI 3 (voltage above normal). The sensor is a 5-volt reference type. What condition produces an FMI 3 (voltage above normal)?

A. The sensor signal wire has a short to the 5-volt reference wire or to battery voltage which drives the signal voltage above the ECM's maximum expected range for the intake manifold pressure sensor input

B. The sensor element has cracked internally creating an open circuit that allows the full 5-volt reference to reach the ECM signal input without being reduced by the sensor's variable resistance element

C. The intake manifold pressure has exceeded the turbocharger's maximum boost output which drives the sensor's piezoelectric element beyond its calibrated voltage range producing the above-normal voltage reading

D. The ECM's internal 5-volt reference supply has increased to 6 or 7 volts from a voltage regulator fault which drives all 5-volt sensor readings above their normal range including the intake manifold pressure sensor

51. A truck has dual batteries in parallel. After a battery replacement, the technician installs one new battery alongside the existing 2-year-old battery. Within 6 months, the new battery has failed. What caused the premature failure?

A. The new battery and the old battery have the same CCA rating but different manufacturers produce batteries with different internal resistance characteristics creating an electrical conflict between the two batteries

B. The two batteries should have been installed with a battery isolator between them to prevent the older battery's higher internal resistance from affecting the new battery's charging and discharging characteristics

C. The newer battery was manufactured with a defective cell that coincidentally failed within 6 months of installation and the failure is not related to the mismatch with the older battery in the parallel configuration

D. The older battery has higher internal resistance than the new battery — the new battery compensates by carrying a disproportionate share of the electrical load and charging current which accelerates its degradation

52. A truck's CAN bus has been diagnosed with intermittent communication faults. The technician has verified the termination resistance at 60 ohms, inspected the backbone for damage, and checked all connectors. The faults persist. What less-common cause should be investigated?

A. The CAN bus wiring is routed too close to a high-current cable (starter cable, alternator cable, or welding cable) and the electromagnetic interference from the high-current cable is inducing noise on the CAN signals

B. The engine block ground strap has excessive resistance creating a ground offset between modules that shifts the CAN bus common-mode voltage outside the transceivers' operating window during high-current events

C. An aftermarket module connected to the CAN bus has a non-standard baud rate that intermittently conflicts with the vehicle's standard J1939 communication rate creating periodic data corruption on the bus backbone

D. The vehicle's crystal oscillator in one of the CAN bus modules has drifted from its specified frequency and the timing mismatch causes the affected module's transmissions to interfere with other modules' data reception

53. A truck's electric mirrors have a memory function that stores the driver's preferred mirror position and recalls it when the driver's key fob is detected. After a battery replacement, the mirror memory positions are lost. What must the driver do?

A. The mirror memory is stored in the battery-backed RAM of the body controller and is automatically restored when the replacement battery reaches full charge within the first 24 hours of driving after the battery swap

B. The driver must manually adjust both mirrors to the preferred positions and perform the memory store procedure through the mirror control switch to re-save the positions in the body controller's non-volatile memory

C. The mirror memory cannot be restored after a battery replacement because the positions are stored in the key fob's internal memory which is erased when the vehicle's battery is disconnected during the replacement

D. The dealer must reprogram the body controller with the driver's mirror positions using the OEM diagnostic software because the memory store function in the mirror switch is disabled after a battery disconnect event

54. A truck equipped with LED marker lamps has installed aftermarket LED bulbs in the turn signal sockets. The turn signals now flash at double the normal rate (hyperflash). What causes this rapid flashing?

A. The LED bulbs draw significantly less current than the incandescent bulbs they replaced — the flasher module interprets the reduced current draw as a burned-out bulb condition and increases the flash rate as an alert

B. The LED bulbs have a higher inrush current than incandescent bulbs that triggers the flasher module's overcurrent protection causing it to cycle faster to limit the peak current through the turn signal circuit

C. The aftermarket LED bulbs have an internal driver circuit that conflicts with the vehicle's turn signal voltage waveform creating a timing error in the flasher module that doubles the flash rate during operation

D. The flasher module's internal temperature has increased from the LED bulbs' waste heat radiation causing the thermal element to cycle faster as it reaches its trip temperature more quickly during each flash cycle

55. A truck's scan tool retrieves a fault code from the ABS module — SPN 789, FMI 5 (wheel speed sensor, current below normal) on the left front position. The technician measures the sensor resistance at 1,450 ohms. The specification is 1,000 to 2,000 ohms. The sensor is a passive (magnetic pickup) type. What does FMI 5 mean for a passive sensor?

A. The sensor is producing a signal but the amplitude is too low for the ABS module to process — the reduced signal voltage can result from an increased air gap, a contaminated tone ring, or a weak sensor magnet

B. The passive sensor has developed a partial short to ground in its winding that reduces the signal current below the ABS module's detection threshold while still measuring within the resistance specification range

C. FMI 5 (current below normal) does not apply to passive sensors that generate voltage signals — the fault code is a misidentification by the ABS module and the technician should ignore it and clear the code

D. The sensor's internal permanent magnet has weakened from heat exposure and cannot generate adequate voltage across the resistance to produce the minimum current the ABS module requires for signal processing

56. A truck's alternator field circuit uses an internal voltage regulator. The regulator senses voltage at the alternator B+ terminal. A fleet engineer wants to change the sensing point to the battery terminals by adding a remote sense wire. What advantage does remote sensing provide?

A. Remote sensing allows the regulator to compensate for voltage drop in the charging cable by increasing the alternator's output voltage until the battery terminal voltage reaches the designed regulation target value

B. Remote sensing reduces the alternator's electrical load on the engine because the regulator can reduce field current when it detects that the battery voltage is already adequate rather than over-charging to compensate

C. Remote sensing protects the alternator from overheating by monitoring the battery temperature through the sense wire's resistance change and reducing the charging rate when the battery temperature exceeds safe limits

D. Remote sensing improves the alternator's response time to load changes because the regulator detects the battery's voltage drop from load application faster than it detects the drop at the alternator's output terminal

57. A truck's dash-mounted voltmeter reads 14.2 volts with the engine running and drops to 13.5 volts when the headlamps are turned on. The alternator output at the B+ terminal reads 14.4 volts with headlamps on. Is the 0.9-volt drop at the dash gauge normal?

A. The drop is normal because the dash voltmeter measures at the instrument cluster which is downstream of the charging cable's resistance and the additional headlamp current increases the voltage drop in the circuit

B. The drop is abnormal — the headlamp circuit should not affect the voltmeter reading because the headlamps are on a separate fused circuit that does not share a path with the instrument cluster's voltage sensing point

C. The drop is normal because all dash voltmeters have an internal resistance that creates a measurement error proportional to the total vehicle electrical load — higher loads produce lower readings regardless of the circuit path

D. The drop is abnormal — the 0.9-volt difference between the alternator output and the dash reading indicates excessive resistance in the charging circuit that is only apparent under the increased load of the headlamp circuit

58. A truck's ABS module performs a self-test when the ignition is turned on. The ABS lamp illuminates for 3 seconds and then turns off. What has the self-test verified?

A. The self-test has verified that the ABS lamp circuit functions and that the module has power and can communicate on the data bus — it does not test the sensors, modulators, or the complete ABS function

B. The self-test has verified the ABS module's power supply, the lamp circuit, the wheel speed sensor circuits for correct resistance, and has briefly energized each modulator valve solenoid to confirm basic function

C. The self-test has verified only the lamp circuit — the lamp illuminating for 3 seconds confirms the bulb works and the module can control it but does not indicate any testing of the ABS system's components

D. The self-test has fully verified all ABS functions including sensor air gaps, modulator valve response times, and the CAN bus communication with all related modules providing a complete system verification

59. A truck's body controller has been replaced under warranty. After the replacement, the power window, power lock, and interior light functions work correctly but the trailer ABS power and charge

circuit on pin 7 of the trailer connector does not output voltage. What was likely missed during the installation?

A. The body controller's trailer charging relay has a separate fuse that was not checked during the installation and the blown fuse prevents the controller from powering the trailer charge output circuit

B. The trailer ABS power output is not controlled by the body controller on this vehicle — it is fed through a separate relay that is controlled by the ignition switch and the relay may have been disconnected during the service

C. The replacement body controller must be configured with the vehicle's specific option codes including the trailer towing package — the default configuration does not enable the trailer ABS power output on pin 7

D. The wiring connector for the trailer circuit on the body controller was not fully seated during the installation — the pin 7 output wire is on the end of the connector that requires full insertion to make contact

60. A truck's engine ECM receives the vehicle speed signal from the ABS module through the J1939 CAN bus. The speedometer reads correctly but the engine ECM's scan tool data shows vehicle speed as 0 km/h at all times. What should be checked?

A. The CAN bus communication between the ABS module and the engine ECM for a specific PGN (parameter group number) that is not being transmitted correctly while the speedometer receives its data from a different source

B. The vehicle speed sensor for a wiring fault that provides a signal to the ABS module for speedometer display but does not provide the separate dedicated speed signal that the engine ECM requires for its speed calculations

C. The engine ECM's software for a configuration parameter that specifies the source of the vehicle speed input — the ECM may be configured to read speed from a different input than the ABS module's CAN broadcast

D. The instrument cluster for a firmware fault that displays the speedometer correctly from its internal speed calculation but blocks the speed data retransmission on the CAN bus that the engine ECM depends on for its input

61. A truck's trailer ABS lamp on the dash illuminates while driving with a trailer connected. The driver disconnects the trailer and reconnects it. The lamp turns off after the reconnection and remains off during subsequent driving. What most likely caused the temporary lamp illumination?

A. The trailer ABS module detected a momentary voltage drop from a poor connector contact during driving — the voltage recovered on reconnection and the module cleared the fault after successful re-initialization

B. The tractor's body controller detected a CAN bus message timeout from the trailer ABS module due to a brief communication interruption and illuminated the lamp until the reconnection re-established communication

C. The trailer ABS module set a fault code from a wheel speed sensor that temporarily lost its signal from debris accumulation — the debris cleared during driving but the code required a power cycle to reset the lamp

D. The trailer's 7-pin connector had an intermittent connection on the ABS power pin that caused a momentary power loss — disconnecting and reconnecting the gladhands reseated the connector and restored solid contact

62. A truck's multiplex wiring system uses a body controller that communicates with remote power modules (RPMs) located near the loads they control. An RPM near the rear of the truck has failed. What symptoms would a failed rear RPM produce?

A. All vehicle systems would fail because the body controller cannot operate any outputs without communication confirmation from all RPMs in the network before it enables any individual output circuit

B. Only the circuits controlled by the failed RPM would be affected — the rear marker lamps, tail lamps, and any other circuits managed by that specific module would fail while all other vehicle systems continue normally

C. The engine would derate because the body controller sends a system-OK signal to the engine ECM through the CAN bus and a failed RPM causes the body controller to withdraw the OK signal triggering the derate

D. The failed RPM would cause intermittent failures across all body electrical circuits because the RPM network uses a serial communication protocol and a failed node blocks all data traffic downstream of its position

63. A truck's starter motor has been replaced with a remanufactured unit. After installation, the starter engages and cranks the engine but produces a loud whirring noise during cranking that was not present with the old starter. The engine starts normally. What is the most likely cause?

A. The remanufactured starter has the wrong drive gear tooth count for this application — the gear meshes with the ring gear but the incorrect tooth count creates a speed mismatch that produces the whirring noise

B. The starter motor mounting bolts are not fully tightened and the motor shifts position during cranking changing the gear mesh depth between the drive gear and ring gear creating the whirring noise from the loose engagement

C. The flywheel ring gear has worn teeth that did not produce noise with the old starter's similarly worn drive gear but the remanufactured starter's new drive gear does not mesh smoothly with the worn ring gear teeth

D. The starter drive (Bendix) mechanism's overrunning clutch is slipping during cranking — the clutch should lock in the drive direction to transmit torque but a worn clutch slips and creates the whirring noise

64. A truck's scan tool shows the throttle position sensor (TPS) at 5% when the accelerator pedal is fully released. The specification for the closed-throttle position is 0% ± 1%. Does the 5% reading affect engine operation?

A. The 5% reading is within the acceptable range for most heavy-duty diesel engines because the TPS is used only for cruise control speed set-point calculation and does not affect the idle speed or fuel delivery at rest

B. The 5% reading has no effect on engine operation because the ECM uses the TPS only as a redundant backup to the accelerator pedal position sensor and the pedal sensor takes priority for all fuel delivery calculations

C. The 5% reading is significant because the ECM monitors the TPS for the idle validation switch function and an off-zero reading may prevent the ECM from recognizing the idle condition causing elevated idle speed

D. The 5% reading indicates the TPS or pedal assembly is not returning to the fully closed position — this can cause elevated idle speed, prevent idle shutdown timers from activating, and affect the engine brake engagement logic

65. A truck's dash lamp test (ignition on, engine off) shows all warning lamps illuminating correctly except the ABS lamp which does not light during the test. What is the safety concern?

A. The ABS lamp not illuminating during the bulb check means the technician cannot determine if the lamp circuit is functional — a failed lamp bulb or circuit could mask an active ABS fault that the driver would never see

B. The non-functioning ABS lamp indicates the ABS module has lost power and the entire ABS system is inoperative which removes the anti-lock protection from all axles during emergency braking events on the vehicle

C. The ABS lamp failure has no safety consequence because the ABS system functions independently of the lamp circuit and the lamp is only an informational indicator that does not affect the system's braking performance

D. The ABS lamp not illuminating means the ABS module is performing an extended self-test that suppresses the lamp during the test period — the lamp will illuminate after the test completes within 30 seconds of ignition on

66. A truck's alternator has been bench-tested and confirmed producing 14.4 volts and 160 amps (full rated output). After reinstallation, the charging voltage at the battery reads only 13.0 volts with a moderate electrical load. What should the technician check on the vehicle?

A. The alternator's field circuit excitation wire for a missing or disconnected connection that prevents the voltage regulator from receiving the excitation signal needed to initiate and maintain full field current output

B. The alternator mounting and ground path for excessive resistance that creates a voltage drop between the alternator case and the battery negative terminal reducing the effective charging voltage at the battery

C. The battery temperature sensor for a high-temperature reading that commands the voltage regulator to reduce the charging voltage below normal as a battery protection strategy during perceived high-temperature conditions

D. The voltage drop in the charging circuit between the alternator B+ terminal and the battery positive terminal for excessive resistance in cables and connections that consumes 1.4 volts of the alternator's 14.4V output

67. A truck's engine ECM has been reflashed with an updated calibration. After the reflash, the engine runs but the check engine lamp illuminates and a fault code for the turbocharger wastegate position sensor is set. The wastegate functioned normally before the reflash. What is the most likely cause?

A. The updated calibration has different wastegate position sensor parameters than the original — the sensor's actual position readings now fall outside the new calibration's narrower acceptable range triggering the fault code

B. The reflash process disrupted the wastegate actuator's calibration data and the actuator must be recalibrated through a scan tool procedure to relearn its open and closed positions against the new calibration parameters

C. The updated calibration was intended for a different engine model or configuration that uses a wastegate with different specifications than the one installed on this engine creating a parameter mismatch fault

D. The reflash process temporarily interrupted the wastegate solenoid power supply and the actuator moved to a default position that the new calibration interprets as out-of-range until a wastegate relearn is performed

68. A truck's 12-volt accessory circuit has been tested and shows a 2-volt drop between the fuse panel and the accessory outlet under load. The wiring gauge is correct for the circuit length and the fuse is not the source of the drop. What specific test should be performed to locate the resistance?

A. Perform an insulation resistance test using a megohmmeter on the accessory circuit wiring to identify any insulation breakdown that is creating a leakage path to ground and reducing the voltage available at the outlet

B. Perform a current draw test using a clamp-on ammeter to verify the accessory connected to the outlet is not drawing excessive current that would create a normal voltage drop through the correctly-sized wiring

C. Perform a sequential voltage drop test at each connection point in the circuit — from the fuse panel output through each connector, splice, and terminal to the outlet — to identify the specific connection with excessive resistance

D. Perform a resistance test using a DMM to measure the total circuit resistance with the circuit de-energized and compare the measured resistance to the calculated specification for the wire gauge and circuit length

69. A truck's manual transmission has a hard shift into all gears that worsens when the transmission is cold. The clutch fully disengages — the transmission shifts smoothly with the engine off. What does the engine-running/engine-off distinction confirm?

A. The hard shifting when the engine is running with the clutch disengaged indicates the clutch disc is dragging on the flywheel and input shaft even with the pedal fully depressed preventing the input shaft from stopping

B. The smooth shifts with the engine off confirm the transmission's internal synchronizers and shift mechanism are functioning correctly — the problem is external to the transmission in the clutch release system

C. The hard shifting confirms the transmission lubricant is too thick for the operating temperature and creates excessive drag on the countershaft gears even with the clutch disengaged preventing speed matching

D. The smooth shifts with engine off confirm the issue is related to the engine's firing impulses transmitting through the transmission case and creating resistance in the shift forks that disappears when the engine stops

70. A truck's automatic transmission has a delayed engagement when cold (approximately 3 seconds from selecting Drive to feeling engagement) but engages within 0.5 seconds when warm. The fluid level is correct when checked at operating temperature. What is the most probable cause?

A. The torque converter drains during overnight parking through a failed check valve and the cold fluid's higher viscosity delays the refill time until the pump can deliver adequate volume to fill the converter at cold speed

B. The transmission seals and gaskets have hardened from age and cold fluid — when cold the seals allow fluid to bypass the apply circuits until the warm fluid softens the seals and they conform for quicker engagement

C. The cold transmission fluid's higher viscosity creates more resistance in the valve body passages delaying the fill time for the forward clutch apply circuit until the fluid warms and flows more freely through the circuits

D. The transmission oil pump's internal clearances have increased from wear and the pump cannot deliver adequate volume at the cold fluid's higher viscosity to fill the clutch apply circuits in the normal engagement time

71. A truck's driveshaft has been shortened by a driveshaft shop to accommodate a wheelbase change. After reinstallation, the truck has a vibration at highway speed that increases with vehicle speed. The U-joints are new and the driveshaft was balanced by the shop after shortening. What should be checked?

A. The driveshaft phasing — if the yoke ears at each end are not aligned on the same plane the U-joints cannot cancel each other's angular velocity variations and the uncancelled variation produces a speed-proportional vibration

B. The slip yoke spline engagement for adequate length — shortening the driveshaft may have reduced the spline engagement to the point where the slip joint creates a vibration from the insufficient support at the yoke end

C. The driveshaft balance weights for correct placement because the shop may have balanced the shortened shaft with weights positioned differently than the original creating a balance condition that is speed-dependent

D. The centre bearing height for correct alignment because the wheelbase change may have altered the driveshaft angle and the centre bearing bracket may need to be relocated to restore the correct operating angle

72. A truck's clutch disc has been replaced. During the replacement, the technician noticed that the old disc's friction material had a pattern of hot spots — discoloured blue-black areas approximately 25 mm in diameter scattered across both friction surfaces. What caused these hot spots?

A. The pressure plate's diaphragm spring fingers were at unequal heights creating uneven clamping pressure that concentrated force at specific points on the disc creating localized overheating at those contact points

B. The flywheel surface had hard spots (areas where the cast iron has undergone a metallurgical transformation from heat) that have higher friction than the surrounding material creating localized heat concentration

C. The clutch disc damper springs were broken allowing the disc hub to oscillate rotationally on the input shaft splines creating intermittent high-friction contact at random points on the disc surface during engagement

D. The flywheel or pressure plate has developed hard spots — localized areas of metallurgical transformation that have higher friction and heat resistance than the surrounding material creating the concentrated hot spot pattern

73. A truck's transfer case is making a grinding noise when shifted into 4WD high range. The noise is present only during the shift and stops once 4WD is fully engaged. What is the most likely cause?

A. The transfer case shift mechanism is engaging the sliding clutch collar before the front axle output speed matches the rear axle speed creating a momentary grinding as the dog teeth accelerate the slower component

B. The transfer case synchronizer (if equipped) is worn and cannot adequately match the front and rear output speeds before the engagement collar contacts the dog teeth resulting in grinding during the speed-matching phase

C. The front driveshaft is seized from corrosion at the slip yoke and the transfer case must drive the seized joint during the shift event creating the grinding noise until the corrosion breaks free and 4WD engages fully

D. The transfer case lubricant level is low at the shift mechanism location and the dry sliding collar contacts produce a momentary grinding during the engagement transition before the lubricant redistributes from the gear splash

74. A heavy-duty truck's transmission has been rebuilt. During the road test, the technician shifts through all gears and notices that 3rd gear produces a slight growl that is not present in any other gear. The growl is proportional to engine RPM in 3rd gear. What is the most likely cause?

A. The 3rd gear pair (mainshaft gear and countershaft gear) has a gear tooth surface finish issue or an assembly error that creates a mesh noise specific to that gear pair while all other gear pairs mesh correctly

B. The 3rd gear synchronizer blocking ring was installed with the friction surface facing the wrong direction creating a slight drag that produces the growl noise proportional to the input shaft speed in that gear position

C. The countershaft bearing at the 3rd gear position has a defect that is only loaded when 3rd gear is engaged because the gear mesh force direction changes with each gear ratio and only loads that bearing in 3rd gear

D. The transmission lubricant level is at the low end of the acceptable range and the 3rd gear position is the highest point in the gear train that receives the least splash lubrication resulting in the growl from marginal lubrication

75. A truck equipped with a two-speed rear axle shifts between the two ratios using an air-operated shift mechanism. The driver reports that the axle occasionally "hunts" between the two ranges during highway cruise at the speed where the shift is normally commanded. What is causing the hunting?

A. The air shift system has a slow leak in the actuator circuit that allows the air pressure to gradually drop below the holding threshold causing the axle to shift out of the selected range before the air system replenishes

B. The vehicle speed sensor signal has excessive noise at the shift point speed and the shift controller alternately reads speeds above and below the shift threshold causing repeated shift commands in both directions

C. The shift controller's speed threshold for the upshift and downshift are set too close together and minor vehicle speed variations during cruise repeatedly cross both thresholds causing continuous shifting between ranges

D. The engine ECM is not providing adequate torque reduction during the shift event and the incomplete torque break causes the shift to fail and retry repeatedly at the cruise speed matching the shift point threshold

76. A drive axle oil sample shows elevated copper content at 45 ppm against a normal trend of 10 to 15 ppm. All other metals are within normal trends. What drive axle component is the most likely source of the elevated copper?

A. The ring gear thrust washer which is typically manufactured from a copper-bronze alloy to provide a low-friction bearing surface between the ring gear and the differential case during the differential rotation

B. The axle shaft bearing retainer ring that uses a copper coating for corrosion protection on the steel retainer surface and the coating wears from the bearing's rotational contact over the axle's service life

C. The differential carrier bearing outer race which has a copper flash coating applied during manufacturing to prevent fretting corrosion between the bearing race and the carrier bore during initial press-fit installation

D. The differential spider gear thrust washers (or the side gear thrust washers) which are typically copper-bronze and wear during differential action as the gears rotate against them during turns and uneven traction conditions

77. A truck's manual transmission shift lever vibrates at a specific engine RPM (approximately 1,800 RPM) but is smooth at all other speeds. The vibration disappears when the clutch pedal is depressed. What is the most likely cause?

A. A torsional resonance condition where the engine's firing frequency at 1,800 RPM matches the natural frequency of the drivetrain through the clutch disc damper springs amplifying the vibration at the shift lever

B. The transmission countershaft bearing has a defect that produces a vibration at the specific rotational speed corresponding to 1,800 RPM engine speed and the bearing frequency excites the shift tower mechanism

C. The engine's crankshaft vibration damper has deteriorated and the undamped torsional vibrations are transmitted through the clutch at the specific frequency corresponding to 1,800 RPM creating the lever vibration

D. The shift lever itself has a resonant frequency that is excited by the normal engine vibration transmitted through the transmission case at 1,800 RPM and the lever amplifies the vibration at that specific speed only

78. A truck's automatic transmission produces a buzzing noise from the bell housing area that is present in all gears and Park/Neutral with the engine running. The noise pitch changes only with engine RPM. What is the most probable source?

A. The flywheel-to-torque converter bolts have loosened and the converter is shifting on the flywheel surface during rotation creating the buzzing from the metal-to-metal contact at engine speed frequency

B. The torque converter's internal stator assembly has a loose component (typically a thrust washer or bearing race) that vibrates at engine speed as the impeller drives fluid past the stator during all operating conditions

C. The flexplate (drive plate) has developed a fatigue crack that flexes under the torque converter's weight during rotation creating a buzzing vibration at the crack location once per engine revolution at all operating speeds

D. The pilot bushing between the crankshaft and the torque converter pump hub has worn and the resulting play allows the converter to wobble at engine speed producing the buzzing noise from the eccentric rotation

79. A truck equipped with a limited-slip differential has had the axle lubricant changed. After the oil change, the differential produces a chattering noise during low-speed turns on dry pavement. The noise was not present before the oil change. What was done incorrectly?

A. The replacement lubricant is the wrong viscosity grade for the ambient temperature and the thick oil prevents the limited-slip clutch discs from slipping smoothly during the speed differential required for turning

B. The drain plug magnet was not cleaned before reinstallation and the accumulated metallic particles are now circulating through the clutch pack creating the chatter from the contaminated friction surface contact

C. The limited-slip friction modifier additive was not added to the replacement gear oil — without the modifier the clutch discs grab and release alternately during turns instead of slipping smoothly under controlled friction

D. The replacement gear oil volume is slightly overfilled and the excess oil creates hydraulic resistance against the clutch pack during differential action preventing smooth clutch engagement and release during turns

80. A truck's driveshaft has been removed and the transmission output shaft seal is being replaced. During the seal replacement, the technician notices scoring on the output shaft surface where the seal rides. What should be done about the scoring?

A. Install the new seal at the same position on the shaft — the seal will conform to the scored surface and provide adequate sealing as long as the scoring is less than 0.1 mm deep in the shaft surface

B. Install a seal saver sleeve (speedi-sleeve) over the scored shaft surface to provide a smooth sealing surface for the new seal — the sleeve presses over the shaft and gives the seal lip a new running surface

C. Polish the scored shaft surface with emery cloth to smooth the scoring before installing the new seal — the polished surface provides adequate sealing if the scoring depth is less than 0.05 mm after polishing

D. Replace the output shaft because any scoring on the seal surface will cause the new seal to leak — the cost of the shaft replacement is justified by the time saved from not having to replace a leaking seal again later

81. A truck's clutch pedal has developed a squeak that occurs during both the depression and release of the pedal. The squeak is rhythmic — it occurs at the same point in the pedal travel each time. What is the most likely source?

A. The clutch master cylinder piston seal is dry and squeaks as it passes a specific point in the bore where the surface finish changes between the honed cylinder wall and the port opening in the cylinder housing

B. The clutch pedal pivot bushing has dried out and the metal-to-metal contact between the pedal shaft and the bushing produces the squeak at the point in the pedal travel where the load is highest during operation

C. The clutch release bearing is contacting the pressure plate fingers during the pedal movement and the dry bearing contact surface produces the squeak at the specific travel point where the bearing first contacts the fingers

D. The clutch cable or hydraulic line is rubbing against the firewall grommet or a body panel during the pedal movement and the friction between the line and the grommet produces the squeak at the contact point

82. A truck's inter-axle differential lock indicator lamp flashes continuously when 4WD is engaged on a transfer case equipped truck. The 4WD functions correctly. What does the flashing lamp indicate?

A. The transfer case is operating in 4WD correctly but the indicator lamp circuit has a poor connection that causes the lamp to flicker from the intermittent contact rather than providing a steady illumination signal

B. The inter-axle lock is not fully engaged — the lamp flashes to indicate the locking collar is in a partially engaged position where it has contacted but not fully seated into the engagement teeth of the lock mechanism

C. The transfer case fluid temperature has exceeded the normal range and the flashing lamp is a secondary warning indicating the transfer case should be shifted to 2WD to prevent overheating damage to the internal components

D. The front axle disconnect hub has not fully engaged and the flashing lamp indicates the front axle is receiving torque from the transfer case but the wheels are not locked to the axle shafts creating a partial 4WD condition

83. A heavy-duty truck's automatic transmission has a condition where it downshifts with a harsh bump when the driver lifts off the throttle during highway cruise. The downshift is from overdrive to direct drive. What is the most probable cause?

A. The torque converter lockup clutch is not releasing before the downshift occurs and the locked converter creates a direct mechanical connection that produces the harsh bump during the gear change event

B. The overdrive clutch pack return springs have weakened and the clutch does not release cleanly during the throttle-lift downshift — the overlapping clutch application creates the harsh bump during the gear transition

C. The engine exhaust brake is activating during the throttle lift and the sudden retarding force triggers the downshift at a higher input speed than normal creating a harsh engagement from the speed differential

D. The TCM's shift calibration for the coast downshift from overdrive to direct has an incorrect torque management parameter that does not reduce the engine speed adequately before the downshift clutch engages

84. A truck's axle shaft on a semi-floating rear axle has developed a 3 mm radial wobble measured at the wheel mounting flange with a dial indicator. What does this wobble indicate?

A. The axle shaft is bent from a previous overload or impact event and the bent shaft rotates eccentrically in the axle housing tube creating the measurable radial runout at the wheel mounting flange

B. The axle shaft bearing has worn and the increased clearance between the bearing and the axle housing allows the shaft to orbit during rotation creating the radial movement at the wheel mounting flange location

C. The axle shaft has developed a fatigue crack near the flange that allows the flange to flex under the wheel's weight and the crack opens and closes during each revolution producing the measured radial wobble

D. The wheel mounting bolts on the flange have loosened allowing the wheel to shift and the measured wobble is from the wheel's eccentric position on the flange rather than from an actual shaft radial runout condition

85. A truck's compression brake produces adequate retarding force but activates with a noticeable clunking noise from the valve cover area when the driver engages the brake switch. The noise occurs once at engagement and once at disengagement. What is the most likely cause?

A. The compression brake solenoid valve actuation is normal and the clunking is the expected operating noise from the slave pistons contacting the exhaust valve crossheads during the engagement and disengagement events

B. The compression brake control valve is not the source — the clunk is from the exhaust brake butterfly valve slamming to the closed position simultaneously with the compression brake engagement creating a combined impact noise

C. The compression brake hydraulic lash adjustment has excessive clearance that allows the slave pistons to free-fall onto the crossheads during engagement creating an impact noise that would be eliminated by correct lash setting

D. The engine rocker arm assemblies have loose mounting hardware that shifts when the compression brake slave pistons apply force to the exhaust valve crossheads creating a clunking impact at the rocker shaft supports

86. A truck's power steering pump is producing a whining noise that increases with engine RPM. The fluid level is correct and the fluid is clean. The noise is more pronounced during straight-ahead driving than during turns. What is the most likely cause?

A. The power steering pump's internal bearings or vanes are wearing and producing the speed-dependent whine — the noise is less noticeable during turns because the increased hydraulic load masks the internal mechanical noise

B. The power steering fluid has degraded from heat exposure and the reduced lubricity creates more friction between the pump's internal components generating the whine that is proportional to the pump shaft speed

C. The power steering pressure relief valve is oscillating at a frequency proportional to engine RPM creating the whining noise that decreases during turns when the increased flow demand stabilizes the valve position

D. The power steering return hose has a partial internal collapse that creates a restriction in the fluid return path — the restriction produces turbulence that generates the whining noise at a frequency proportional to pump speed

87. A truck's front suspension has been modified with helper springs to increase the steer axle load capacity. After the modification, the driver reports the steering requires significantly more effort. What is causing the increased steering effort?

A. The helper springs have raised the front ride height beyond the power steering gearbox's designed operating range and the altered geometry creates a mechanical disadvantage that the hydraulic assist cannot fully overcome

B. The helper springs do not directly affect steering effort — the increased steering effort is from the additional weight on the steer axle from the modification which increases the tire-to-road friction the steering must overcome

C. The helper springs have increased the steer axle weight which increases the friction between the tires and the road surface — the power steering system must overcome this additional friction requiring more driver effort

D. The helper springs have changed the spring rate and the stiffer suspension transmits more road feedback through the steering linkage to the steering wheel creating the sensation of increased effort during turns

88. A truck's steering gearbox has been adjusted to remove free play at the centre position. After the adjustment, the driver reports the steering feels tight during all turns — the steering wheel does not return to centre smoothly after completing turns. What happened during the adjustment?

A. The worm shaft bearing preload was not checked before the sector shaft adjustment and the combined preload of the tight bearings and the sector adjustment exceeds the gearbox's design operating friction specification

B. The sector shaft adjustment was set too tight — the adjustment should provide zero lash at the centre position with increasing clearance off-centre and the over-adjustment has created binding throughout the entire steering range

C. The power steering fluid has not been changed in conjunction with the adjustment and the old fluid cannot lubricate the tighter internal clearances adequately creating increased friction throughout the steering range

D. The steering gearbox internal seals have swollen from exposure to an incorrect power steering fluid type and the swollen seals create additional friction that combines with the sector shaft adjustment to produce the tight feel

89. A truck's steer tire has developed a cupping (scalloped) wear pattern — a series of alternating high and low spots around the tire circumference. The alignment is within specification and the tire inflation is correct. What suspension or steering component is the most likely cause?

A. The steer axle shock absorbers have failed and cannot control the tire's bounce during driving — each bounce cycle creates a momentary high-friction contact point that wears the tire at that location creating the cupping pattern

B. The steer axle king pin bushings are worn creating a dynamic play that allows the wheel to oscillate during driving producing the scalloped wear pattern from the intermittent directional changes at the tire contact patch

C. The steering gearbox has excessive internal play that allows the steer wheels to oscillate at a frequency corresponding to the cupping pattern spacing as the wheels respond to road surface variations during driving

D. Worn shock absorbers are the most common cause — the failed shocks cannot dampen the tire's vertical oscillation during driving and each bounce creates a heavy and light contact alternation that wears the cupping pattern

90. A truck's frame rail has a vertical crack in the web section (the vertical portion between the upper and lower flanges) near a suspension bracket mounting point. The crack is approximately 100 mm long. What is the correct repair procedure?

A. Weld the crack closed using the correct electrode for the frame material after proper surface preparation, preheat, and joint design — then reinforce the area with a bolted doubler plate over the welded repair

B. Drill stop holes at both ends of the crack to arrest its propagation and install a bolted splice plate over the cracked area per the frame manufacturer's approved repair procedure for web cracks in that location

C. Install a bolted doubler plate over the cracked area without welding the crack — the doubler plate bridges the crack and carries the load while the crack remains as a controlled stress relief in the frame web section

D. Drill stop holes at each end of the crack and consult the frame manufacturer's repair procedures — the appropriate repair method (bolted splice plate, welded repair, or section replacement) depends on the crack location and loading

91. A trailer's tandem axle suspension uses walking beam equalizers. One equalizer beam has a cracked weld at the centre pivot. The beam still supports the load but flexes visibly at the crack under full load. What action is required?

A. Weld-repair the cracked equalizer beam using the correct electrode and procedure for the beam material type and reinstall the beam after NDT verification of the weld quality before returning the trailer to loaded service

B. Replace the equalizer beam because it is a structural suspension component that carries dynamic loads — a cracked weld indicates fatigue failure that welding cannot reliably restore to the original design strength

C. Monitor the crack at each PM interval — if the crack does not grow beyond 50% of the beam width the beam remains serviceable because the remaining intact section provides adequate load-carrying capacity

D. Install a bolted reinforcement plate over the cracked area to bridge the crack and restore the beam's load-carrying capacity without removing the beam from the trailer for a full replacement procedure

92. A truck's wheel hub assembly has been removed for brake service. The technician notices that the bearing races in the hub bore show a pattern of evenly-spaced indentations (brinelling) in the race surface. What caused these marks?

A. The bearing was subjected to impact loading or vibration while stationary — the indentations are permanent deformations in the race surface from the bearing rollers being pressed into the race under static overload

B. The bearing was operated with contaminated lubricant that contained hard particles — the particles were crushed between the rollers and race creating the evenly-spaced indentation pattern during rotation operation

C. The bearing was assembled with excessive preload that concentrated the roller contact force at specific points — the overloaded contact points permanently indented the race surface from the excessive preload force

D. The bearing races have been etched by acidic contamination from degraded lubricant — the acid attacked the race surface at the roller contact positions creating the indentation pattern from chemical erosion during use

93. A truck's tire has been patched on the inside after a nail puncture in the tread. The patch is properly bonded and the tire has been balanced. After 10,000 km, the driver reports a slow leak that loses approximately 10 kPa per day. What is the most likely cause of the slow leak?

A. The patch adhesive has degraded from the tire's internal temperature cycling during normal driving and the bond between the patch and the inner liner has weakened creating a slow leak path at the patch edge perimeter

B. The original nail puncture channel through the tire carcass was not completely sealed by the patch because a patch alone seals only the inner liner surface — the puncture channel remains as an air migration path through the casing

C. The tire bead seal has deteriorated from the vibration of 10,000 km of driving and the slow leak is from the bead-to-rim interface rather than the patch repair — the two events are coincidental rather than cause-and-effect

D. The nail puncture damaged the internal belt reinforcement and the damaged belt has gradually separated from the casing creating a secondary air pocket that slowly leaks through the original puncture channel to atmosphere

94. A truck's hub oil bath level is checked and found to be at the bottom of the sight glass instead of the centre. The technician adds hub oil to bring the level to the centre mark. What is the consequence of having operated with the low oil level?

A. The inner bearing may have been inadequately lubricated because the oil level was too low to splash lubricant to the inner bearing position during hub rotation and the bearing should be inspected for heat damage

B. The outer bearing was operating partially above the oil level and the reduced splash lubrication may have caused accelerated wear — the bearing should be inspected for damage before the hub is returned to service

C. The low oil level had no operational consequence because hub bearings are designed to operate with oil levels ranging from 25% to 75% of the sight glass and the bottom reading was within the designed minimum level

D. Both the inner and outer bearings may have been inadequately lubricated at the low oil level — the sight glass centre mark represents the minimum oil volume needed for adequate splash to both bearing positions

95. A truck's fifth wheel plate has excessive grease buildup — approximately 10 mm of accumulated old grease mixed with road debris on the plate surface. What operational problem does this excessive buildup create?

A. The thick grease layer insulates the fifth wheel plate from the trailer upper coupler plate preventing adequate heat transfer during braking which causes thermal damage to both the plate and the coupler surface

B. The excessive grease attracts road debris that embeds in the grease layer creating an abrasive compound that accelerates wear on both the fifth wheel plate and the trailer upper coupler plate surface during articulation

C. The grease buildup prevents smooth articulation between the tractor and trailer — the thick layer creates resistance to the trailer's pivoting motion and may prevent the fifth wheel jaws from locking fully around the king pin

D. The old degraded grease mixed with debris should be cleaned and fresh grease applied in a thin film — the excess buildup does not provide better lubrication and the contaminated grease increases wear and reduces coupling security

96. A truck's front wheel alignment shows the following readings: Left toe: +0.05° (toe-in), Right toe: -0.10° (toe-out). The total toe specification is 0.00° to +0.15° (zero to slight toe-in). The total toe measures -0.05° (slight toe-out). What is the primary concern with this reading?

A. The individual toe readings show that the right wheel is toeing out while the left wheel is toeing in — this asymmetric condition will cause the steering wheel to be off-centre and the right steer tire to develop feathered wear

B. The total toe of -0.05° is only marginally outside the specification and the wear effect will be minimal — the technician should document the reading and recheck at the next PM service to establish the trend direction

C. The total toe being slightly out of specification is less concerning than the individual toe asymmetry — adjusting the tie rod to bring the total into specification may correct the total but will not address the asymmetric condition

D. The individual right toe-out of -0.10° will cause rapid feathered wear on the right steer tire and the toe setting must be adjusted to bring both sides into the specified total toe-in range for even tire wear on both steer tires

97. A trailer's air ride suspension has one air spring that is sitting lower than the other three on the same tandem. The air line to the low spring has been disconnected and air is flowing freely from the disconnected line. What does this indicate?

A. The air supply to that spring is functioning — the low height is caused by a leak in the air spring itself that allows the supplied air to escape faster than the height control valve can replenish it through the supply line

B. The height control valve for that spring position is supplying air but the valve is stuck in the supply position and is over-pressurizing the spring causing the bladder to deform and sit lower than the other three springs

C. The air line to the low spring is not the supply line — the technician may have disconnected the wrong line and the actual supply to the low spring has a separate restriction that prevents adequate air delivery to inflate it

D. The air supply is confirmed flowing to the spring — the low height confirms the air spring bladder has a leak that allows the air to escape and the spring cannot maintain ride height despite continuous air supply from the valve

98. A truck's steer axle has been replaced with a remanufactured unit. After installation and alignment, the driver reports the truck wanders at highway speed and requires constant steering corrections. The alignment readings are within specification. What should be checked?

A. The remanufactured axle's king pin inclination (KPI) and caster settings for conformance to the OEM specification because these built-in angles may differ from the original axle's geometry affecting directional stability

B. The new axle's king pin bushings for adequate preload because a remanufactured axle may have been assembled with insufficient bushing preload that allows excessive play at highway speed creating the wandering condition

C. The steering gearbox for compatibility with the new axle's geometry because different axle manufacturers may use different steering arm lengths and angles that change the Ackermann geometry and steering response

D. The tire specification for compatibility with the new axle because the remanufactured axle may have a different track width than the original requiring different tire sizes for correct loading and handling characteristics

99. A truck's wheel bearing has been replaced with a new unitized bearing assembly. After installation, the technician discovers the ABS wheel speed sensor does not fit the new bearing assembly's sensor boss. The sensor is too large for the mounting hole. What should the technician do?

A. Machine the sensor mounting boss on the new bearing assembly to accept the existing sensor because the sensor is calibrated for this vehicle's ABS module and a different sensor may not produce a compatible signal

B. Verify the bearing assembly part number against the vehicle application because the wrong bearing may have been supplied — a bearing for a different model may have a different sensor boss dimension for its sensor type

C. Install a bushing adapter between the sensor and the mounting boss to reduce the diameter difference and allow the existing sensor to fit the new bearing assembly's slightly different mounting configuration

D. Replace the ABS sensor with one that matches the new bearing assembly's sensor boss dimension and recalibrate the ABS module to recognize the new sensor's signal characteristics through the scan tool procedure

100. A truck's tire has been rotated from a drive axle position to the steer axle. After the rotation, the driver reports a vibration at highway speed that was not present before the rotation. The tire has been balanced and the balance is within specification. What is the most likely cause?

A. The tire developed irregular wear on the drive axle from the drive torque and braking forces — the irregular tread pattern produces vibration at highway speed when placed on the steer axle where it provides steering feedback

B. The tire's belt structure has taken a permanent set from the different loading pattern on the drive axle and the deformed belt produces a radial force variation that creates vibration when installed on the steer axle position

C. The tire has developed a radial force variation from its time on the drive axle — the drive forces created a permanent deformation in the tire's internal structure that produces a once-per-revolution force imbalance at speed

D. The tire was balanced for the drive axle's higher centrifugal force and the lower centrifugal force at the steer axle position changes the balance point producing a vibration that was not present at the drive axle speed range

101. A truck's hub cap has been removed for brake inspection. The technician notices a thin layer of metallic paste on the inside of the hub cap at the bottom. The paste has a silver-grey colour and a fine metallic texture. What does this metallic paste indicate?

A. The hub cap seal has degraded and road debris has entered through the seal creating the metallic paste from the fine sand and dirt mixing with the hub oil at the bottom of the cap during normal driving

B. The metallic paste is normal — it is the residue from the initial break-in of the bearings and gear oil additives that settle at the lowest point of the hub cap during the first several thousand kilometres of operation

C. The hub oil has been contaminated with water and the water-oil emulsion has reacted with the metallic bearing surfaces creating the silver-grey paste from the corrosion products settling at the bottom of the cap

D. The wheel bearings are producing fine metallic wear debris that accumulates in the oil and settles at the lowest point in the hub cap — the bearing surfaces should be inspected for damage or excessive wear

102. A trailer equipped with self-steering axles has developed excessive tire wear on the self-steering axle position. The wear pattern is even across the tread but the tread depth has worn significantly faster than the fixed axle tires at the same mileage. What is causing the accelerated wear?

A. The self-steering axle tires experience more scrubbing forces during turns than the fixed axle tires because the steering action drags the tires laterally across the road surface during each turn consuming tread material

B. The self-steering axle has a lower weight rating than the fixed axles and is carrying more weight than designed which increases the tire loading and accelerates the wear rate on the self-steering axle tires proportionally

C. The self-steering axle's centering mechanism is too stiff and prevents the axle from steering freely during turns — the tires are being dragged through turns instead of rolling which accelerates the wear from lateral scrubbing

D. The self-steering axle tires are a different compound than the fixed axle tires and the softer compound used on the steering axle for improved traction during turns wears faster from the normal mileage accumulation

103. A truck's front suspension has been lowered by 40 mm using lowering blocks between the leaf springs and the axle pads. After the modification, the steering becomes vague and the truck wanders. What suspension geometry has been altered by the lowering blocks?

A. The lowering blocks change the effective spring rate of the leaf springs because the altered spring-to-axle relationship changes the arc through which the spring flexes during suspension travel affecting the spring's response

B. The lowering blocks change the steering geometry by moving the axle relative to the frame which alters the caster angle and the roll centre height affecting the vehicle's directional stability and steering response

C. The lowering blocks have no effect on steering geometry — the wandering is caused by the reduced ground clearance allowing the front tires to contact road debris and pavement irregularities that deflect the steering

D. The lowering blocks change the effective king pin inclination angle by tilting the entire axle assembly relative to the road surface which reduces the self-centering force and causes the vague steering and wandering

104. A truck's cab has a persistent vibration at highway speed that is felt through the steering wheel and the seat simultaneously. The tires are balanced, the alignment is correct, and the driveshaft is in good condition. The vibration is proportional to vehicle speed. What cab-specific component should be investigated?

A. The engine mounts for deterioration that allows the engine to transmit vibration to the cab structure through the hardened mount material rather than isolating it as designed during normal vehicle speed operation

B. The cab air suspension for a failed shock absorber that allows the cab to oscillate at its natural frequency when excited by road surface irregularities at the specific highway speed range producing the dual-location vibration

C. The cab mounting bolts for looseness that allows the cab to shift on the frame creating a vibration from the movement that is transmitted to both the steering column and the seat through the cab body structure simultaneously

D. The cab-to-frame mounting isolators for deterioration — hardened or compressed isolators transmit road vibration directly from the frame to the cab structure affecting both the steering column and the seat at vehicle speed

105. A truck driver reports a rhythmic squeaking noise from the cab area during slow-speed driving over uneven surfaces. The noise disappears on smooth roads and at highway speed. What should be inspected?

A. The cab suspension air springs for a deteriorated rubber bellows that rubs against the air spring piston during slow-speed compression events producing the squeak that is masked by road noise at highway speed

B. The cab mounting isolators and bushings for dry or deteriorated rubber that squeaks when compressed and released during the slow-speed body roll and pitch movements that occur on uneven road surfaces

C. The windshield seal for a separation that allows the glass to shift in its frame during the cab's low-frequency body movements on uneven surfaces producing a squeak that is too low-frequency to hear at highway speed

D. The steering column flexible coupling for a dry or worn joint that squeaks during the column's slight movement from cab flex during low-speed driving but is masked by the vibration isolation at highway operating speed

106. A truck's cab tilt latch has been inspected and found to have a worn engagement surface that allows 5 mm of movement between the latch and striker. The maintenance manual specifies zero movement when the latch is fully engaged. What is the consequence of this wear?

A. The 5 mm movement allows the cab to shift during braking and acceleration creating a clunking noise from the latch engagement surfaces impacting with each direction change of the cab's inertia loading

B. The 5 mm movement is within the normal wear tolerance for cab tilt latches and does not affect the cab's security during driving — the latch should be documented for trending and replaced when the movement reaches 10 mm

C. The worn latch creates a safety hazard because the cab may not be positively retained during a collision or hard braking event — the latch or striker must be adjusted or replaced to restore the zero-movement specification

D. The worn engagement surface allows the cab to vibrate at its natural frequency during highway driving creating a resonance condition that amplifies the cab's perceived vibration at specific vehicle speed ranges

107. A truck's door check (the device that holds the door open at specific positions) has broken. The door swings freely and does not hold at any position. What is the safety concern?

A. The door may swing open unexpectedly during vehicle operation if the latch does not fully engage and the door could strike objects or people adjacent to the vehicle during parking lot manoeuvring or loading dock operations

B. The uncontrolled door swing can cause injury to the driver during cab entry and exit — the door may swing closed on the driver's hands or body or swing open and strike adjacent vehicles or structures in windy conditions

C. The broken door check has no safety concern because the door latch independently holds the door closed during driving and the check only affects the convenience of holding the door at preset open positions

D. The door check also serves as a secondary door latch and its failure means the door may not remain closed during driving creating a risk of the door opening at highway speed from the aerodynamic pressure differential

108. A truck cab's HVAC recirculation door is stuck in the fresh air position and cannot be switched to recirculation mode. What operational effect does this have?

A. The cab heating performance is reduced because the HVAC system must continuously heat cold outside air instead of recirculating and reheating the already-warm cab air creating a higher heating demand on the heater core

B. The A/C system must work harder to cool hot outside air continuously instead of recirculating already-cooled cab air — this increases the compressor load and reduces the A/C system's effective cooling capacity significantly

C. The stuck recirculation door has a significant effect on both heating and cooling — the system continuously conditions outside air instead of recirculating cab air which increases energy consumption and reduces HVAC effectiveness

D. The stuck recirculation door has minimal operational effect because the HVAC system is designed to operate primarily in fresh air mode and the recirculation function is only needed during brief periods of heavy exterior contamination

109. A reefer trailer's cargo compartment has a floor drain that allows meltwater and cargo spillage to exit the trailer during transport. During a PM inspection, the technician finds the drain is clogged with frozen debris. What operational concern does a clogged floor drain create for a refrigerated trailer?

A. The clogged drain creates a sanitary violation for food transport trailers because standing water in the cargo space promotes bacterial growth that can contaminate the transported food products during the delivery cycle

B. The clogged drain causes ice buildup on the cargo floor that changes the floor's thermal properties and forces the TRU to work harder to maintain the set-point temperature increasing fuel consumption significantly

C. The clogged drain has no operational concern because the floor drain is only used during trailer washout between loads and a frozen blockage during transport does not affect the TRU operation or cargo temperature

D. The clogged drain allows water to accumulate and freeze on the cargo floor which can damage the floor material, create a slip hazard during loading, and the ice acts as a thermal bridge increasing heat gain into the cargo space

110. A trailer's composite panel sidewall has sustained a forklift impact that cracked the outer skin but the inner liner appears intact. The trailer is a dry van used for general freight. What is the primary concern with this damage?

A. The cracked outer skin allows moisture to enter the composite panel structure where it degrades the foam insulation core and promotes corrosion of the panel's internal structural components over time from moisture entrapment

B. The cracked outer skin has no structural significance because the inner liner carries the structural load and the outer skin is primarily a weather barrier that can be repaired with a patch without affecting the trailer's load capacity

C. The cracked outer skin creates an aerodynamic disruption that increases fuel consumption from the turbulent airflow at the damaged panel surface during highway driving at speeds above 80 km/h by approximately 1-2%

D. The cracked outer skin will propagate under the flexing loads of highway driving and eventually reach the inner liner creating a full-wall penetration that allows weather and road spray to enter the cargo space and damage freight

111. A trailer's ABS module has been replaced. After the replacement, the ABS lamp illuminates and a fault code indicates the module's configuration does not match the trailer's sensor and modulator arrangement. What must be done?

A. Return the module and obtain a pre-configured module that matches the trailer's specific ABS configuration because trailer ABS modules are not field-programmable and must be ordered pre-configured for each application

B. Perform a module swap between another identical trailer in the fleet to verify if the fault is in the new module or the trailer's wiring before spending additional diagnostic time on the configuration mismatch error

C. Program the new ABS module with the trailer's specific configuration — the number of wheel speed sensors, number of modulator valves, and their channel assignments — using the ABS manufacturer's diagnostic tool

D. The configuration error is a normal initial fault that clears automatically after the module performs its power-on self-test during the first 10 km of driving when it detects the sensors and modulators and configures itself

112. A trailer equipped with a nosemount reefer unit (front-wall-mounted TRU) has a complaint that the TRU vibrates excessively when the compressor is running. The vibration is felt in the trailer body and transmitted to the tractor cab through the fifth wheel coupling. What should be inspected?

A. The TRU engine mounts and compressor mounts for deterioration that allows the rotating and reciprocating components to transmit vibration directly to the trailer structure instead of being isolated by the designed mounting system

B. The TRU mounting bolts that attach the unit to the trailer front wall for looseness that allows the entire TRU assembly to vibrate on the trailer face amplifying the normal vibration into the trailer structure and fifth wheel

C. The refrigerant charge level because an undercharged system causes the compressor to cycle irregularly creating pulsating forces that are transmitted through the TRU frame to the trailer body as the perceived vibration

D. The TRU's mounting system — engine mounts, compressor mounts, and the unit-to-trailer mounting hardware — for deterioration or looseness because any mechanical weakness in the mounting chain transmits vibration to the structure

113. A trailer's marker lamp wiring has been repaired after a rodent chewed through the harness. The technician spliced the damaged wires and wrapped the repair with electrical tape. After the repair, the marker lamps function but the trailer ABS intermittently sets communication fault codes. What is the connection between the wiring repair and the ABS faults?

A. The rodent damage may have also affected the ABS wiring that runs in the same harness bundle and the repair did not address the ABS wire damage because the technician only repaired the visible marker lamp wires

B. The electrical tape splice repair creates a moisture trap that will corrode the connections over time but this takes months to develop and the immediate ABS faults are likely coincidental and unrelated to the marker lamp repair

C. The marker lamp and ABS wiring share common ground paths and the splice repair has introduced resistance in the shared ground that creates voltage drops affecting the ABS module's sensor signal quality during operation

D. The splice repair has created an electromagnetic interference source from the exposed conductor at the splice point that radiates interference into the adjacent ABS sensor wiring in the same harness bundle during lamp operation

114. A flatbed trailer's stake pockets and rub rails have been inspected during annual certification. Several stake pockets show heavy rust and pitting on the interior walls. The pocket walls have lost approximately 1 mm of metal thickness from corrosion. What is the concern?

A. The corroded stake pockets have reduced wall thickness that lowers their rated load capacity for securing cargo — stakes inserted into the thinned pockets may bend or break through the pocket walls under cargo loading forces

B. The corrosion produces rough interior surfaces that prevent the cargo stakes from being inserted and removed smoothly which increases the loading and unloading time and creates a pinch hazard for the driver's hands

C. The corroded pocket interiors will contaminate the cargo stakes with rust particles that transfer to the cargo during transport creating a cleanliness issue for the shipped products but not a structural concern

D. The corroded stake pockets are only cosmetic concerns because the pockets are designed with a safety margin that accommodates up to 3 mm of corrosion loss before the structural capacity is affected below the rated load

115. A trailer's suspension has walking beam equalizers with hardened steel wear pads at the beam pivot and end connections. During inspection, the wear pads show scoring and galling on the contact surfaces. What is the maintenance action?

A. Lubricate the wear pads and reassemble — the scoring and galling will smooth out during normal operation as the lubrication restores the designed friction characteristics between the beam and the mounting bracket

B. The scoring on the wear pads indicates the pivot bushings behind the wear pads have worn and the pads are carrying loads they were not designed to handle — the bushings must be inspected and replaced if worn

C. Replace the scored and galled wear pads because the damaged surface creates metal-to-metal binding that can prevent the equalizer beam from pivoting freely under load which affects the axle load equalization

D. The scoring and galling on the wear pads is normal for the operating environment and the pads should be replaced at the next scheduled overhaul interval rather than during this intermediate inspection cycle

116. A trailer's mud flap mounting bracket has broken on one side allowing the mud flap to hang at an angle. The flap partially blocks the tire's sidewall view during a walk-around pre-trip inspection. What is the concern?

A. The hanging mud flap could contact the tire sidewall during driving creating friction heat that damages both the mud flap material and the tire sidewall potentially leading to a tire blowout from the heat damage

B. The dangling mud flap obscures the driver's ability to visually inspect the tire's sidewall condition during pre-trip and en-route inspections potentially hiding damage that would be detected with the flap properly mounted

C. The broken bracket allows the mud flap to swing freely and potentially contact other vehicles during lane changes creating a liability hazard from the unsecured flap contacting adjacent traffic during highway driving

D. The hanging mud flap creates turbulent airflow at the wheel opening that increases the tire's rolling resistance by approximately 1% from the disrupted aerodynamic flow pattern around the wheel and tire assembly

117. A truck's A/C system has been serviced and the technician replaced the receiver/dryer as part of the compressor replacement. After the service, the A/C cools adequately but the compressor runs continuously without cycling even though the evaporator temperature reaches 0°C. What was most likely not reconnected or replaced during the service?

A. The high-pressure switch was not reconnected after the receiver/dryer replacement — without the high-pressure switch the system cannot detect overcondition but this would not prevent cycling for temperature control

B. The condenser fan relay was not reconnected and the condenser fan is not operating — the high-side pressure builds until the high-pressure switch trips but this would cause the compressor to stop not run continuously

C. The evaporator thermistor wire was not connected or the thermistor was not transferred from the old dryer to the new one if it mounts on the dryer outlet — without it the system has no feedback to cycle the compressor off

D. The low-pressure switch was not reconnected after the receiver/dryer replacement — without the switch the system cannot detect the low-pressure condition that occurs when the evaporator reaches freezing temperature

118. A truck's heater produces adequate heat at all vent positions but the defroster airflow velocity seems low compared to the floor and panel positions. The blower motor speed is the same at all positions. What is the most likely cause?

A. The defroster ductwork has a partial separation, collapse, or restriction between the HVAC plenum and the dash-top defroster outlets that reduces the air velocity reaching the windshield compared to the shorter floor and panel paths

B. The windshield has a film of road grime on the interior surface that the driver perceives as inadequate defroster performance — the airflow is actually adequate but the film prevents the warm air from clearing the glass

C. The defroster mode door is not opening fully — it allows enough air through for the driver to feel warm air at the defrost vents but the restricted opening limits the total volume compared to the unrestricted floor and panel paths

D. The blower motor is producing adequate volume but the impeller's blade pitch is optimized for the floor and panel duct geometry and the defroster duct's smaller cross-section creates more back-pressure reducing the delivered volume

119. A truck's A/C compressor has been replaced and the system has been evacuated and recharged. During operation, the compressor produces a rattling noise that increases with RPM. The noise was not present with the old compressor. What should be checked first?

A. The compressor clutch air gap for a specification that is too wide causing the clutch disc to engage and disengage rapidly producing a rattle from the intermittent contact at each revolution of the compressor shaft

B. The compressor mounting bolt torque because a loose compressor shifts on its mounting bracket during operation creating a rattle from the compressor body moving against the bracket with each revolution at increasing RPM

C. The refrigerant charge for an undercharge condition that allows liquid slugging in the compressor — low refrigerant levels can produce a rattling sound as the compressor alternately draws liquid and vapor during operation

D. The compressor's internal components for a manufacturing defect because a new replacement compressor with an immediate rattle indicates an internal fault such as a loose reed valve, broken spring, or debris in the housing

120. A fuel-fired APU heater has a fault code for "flame sensor failure." The heater starts and a flame is visible through the inspection window. The technician cleans the flame sensor and clears the code. The heater operates for 10 minutes then sets the same code and shuts down. What should be checked next?

A. The flame sensor for a crack in its ceramic insulator that allows combustion gases to leak into the sensor body causing the sensor to read correctly when cold but lose sensitivity as it heats up during the 10-minute operation

B. The flame sensor wire for a high-resistance connection that passes enough current for initial flame detection but cannot maintain the signal as the combustion temperature increases the wire resistance during extended operation

C. The combustion chamber for excessive carbon buildup that insulates the flame sensor from the actual flame contact — the sensor detects the initial flame but the carbon layer grows during operation reducing sensor exposure

D. The heater's fuel metering pump for a delivery rate that decreases during operation from a thermal expansion issue — the flame weakens as the fuel delivery drops until the flame sensor can no longer detect adequate combustion

121. A truck's A/C system has a sight glass that is completely clear (no bubbles) during operation. The system pressures are higher than normal on both the high and low sides. The cooling performance is reduced. What does this combination of symptoms indicate?

A. The system is critically low on refrigerant — a nearly empty system shows clear sight glass because there is insufficient liquid to produce bubbles and the reduced refrigerant mass creates abnormal pressure readings

B. The receiver/dryer desiccant has broken down and the loose desiccant material is circulating through the system clogging the expansion valve and creating the elevated pressures with reduced cooling output performance

C. The system is overcharged with refrigerant — the excess refrigerant fills the condenser with liquid reducing its heat rejection area and the excess liquid in the evaporator reduces heat absorption creating higher pressures

D. The condenser fan has failed and the reduced airflow causes elevated high-side pressure from poor heat rejection which cascades to elevated low-side pressure as the expansion valve cannot compensate for the hot liquid

122. A truck's HVAC system has a complaint that the A/C produces a chemical odour when first turned on. The odour dissipates after 5 minutes of operation. The evaporator drain is clear and the cabin air filter has been recently replaced. What is the most likely cause?

A. Refrigerant is leaking from a small connection in the evaporator core and the leaked refrigerant odour is detected when the blower first circulates air across the evaporator surface before the refrigerant evaporates completely

B. The evaporator coil surface has mould or bacterial growth that produces a musty odour when the blower first activates and pushes air across the contaminated surface — the odour dissipates as the cold air inhibits microbial activity

C. The heater core has a pinhole leak and the coolant odour is carried by the initial airflow from the HVAC housing — the sweet glycol smell dissipates as the A/C operation dries the air and reduces the humidity around the core

D. The evaporator's expansion valve has a slow leak at its body gasket and the refrigerant oil escaping from the leak point produces the chemical odour when the system pressure increases during initial compressor engagement

123. A truck's APU A/C system provides adequate cooling during overnight parking but the main vehicle A/C system has reduced cooling performance the next morning during the first hour of driving. After one hour, the main A/C cools normally. What is causing the delayed performance of the main A/C system?

A. The main A/C compressor needs to reach operating temperature before it can pump efficiently — the overnight APU operation cooled the engine compartment below the minimum temperature for efficient main compressor operation

B. The APU A/C system used a significant portion of the main A/C refrigerant during overnight operation and the main system must recover the refrigerant from the APU circuit before it has adequate charge for full cooling performance

C. The main A/C system's receiver/dryer desiccant has absorbed moisture overnight from the humid air in the cab and the moisture must be removed through normal system cycling before the main A/C reaches full cooling efficiency

D. The engine must reach operating temperature before the main A/C condenser receives adequate airflow from the engine cooling fan — the fan operates at minimum speed until the engine warms creating reduced condenser airflow

124. A hydraulic system on a refuse truck has a complaint that the packer blade moves more slowly as the hydraulic oil temperature increases during the work shift. In the morning, the packer speed is normal. By afternoon, the speed has decreased by approximately 30%. What does this temperature-dependent speed loss indicate?

A. The hydraulic pump's internal clearances increase with temperature from thermal expansion allowing more internal bypass at the higher temperature reducing the net flow delivered to the packer cylinder circuit

B. The hydraulic fluid's viscosity decreases as temperature rises which reduces the pump's volumetric efficiency and increases internal leakage throughout the system — both factors reduce the effective flow to the packer

C. The packer cylinder rod seals expand from the higher oil temperature creating increased friction that resists the piston movement and slows the packer blade speed proportionally to the temperature increase during the shift

D. The system's internal leakage increases as the oil thins from heat — worn pump clearances, cylinder seal bypass, and valve spool leakage all increase with reduced oil viscosity allowing more flow to bypass the working circuit

125. A hydraulic crane's boom telescope cylinder has a cushion (deceleration device) at the end of the retraction stroke. The operator reports that the boom retracts smoothly until the last 100 mm of travel where it decelerates abruptly and then stops with a harsh impact. What is the most likely cause?

A. The cylinder's internal cushion plunger has been damaged and the stepped deceleration that should gradually slow the piston has been replaced by a sudden restriction that produces the abrupt deceleration and harsh stop

B. The cylinder cushion's needle valve adjustment is closed too far restricting the oil escape during the cushion stroke too aggressively — opening the needle valve slightly will allow more flow and produce a smoother deceleration

C. The boom telescope mechanism has a mechanical interference at the fully retracted position that stops the piston before the cushion can complete its designed deceleration stroke creating the harsh impact at full retraction

D. The return line filter has a bypass condition that allows contaminated oil to reach the cushion valve — debris in the cushion circuit blocks the controlled bleed during the deceleration stroke causing the abrupt stop

126. A hydraulic system's pressure gauge has been replaced. After installation, the gauge reads 500 kPa higher than the expected standby pressure. A second gauge installed at the same point reads the correct standby pressure. What should be done?

A. The replacement gauge is miscalibrated — the gauge should be replaced with a calibrated unit or sent to a calibration service to verify its accuracy before being used for any diagnostic pressure measurements in the system

B. Both gauges may be reading correctly but the installation of the second gauge changed the circuit volume which affected the pump's compensator setting and the first gauge was reading the original higher standby pressure

C. The first gauge has a different pressure range than the original and the scale graduation is creating a reading error — the technician should verify the gauge range matches the system's operating pressure specification

D. The first gauge may have a zero-offset error from shipping damage — the gauge pointer was displaced from zero before installation and all readings are offset by 500 kPa which can be corrected by adjusting the zero screw

127. A hydraulic system uses a gear motor to drive a conveyor belt on a truck body. The conveyor belt speed has decreased gradually over the past 6 months. The system pressure is adequate and the directional valve provides full flow to the motor. What is the most likely cause?

A. The conveyor belt tension has increased from belt stretching and the additional mechanical resistance requires more motor torque which the hydraulic system provides by reducing the motor speed to maintain the torque

B. The hydraulic gear motor has worn internally — the increased clearances between the gears and the housing allow more fluid to bypass without performing work reducing the motor's speed output at the same input flow and pressure

C. The hydraulic fluid has thickened from contamination creating additional resistance to flow through the motor's internal passages which reduces the motor's rotational speed at the same pump delivery flow rate

D. The conveyor belt drive sprocket has worn and the chain connecting the motor output shaft to the sprocket has stretched creating slippage that reduces the belt speed while the motor continues to rotate at the correct speed

128. A dump truck hydraulic system has a raise cylinder that extends fully but does not retract when the lower function is activated. The pump runs and the directional valve shifts to the lower position. Oil flows from the cylinder rod-end port back to the reservoir when the lower line is disconnected at the cylinder. What does this test confirm?

A. The cylinder piston seal has failed completely and the oil flows through the failed seal from the rod end to the cap end rather than retracting the piston — the rod-end flow confirms the valve and pump are delivering oil correctly

B. The hydraulic circuit from the pump through the valve to the cylinder is clear — the oil reaches the cylinder and returns freely meaning the fault is inside the cylinder (seized piston, broken rod, or failed piston connection)

C. The pilot-operated check valve in the raise circuit is not opening during the lower command and the trapped oil on the cap end cannot escape preventing the cylinder from retracting even though the rod end is receiving flow

D. The counterbalance valve's pilot circuit is not receiving adequate signal pressure from the directional valve to open the counterbalance for the lowering function and the trapped cap-end oil prevents cylinder retraction

129. A hydraulic system's accumulator has been pre-charged to the specified nitrogen pressure. After connecting the hydraulic system, the technician operates the circuit and notices the accumulator's hydraulic side pressure does not increase above the pre-charge level. What is the most probable cause?

A. The accumulator's bladder has ruptured and the nitrogen has migrated to the hydraulic side filling the entire accumulator with gas — hydraulic fluid cannot enter the accumulator because the gas occupies all available volume

B. The accumulator isolation valve is closed and the hydraulic system pressure cannot reach the accumulator to charge the hydraulic side against the pre-charged nitrogen bladder during the normal operating cycle

C. The pre-charge pressure was set higher than the system's maximum working pressure and the hydraulic pump cannot develop enough pressure to compress the nitrogen bladder and allow hydraulic fluid to enter

D. The accumulator's gas valve is leaking and the nitrogen pre-charge has already escaped reducing the bladder pressure to zero — the hydraulic fluid fills the entire volume but no energy storage occurs without the gas spring

130. A hydraulic system has a cylinder that must hold a load in position for extended periods. The circuit uses a pilot-operated check valve to hold the load. The technician tests the holding capability by pressurizing the cylinder to working pressure and then shutting down the hydraulic system. After one hour, the cylinder has drifted 10 mm. Where should the technician look for the leak source?

A. The pilot-operated check valve's internal seat for wear or contamination that allows a small amount of fluid to trickle past the check poppet under the static load pressure during the one-hour holding period test

B. The cylinder's internal piston seal for bypass that allows fluid from the loaded side to migrate past the piston to the unloaded side reducing the effective fluid volume holding the load in the designed position

C. Both the pilot-operated check valve and the cylinder's internal piston seal — either component can independently cause the 10 mm drift and both must be tested in isolation to determine the actual leak source

D. The directional control valve's spool for internal leakage in the neutral position that allows the loaded cylinder port to drain slowly through the spool clearance to the return port during the extended holding period

131. A truck-mounted hydraulic crane has a load chart that specifies the maximum lifting capacity at various boom lengths and radii. The operator asks the technician to increase the hydraulic system relief valve pressure to allow the crane to lift heavier loads. Why must the technician refuse this request?

A. The relief valve setting is matched to the weakest structural component in the lifting circuit — increasing the pressure could exceed the structural capacity of the boom, cylinder, sheave, or mounting bolts causing catastrophic failure

B. Increasing the relief valve pressure would exceed the crane's tipping capacity rating and the additional lifting force would tip the truck even though the structural components may be strong enough for the higher pressure

C. The relief valve pressure is calibrated to the load chart by the crane manufacturer — increasing the pressure alters the engineered relationship between hydraulic force and structural capacity creating an unsafe operating condition

D. The crane's load chart is a legally certified document — altering the relief valve pressure invalidates the chart and the operator cannot determine safe operating limits without the manufacturer recertifying the modified system

132. A battery-electric truck's driver reports that the vehicle's regenerative braking feel has changed — the deceleration is noticeably weaker when lifting off the accelerator compared to the vehicle's behaviour when it was new. The battery SOH is at 90% and no fault codes are stored. What is the most likely explanation?

A. The friction brake pads have worn which increases the mechanical drag during deceleration — the propulsion controller detects the higher mechanical braking and reduces the regenerative contribution to prevent over-deceleration

B. The battery's cell balancing has shifted the operating voltage window downward and the reduced maximum cell voltage limits the regenerative charging current because the cells reach their voltage limit earlier during energy recovery

C. The regenerative braking system calibration has been automatically adjusted by the propulsion control system as the battery ages — the controller reduces regen force proportionally to the battery's reduced charge acceptance capability

D. The traction motor's permanent magnets have weakened slightly from heat cycling over the vehicle's life reducing the motor's generating efficiency during regenerative braking which produces less deceleration force per unit of speed

133. A hybrid truck equipped with a 48-volt mild hybrid system has the ISG (integrated starter-generator) belt replaced. After the belt replacement, the stop-start system functions but the regenerative braking energy recovery has decreased by approximately 50%. What was likely done incorrectly?

A. The replacement belt is a standard V-belt instead of the required multi-rib poly-V belt that provides the higher grip surface area needed for the ISG's regenerative torque transmission during energy recovery braking events

B. The belt tension was not set to the ISG specification — a looser-than-specified tension allows belt slippage during the high-torque regenerative events when the ISG acts as a generator resisting the engine's deceleration rotation

C. The replacement belt is the correct type but the ISG's belt tensioner was not reset to the specified tension after the belt change — the tensioner's automatic adjustment range may not compensate for the new belt's different stretch

D. The ISG pulley ratio was changed during the belt replacement because the technician installed the belt on the wrong pulley groove changing the ISG's operating speed relative to the engine and reducing its generating capacity

134. A battery-electric truck's charging port has been damaged by a forklift impact. The charge port cover is broken and the connector pins are exposed to the elements. What is the immediate safety concern?

A. The exposed charging port connector pins may have live high voltage present even when the vehicle is not charging — moisture, debris, or accidental contact with the exposed pins creates an electrocution hazard

B. The exposed charge port allows moisture and debris to contaminate the connector pins which will cause a ground fault during the next charging attempt — the charger's safety systems will prevent the charging session from starting

C. The broken port cover allows dust and road debris to pack into the connector housing which gradually corrodes the pins and increases the contact resistance creating a fire hazard from the resistive heating during high-current charging

D. The charging port damage has likely compromised the vehicle's high-voltage isolation and the insulation resistance test should be performed immediately to verify the HV system's safety before the vehicle operates or charges again

135. A parallel hybrid truck has the engine and electric motor coupled to the same transmission through a clutch. The electric motor can drive the vehicle alone or assist the engine. During a diagnostic test, the

technician commands the electric motor to drive the vehicle with the engine off and the engine clutch disengaged. The vehicle moves but produces a grinding noise from the drivetrain. What is the most likely cause?

A. The engine clutch is not fully disengaging and the partially engaged clutch disc is dragging against the flywheel creating the grinding noise as the electric motor drives the transmission input shaft through the dragging clutch

B. The electric motor's rotor bearing has worn and the rotor contacts the stator during the full-torque driving condition creating the grinding noise that is masked by the engine noise during normal hybrid operation but audible in EV mode

C. The transmission synchronizer is grinding because the motor drives the input shaft at a different speed pattern than the engine and the synchronizer cannot match the speed differential created by the motor's instant torque delivery

D. The traction motor coupling to the transmission has a worn spline that creates a grinding noise under the motor's high-torque low-speed driving condition — the engine's vibration masks this noise during normal hybrid driving operation

Practice Exam 10: Answer Key and Explanations

1. A — The 500 kg rated jack must be used because the transmission weighs 400 kg and the jack must exceed the load weight with a safety margin. The 250 kg jack would be loaded to 160% of its capacity which risks catastrophic jack failure. Never exceed a lifting device's rated capacity regardless of how briefly the load is supported.

2. C — Air tank inspection and replacement requirements vary by province and territory. The technician must verify the applicable provincial regulation for the jurisdiction where the vehicle is registered and maintained, then inspect or replace the tank according to that regulation's specific requirements for the tank's age, condition, and inspection interval.

3. D — A dropped brake shoe may have developed internal cracking in the friction material from the impact that is not visible on the surface. Under braking heat and force, the hidden crack can propagate and cause a large section of the lining to separate from the shoe table. The risk of lining separation during braking outweighs the cost of a replacement shoe.

4. B — The first priority before any hydraulic repair is to lower the suspended load safely to the ground. A load suspended 3 metres above the ground represents a crushing hazard if the holding valve or any

supporting component releases during the repair. No work should begin on the hydraulic system until the load is safely on the ground.

5. A — Grey-coloured grease from a system that normally dispenses amber grease indicates contamination. The contamination could be from mixing incompatible grease types in the bulk supply, moisture intrusion that has degraded the grease, or metal particles from a worn pump or fitting. Contaminated grease should not be applied to vehicle components until the source is identified.

6. D — A floor jack and chain is an improvised setup that lacks the stability and security needed for a 180 kg differential carrier removal. The carrier can shift, tilt, or fall during the horizontal sliding motion required to extract it from the housing. A purpose-built differential carrier stand or fixture provides secure, stable support designed for this specific task.

7. C — A mushroomed tool head changes the flat striking surface into a rounded or flared surface. When the hammer strikes the mushroomed head, it can glance off at an unpredictable angle, deflecting the hammer toward the technician's hand or the punch sideways into the workpiece. All mushroomed tools must be dressed or replaced before use.

8. B — Repeated exposure to diesel fuel, solvents, and cleaning chemicals without consistent hand protection causes occupational contact dermatitis — a cumulative skin condition. The technician must use chemical-resistant gloves (nitrile is appropriate for petroleum products) consistently during all fuel system work and chemical contact to prevent further skin damage.

9. D — Elevated oil consumption during the first 5,000 to 10,000 km of a rebuilt engine's life is expected and normal. New piston rings must seat against the freshly honed crosshatch pattern, and this seating process allows some oil to pass the rings until full conformity is achieved. The consumption rate should decrease progressively and reach the OEM specification after break-in.

10. A — At 2,500 metres elevation, the atmospheric pressure is approximately 75 kPa versus 101 kPa at sea level — a 25% reduction in air density. The turbocharger compresses this thinner air, but the reduced mass of air molecules in each volume means less oxygen reaches the cylinders per boost-pressure unit. The engine cannot burn as much fuel completely, reducing power output.

11. C — The CCV heated hose is designed to prevent the crankcase vent from freezing in extreme cold. If the heater circuit fails, the vent freezes shut trapping crankcase gases inside the engine. The resulting internal pressure buildup forces oil past the path of least resistance — typically the rear main seal. The problem resolves when temperatures rise and the vent thaws naturally.

12. B — The engine has glow plugs, grid heater, and adequate fuel system function confirmed. The most common remaining cold-weather starting failure is the engine oil viscosity being too heavy for the ambient temperature. Thick oil creates excessive cranking resistance that slows the starter below the minimum RPM needed for adequate compression heating and injection system operation.

13. D — The radial play of 0.15 mm is nearly double the 0.08 mm maximum specification. Although the turbocharger currently performs normally, the excessive play means the shaft is approaching contact with the compressor and turbine housings. Sudden contact causes catastrophic failure — a broken wheel can send debris into the engine (compressor side) or DPF (turbine side).

14. A — A slightly earlier RPM acceleration during the cranking test for one cylinder suggests that cylinder's compression event is subtly different. A worn intake cam lobe reduces valve lift and duration, decreasing the cylinder's air charge. Less air means less resistance during compression — the crankshaft accelerates slightly faster past that cylinder's compression stroke.

15. C — The high-pressure pump builds adequate rail pressure (confirming it still works) but consumes 15% more engine power. Internal wear has increased the clearances between pistons and barrels, allowing more fuel to leak internally during each compression stroke. The pump must compress more fuel per cycle to compensate for the leakage, consuming more mechanical energy from the engine.

16. B — A noise occurring at exactly half the engine RPM corresponds to camshaft speed. The camshaft rotates once for every two crankshaft revolutions in a four-stroke diesel engine. A worn cam lobe, a sticking valve lifter, a worn rocker arm, or a fuel injection pump drive component rotating at camshaft speed is the source of the half-engine-speed ticking.

17. D — EGR cooler efficiency depends on clean heat transfer surfaces on both sides. Carbon and soot deposits on the exhaust gas passages insulate the tubes from the coolant, and scale or corrosion on the coolant passages reduces coolant flow and heat absorption. Either condition independently reduces the temperature drop, and both may be present simultaneously.

18. A — Turbocharger lag is the delay between the driver commanding full fuel and the turbocharger producing full boost. During this brief lag, the fuel system delivers full fuel but the intake air charge is still at low-boost levels. The temporary rich mixture (more fuel than air can burn) produces black smoke until the turbocharger spools up and delivers adequate air.

19. C — Biodiesel has stronger solvent properties than petroleum diesel. The biodiesel fraction that passes the piston rings during combustion dissolves into the crankcase oil more readily than petroleum diesel fuel dilution. The dissolved biodiesel reduces the oil's viscosity faster and to a greater degree than standard diesel, potentially requiring shortened oil change intervals.

20. B — A gradual decrease in heater output with correct coolant level and normal gauge temperature suggests reduced coolant flow through the heater core. Measuring the temperature difference between the inlet and outlet heater hoses identifies whether the core has an internal restriction — a large temperature drop from inlet to outlet with reduced flow confirms a partially blocked core.

21. D — Ten regenerations in 1,000 km versus the normal one per 500 km means the engine is producing soot five times faster than designed. The DPF loads to the regeneration threshold much sooner than normal because the engine has a combustion-related problem — worn injectors, low boost, intake restriction, incorrect timing, or an EGR fault — that produces excessive soot.

22. A — Oil pressure that rhythmically pulsates at idle but stabilizes at higher RPM indicates the oil pressure relief valve is oscillating at the boundary of its cracking pressure. At idle, the pump output is just above the relief valve's opening threshold. The valve alternately opens (pressure drops) and closes (pressure rises) creating the pulsation. At higher RPM, the pump output exceeds the valve's range and pressure stabilizes.

23. C — The engine runs normally with no driveability complaints, but the scan tool shows 80 bar above commanded at all conditions. If the fuel system were actually 80 bar over, the engine would exhibit symptoms. The most likely explanation is the replacement sensor has a different calibration offset — it reads 80 bar higher than actual pressure. The system operates correctly but the sensor reports inaccurately.

24. B — A new filter that produces more smoke than the slightly used old filter is counterintuitive if the filter is functioning correctly. The most likely cause is a manufacturing defect in the new element — a folded pleat, torn media, or unsealed edge that allows unfiltered air (and the contaminants it carries) to bypass the filter media and enter the engine.

25. D — When disabling an injector produces no change in RPM or vibration, that cylinder is not contributing to engine power. The cylinder is already dead from a combustion failure — either the injector is not delivering fuel, the compression is too low for combustion, or the valve timing is incorrect. Disabling an already-dead cylinder changes nothing.

26. A — Plunger lift at port closure determines when effective injection begins. A lift of 2.5 mm versus the specified 3.0 mm means port closure occurs later in the pump's rotation — the plunger must travel further before it seals the port and begins building injection pressure. The delayed port closure retards the injection timing relative to the piston position.

27. C — Even 3% EGR valve opening at idle introduces exhaust gas into the intake manifold. At idle, the engine operates at its most sensitive condition with minimal air charge. A small amount of exhaust gas displaces a proportionally significant amount of oxygen in the already-small air charge, reducing combustion quality enough to produce perceptible rough idle.

28. D — With correct DEF quality and dosing rate, the low NOx conversion must originate at the SCR catalyst itself. Thermal degradation from excessive temperature exposure, contamination from fuel or oil residue on the catalyst surface, or sulphur poisoning from fuel sulphur compounds all reduce the number of active catalytic sites available for the NOx conversion reaction.

29. B — Blue-grey smoke during deceleration after full-load operation indicates oil entering the combustion chambers during the high-vacuum condition. When the throttle closes after full boost, the intake manifold vacuum spikes. Hardened valve stem seals cannot maintain their seal against the stem during this high vacuum, allowing oil to be drawn past the guides into the combustion chambers.

30. A — Compressed air exits the compressor at approximately 150 to 200°C from the heat of compression. The discharge line between the compressor and the air dryer is designed to withstand this temperature. The hot air actually helps the air dryer function — the elevated temperature keeps moisture in vapour form until it reaches the dryer where it is captured by the desiccant.

31. C — With normal system pressure and no external leaks, the spongy pedal with extra travel points to an internal bypass in the foot valve. The inlet piston seals allow air to bypass during the initial stroke before seating under higher pressure. This dead band at the beginning of travel absorbs pedal movement without building delivery pressure.

32. D — During hard braking, dynamic weight transfer shifts the vehicle's mass forward loading the front axle tires more heavily and lightening the rear axle. The increased front tire traction allows the front brakes to absorb more force without lockup. The lightened rear axle has reduced traction and the rear tires approach lockup first, correctly triggering rear ABS activation.

33. A — ABS systems typically require a minimum vehicle speed (usually 7 to 10 km/h) before they will activate and modulate. Additionally, the wheel speed sensors need adequate rotational speed to

generate a usable signal. A simple yard push at very low speed may not exceed the activation threshold needed for meaningful ABS testing and verification.

34. A — In a floating caliper design, the piston pushes the inboard pad against the rotor and the reaction force slides the caliper body to press the outboard pad. If the caliper slide pins are seized, the caliper cannot float — the piston still pushes the inboard pad but the caliper body cannot pull the outboard pad into equal contact. The inboard pad does all the work and wears faster.

35. B — New spring brake chambers are often shipped with the caging bolt engaged to compress the powerful internal spring for safe handling and shipping. If the technician installs the chamber without disengaging the caging bolt, the spring is mechanically held compressed and cannot apply force to the pushrod when the parking brake valve exhausts the air supply.

36. D — Equal chamber sizes and equal pushrod strokes eliminate the air system and adjustment as variables. The remaining variable is the friction surface. Oil contamination on the right side brake lining from an axle seal leak reduces the friction coefficient. The contaminated lining converts less kinetic energy to heat, producing the measurably lower drum temperature.

37. B — In an EBS system, the pedal travel sensor is the primary input that tells the EBS controller how much braking the driver demands. The controller uses this electronic signal to calculate and deliver optimized brake pressure to each axle based on the demand level, load condition, and traction available. A failed sensor forces the system into backup pneumatic mode.

38. A — The height control valve's supply port has a flow restriction that limits the volume of air reaching the bags during reinflation. The valve's internal flow capacity determines how quickly the bags can be filled. A restricted supply port fills the bags slowly and the valve may reach its neutral (height-satisfied) position prematurely before the bags achieve full inflation pressure.

39. C — Water from the deep crossing has entered the brake drums and coated the friction surfaces of the brake linings. The water film between the linings and drums dramatically reduces the friction coefficient. Braking effectiveness is reduced until the water evaporates from the heat generated during subsequent brake applications — typically requiring several moderate stops.

40. D — The late-closing trailer protection valve allows the tractor's air supply to drain to a dangerously low level (275 kPa instead of the designed 420 kPa) before it closes. At 275 kPa, the tractor may not

have adequate air pressure for its own service brakes or to maintain its spring brakes in the released position. The valve must be adjusted or replaced.

41. B — The service section geometry of a Type 30/30 combination chamber differs from a straight Type 30 chamber. The internal diaphragm effective area, the pushrod travel relationship, and the chamber's physical dimensions create a different stroke characteristic. The technician should verify the stroke against the Type 30/30's specific adjustment specification.

42. A — The parking brake's holding ability depends on the spring force applied to the foundation brakes through the specific brake geometry. If the spring brake chambers are undersized for the vehicle's GVW, the spring force may be adequate for moderate grades but insufficient for a 15% grade with a full load. The chamber force rating must match the vehicle's weight and grade requirements.

43. D — Brake pedal pulsation with adequate pad thickness and apparently smooth rotor surfaces requires measurement of the rotor's lateral runout (using a dial indicator) and thickness variation (using a micrometer at multiple circumferential points). Either excessive runout or thickness variation (parallelism error) forces the caliper piston to oscillate, producing the pedal pulsation.

44. D — The sensor has been replaced and the air gap is correct, but the code returns within 50 km. Both the tone ring and the sensor wiring harness must be inspected. A cracked, contaminated, or damaged tone ring produces signal interruptions. A chafed, pinched, or corroded wiring harness creates intermittent opens or shorts. Either can independently produce the recurring fault.

45. B — The air dryer purge valve is not fully closing between purge cycles. The partially open valve continuously vents a small amount of air from the system, causing the pressure to drop to the governor's cut-in point more frequently. Each governor loading cycle triggers a purge, creating the 30-second cycle. The purge valve must be repaired or replaced.

46. A — The relay valve exhausts normally when tested by hand, confirming the air system releases correctly. The brakes drag after release because the brake shoe return springs on that axle are broken or weakened and cannot overcome the residual friction between the linings and drums to pull the shoes away from the drum surface after the application pressure is released.

47. D — A load test requires the battery to start from a full state of charge to produce a valid result. A partially discharged battery will fail the load test because it cannot deliver its rated CCA from a depleted

state — this is a test condition failure, not a battery failure. The battery must be fully charged and allowed to rest before the load test to eliminate false-fail results.

48. C — The ECM sensor and the dash gauge sender are separate devices. An NTC sensor with an open circuit presents infinite resistance to the ECM, which reads the full 5-volt reference unloaded. The ECM interprets maximum voltage as minimum temperature (-40°C on the NTC scale). The dash gauge operates from its own functioning sender and shows the correct temperature.

49. B — The total voltage drop is the sum of all drops in the complete circuit: 0.8V (positive cable) + 0.4V (ground circuit) = 1.2V total. The maximum allowable voltage drop for the charging circuit is typically 0.5V. The 1.2V drop is significantly excessive and means the battery receives only 13.2V of the alternator's 14.4V output. The high-resistance connections must be repaired.

50. A — FMI 3 (voltage above normal) on a 5-volt reference sensor means the ECM is seeing voltage above the sensor's designed maximum output range. A short between the signal wire and the 5-volt reference wire, or a short to battery voltage, drives the signal above the maximum expected level. The ECM cannot interpret the over-range voltage as a valid pressure reading.

51. D — Parallel batteries must be matched in age, capacity, and internal resistance. The new battery has lower internal resistance than the 2-year-old battery, so it accepts more charging current and delivers more load current — essentially doing a disproportionate share of the electrical work. This accelerated cycling degrades the new battery far faster than if paired with a matched unit.

52. C — With termination, backbone, and connectors verified, the intermittent faults may originate from electromagnetic interference. CAN bus wiring routed alongside high-current cables (starter, alternator, welding) is exposed to electromagnetic fields that can induce noise on the differential signal pair. Rerouting the CAN wiring away from high-current paths or adding shielding resolves the interference.

53. B — Mirror memory positions are stored in the body controller's electronic memory. When the battery is disconnected, the volatile memory loses the stored positions. The driver must manually readjust both mirrors to the preferred positions and perform the memory store procedure through the mirror control switch to save the new positions in the controller's memory.

54. A — LED turn signal bulbs draw significantly less current than the incandescent bulbs they replaced. The flasher module monitors circuit current to detect burned-out bulbs — a failed bulb reduces

the circuit current. The LED's low current mimics the current pattern of a burned-out incandescent bulb, triggering the flasher module's bulb-out alert (hyperflash).

55. C — FMI 5 (current below normal) for a passive sensor is unusual because passive sensors generate voltage, not current. However, the signal current flowing through the sensor's resistance determines the voltage the ABS module measures. A reduced signal — from increased air gap, weakened magnet, or contaminated ring — produces less current than the module requires for valid speed data.

56. A — With internal sensing at the B+ terminal, the regulator sees the alternator's output voltage which includes the cable voltage drop. The regulator is satisfied at 14.4V at the alternator even though the battery only receives 13.2V after the drop. Remote sensing allows the regulator to read the actual battery voltage and increase output to compensate for the cable drop.

57. D — The alternator produces 14.4V at B+ with headlamps on, but the dash reads only 13.5V. The 0.9V difference under the headlamp load indicates excessive resistance in the charging circuit that only becomes apparent under the increased current draw of the headlamp circuit. The additional current amplifies the voltage drop through the resistive connections.

58. B — The ABS power-on self-test does more than just check the lamp. It verifies the module's power supply, the lamp circuit, the wheel speed sensor circuits for correct resistance, and briefly energizes each modulator valve solenoid to confirm they respond. The 3-second lamp illumination followed by extinguishment indicates all tested components passed the basic functional check.

59. C — The replacement body controller must be configured with the vehicle's specific option codes and feature settings. A new controller ships with default configuration that may not include the trailer towing package. Without enabling the trailer package in the configuration, the controller does not activate the pin 7 output for trailer ABS power and charging.

60. A — The speedometer works correctly (receiving speed data from one source) but the engine ECM shows 0 km/h (not receiving speed from its source). On many heavy-duty vehicles, the ECM receives vehicle speed from the ABS module via a specific J1939 PGN. If the ABS module is not broadcasting that specific PGN, or the ECM is looking for it on a different parameter, the ECM reads zero.

61. D — The trailer's 7-pin connector had an intermittent connection on the ABS power pin. During driving, the poor contact caused a momentary power loss to the trailer ABS module, which illuminated

the tractor dash lamp. Disconnecting and reconnecting the gladhands physically reseated the connector pins, restoring solid electrical contact and clearing the fault.

62. B — Remote power modules (RPMs) control only the specific circuits assigned to them. A failed rear RPM affects only the rear marker lamps, tail lamps, and other circuits managed by that module. All other RPMs continue operating independently, and the engine, transmission, and other vehicle systems function normally because they are not dependent on the rear RPM.

63. C — The old starter's worn drive gear meshed compatibly with the equally worn ring gear. The remanufactured starter has new drive gear teeth that do not mesh smoothly with the ring gear's worn tooth profile. The mismatch between the new gear's sharp tooth profile and the ring gear's rounded, worn teeth creates the whirring noise during engagement.

64. D — A TPS reading of 5% with the pedal fully released is outside the 0% ± 1% specification. This off-zero reading can cause elevated idle speed (the ECM thinks the driver is applying slight throttle), prevent idle shutdown timers from activating, interfere with engine brake logic, and affect cruise control engagement. The pedal assembly or TPS needs adjustment or replacement.

65. A — The ABS lamp not illuminating during the bulb check means the driver has no way to know if the ABS system develops a fault during driving. A failed lamp circuit could mask an active ABS fault indefinitely — the system could be completely disabled without the driver's knowledge, removing anti-lock protection during every emergency braking event.

66. D — The alternator was bench-tested and confirmed at 14.4V and full output. After reinstallation, the battery only receives 13.0V. The 1.4V difference is lost in the charging circuit between the alternator B+ terminal and the battery positive terminal. A voltage drop test of the cables and connections will identify the specific high-resistance point consuming the 1.4V.

67. A — The updated ECM calibration may have different parameters for the wastegate position sensor's expected operating range, response time, or position thresholds. The sensor that operated within the old calibration's parameters now falls outside the new calibration's narrower or shifted acceptable range. A wastegate recalibration or position relearn may be needed.

68. C — A 2-volt drop somewhere between the fuse panel and the outlet under load indicates a high-resistance connection in the circuit. A sequential voltage drop test — measuring the drop across each

connection point individually while the circuit carries its full operating current — identifies the specific connector, splice, or terminal that contains the excessive resistance.

69. B — The transmission shifts smoothly with the engine off (no input shaft rotation) confirming the synchronizers, shift forks, and detents are mechanically sound. When the engine runs and the clutch is depressed, the input shaft should stop rotating for clean shifts. If the clutch drags (does not fully disengage), the input shaft continues spinning, making gear engagement difficult.

70. C — Cold transmission fluid has higher viscosity that resists flow through the valve body's small passages and orifices. The forward clutch apply circuit must fill through these passages, and the thick cold fluid flows slowly, delaying the fill time. As the fluid warms and thins, it flows faster through the same passages and the engagement time returns to normal.

71. A — The driveshaft was balanced by the shop, and the U-joints are new. A vibration proportional to vehicle speed after shortening points to U-joint phasing. If the yoke ears at each end are not aligned on the same rotational plane, the U-joints cannot cancel each other's angular velocity variations, producing a speed-proportional vibration.

72. D — Hot spots on the clutch disc friction surfaces are caused by corresponding hard spots on the flywheel or pressure plate. Hard spots form when localized areas of the cast iron undergo a metallurgical transformation (to martensite) from repeated heat-and-cool cycles. These hardened areas have higher friction than the surrounding material, concentrating heat at those points.

73. B — A grinding noise during the 4WD shift that stops once engagement is complete indicates the shift mechanism cannot match the front and rear output speeds before the engagement collar contacts the dog teeth. A worn synchronizer cannot slow the speed differential adequately, and the unmatched speeds produce grinding until the teeth mesh and force synchronization.

74. A — A growl in only one gear position with all other gears quiet points to the specific gear pair for that ratio. The 3rd gear mainshaft and countershaft gears may have a tooth surface finish defect, an assembly error (wrong gear, incorrect backlash), or a defective gear from manufacturing. All other gear pairs mesh correctly, isolating the problem to the 3rd gear set.

75. C — The two-speed axle shifts between ranges based on vehicle speed. If the upshift and downshift speed thresholds are set too close together, minor speed variations during cruise repeatedly cross both

thresholds. The controller alternately commands upshift (speed rises above threshold) and downshift (speed drops below threshold) creating continuous hunting.

76. D — The differential spider gear thrust washers and side gear thrust washers are typically manufactured from copper-bronze alloy. These washers bear the axial loads generated during differential action (turns, uneven traction). Elevated copper without corresponding increases in other metals confirms the copper-bronze thrust washers are the wear source.

77. A — A vibration at a specific engine RPM that disappears when the clutch is depressed (disconnecting the engine from the drivetrain) confirms the vibration is transmitted through the clutch. At 1,800 RPM, the engine's firing frequency matches the natural resonance frequency of the drivetrain through the clutch disc damper springs, amplifying the vibration.

78. B — A buzzing noise present in all gears and Park/Neutral that changes only with engine RPM originates from a component rotating at engine speed in all conditions. The torque converter mounts directly to the flywheel and rotates at engine speed regardless of gear selection. A loose internal component (thrust washer, bearing race) vibrates at engine frequency.

79. C — Limited-slip differentials require a specific friction modifier additive in the gear oil to control the clutch disc engagement characteristics. Without the friction modifier, the clutch discs grab and release alternately during the speed differential required for turns. The stick-slip cycle produces the characteristic chatter noise and vibration during low-speed dry-pavement turns.

80. D — Scoring on the output shaft seal surface means a new seal lip will ride in the scored groove and leak. A seal saver sleeve (speedi-sleeve) presses over the scored area providing a smooth, new running surface for the seal lip. This is the standard industry repair that avoids the cost and labour of output shaft replacement for a seal surface issue.

81. B — A squeak at a specific repeatable point in the clutch pedal travel during both depression and release indicates a dry pivot point. The clutch pedal pivot bushing has dried out from lack of lubrication, and the metal-to-metal contact between the pedal shaft and the bushing squeaks at the point where the pedal load is highest during the travel arc.

82. A — The inter-axle lock functions correctly (4WD works) but the indicator lamp flashes continuously instead of illuminating steadily. The flashing indicates a poor electrical connection in the

lamp circuit — a corroded connector, loose terminal, or intermittent wire — that causes the lamp to cycle rather than maintaining steady illumination.

83. D — A harsh downshift bump during throttle-lift in overdrive indicates the gear transition is not properly managed. The TCM's shift calibration for the coast downshift has an incorrect parameter — the engine speed is not being matched adequately to the lower gear's input speed requirement before the clutch engages, creating the harsh bump from the speed mismatch.

84. C — A 3 mm radial wobble at the wheel mounting flange of a semi-floating axle shaft indicates the shaft has developed a fatigue crack near the flange. The crack allows the flange to flex under the wheel's weight, and the crack opens and closes during each revolution. On a semi-floating axle, a shaft failure can result in wheel separation — the shaft must be replaced immediately.

85. C — A single clunk at compression brake engagement and disengagement indicates excessive lash between the slave pistons and the exhaust valve crossheads. The slave pistons free-fall across the excessive gap and impact the crossheads during engagement. Correct lash eliminates the gap and produces a smooth, quiet engagement and disengagement.

86. A — A power steering pump whine that increases with RPM and is more noticeable during straight-ahead driving (low hydraulic load) indicates internal wear. The pump's internal bearings, vanes, or rotor surfaces are wearing and producing the speed-dependent noise. During turns, the increased hydraulic load creates flow noise that masks the mechanical wear noise.

87. C — Adding helper springs increases the steer axle's weight-carrying capacity, which means more weight on the steer tires. More weight on the tires increases the friction between the tires and the road surface (the contact patch load increases). The power steering system must overcome this additional tire-to-road friction during turns, requiring more effort from the driver.

88. A — The sector shaft adjustment controls lash at the centre position, with designed increasing clearance off-centre. Over-tightening creates binding throughout the entire range because the off-centre clearance has been eliminated. Additionally, if the worm shaft bearing preload was not verified before the sector adjustment, the combined over-tight preloads create binding.

89. D — Cupping (scalloped wear) on steer tires with correct alignment and inflation is most commonly caused by worn shock absorbers. Failed shocks cannot control the tire's vertical bounce during driving.

Each bounce cycle creates alternating heavy and light ground contact that wears the tire unevenly — heavy contact wears the tread, light contact allows the tire to skip, creating the cupping pattern.

90. C — Frame web cracks require proper diagnosis before repair. The correct approach is to drill stop holes at each crack end to arrest propagation, then consult the frame manufacturer's approved repair procedures. The appropriate repair method — bolted splice plate, welded repair, or section replacement — depends on the specific crack location, frame loading, and the manufacturer's engineering analysis.

91. B — An equalizer beam is a structural suspension component that carries dynamic loads during driving. A cracked weld indicates the beam has reached its fatigue life and the crack will continue to grow under the repeated loading of normal operation. Welding a fatigued structural component cannot reliably restore its original design strength. The beam must be replaced.

92. A — Brinelling is the permanent indentation of the bearing race surface by the rolling elements under static overload or vibration. The evenly-spaced marks correspond to each roller's contact position. This damage occurs when the bearing is subjected to impact loading (pothole, dropped during installation) or vibration while stationary (extended trailer parking on rough ground).

93. D — A patch-only repair (no plug) seals the inner liner surface but does not seal the puncture channel through the tire carcass. Air slowly migrates through the unsealed casing material in the puncture path over time. The combination plug-patch (required for proper commercial tire repair) seals both the inner liner and the puncture channel preventing this migration.

94. B — The outer bearing position in a hub is typically at or above the oil level in the sight glass. When the oil level drops to the bottom of the glass, the outer bearing may be above the oil surface and relies on splash lubrication from the gear/hub rotation. Reduced splash at the low level may have caused the outer bearing to operate with marginal lubrication.

95. C — Excessive old grease buildup mixed with road debris creates multiple problems. The contaminated grease becomes abrasive, accelerating wear on both coupling surfaces. The thick buildup can prevent the fifth wheel jaws from locking fully around the king pin. The old grease should be cleaned off and replaced with a thin film of fresh lubricant for proper coupling function.

96. A — The individual readings show the right wheel toeing out (-0.10°) and the left toeing in (+0.05°). This asymmetric condition creates two problems: the steering wheel will be off-centre during straight

driving, and the right steer tire will develop rapid feathered wear from being dragged outward. Both sides must be adjusted to bring the individual and total toe within specification.

97. D — Air flows freely from the disconnected supply line confirming the supply is functioning. The air spring is receiving air but sitting low — the spring bladder has a leak that allows the air to escape. The height control valve continuously supplies air trying to maintain height, but the leak prevents the spring from reaching and maintaining the correct ride height.

98. B — A remanufactured axle may have been assembled with insufficient king pin bushing preload. Loose bushings allow the steering knuckles to float on the king pins creating play that is too small to measure as traditional steering wheel free play but is large enough to produce the vague feel and wandering sensation during highway driving.

99. A — The ABS sensor does not fit the new bearing assembly's sensor boss because the sensor and bearing are mismatched. The most likely cause is an incorrect bearing part number. Different vehicle models or years use different sensor types (passive vs active) with different mounting dimensions. The bearing part number must be verified against the specific vehicle application.

100. C — A tire that developed on a drive axle takes a permanent set in its internal structure from the specific loading pattern (drive torque, braking forces, dual-tire contact). When moved to the steer axle, this permanent deformation produces a radial force variation — a once-per-revolution force imbalance that creates vibration at highway speed even though the tire balances correctly on a static balancer.

101. D — Fine metallic paste at the bottom of the hub cap is bearing wear debris that has been carried by the oil and settled at the lowest point. The silver-grey colour and metallic texture indicate the bearing rolling elements or races are shedding material. The bearings should be inspected for spalling, pitting, or other surface damage before the hub is returned to service.

102. A — Self-steering axle tires experience lateral scrubbing forces during every turn because the steering action requires the tires to change direction through a lateral scrub. Fixed axle tires roll through turns without lateral scrub because they are rigidly mounted. The cumulative lateral scrubbing from thousands of turns accelerates the tread wear on the self-steering axle.

103. B — Lowering blocks move the axle position relative to the frame which changes the geometric relationship between the spring, axle, and frame. This alteration directly changes the caster angle (the

forward or rearward tilt of the king pin axis). Reduced caster decreases the steering's self-centering force and directional stability, producing the vague feel and wandering.

104. C — The cab mounting bolts for looseness that allows the cab to shift on the frame during driving would transmit vibration to both the steering column and seat simultaneously through the cab body structure. This explains the dual-location vibration that is proportional to vehicle speed — road input from the frame reaches both locations through the loose cab-to-frame connection.

105. A — The cab suspension air springs with deteriorated bellows can rub against the piston during slow-speed compression. The slow body roll and pitch on uneven surfaces compress and extend the air springs at low frequency, and the deteriorated rubber squeaks against the piston during this movement. Highway speed road noise masks the low-frequency squeak.

106. D — A cab tilt latch with 5 mm of movement when the specification calls for zero has a worn engagement surface that compromises the cab's positive retention. During a collision or hard braking event, the dynamic forces on the cab could exceed the worn latch's holding capacity, potentially allowing the cab to unlatch. The latch or striker must be restored to zero-movement specification.

107. B — A broken door check allows the door to swing freely and uncontrollably. During cab entry or exit, the door can swing closed on the driver's hands, arms, or body causing injury. In windy conditions, the door can swing open and strike adjacent vehicles, structures, or people. The broken door check creates a direct injury hazard during every cab entry and exit.

108. C — The recirculation mode recirculates already-conditioned cab air through the HVAC system instead of continuously conditioning outside air. With the door stuck in fresh air mode, both the heater and A/C must continuously heat or cool outside air. This increases energy consumption (more fuel for heating, more compressor load for cooling) and reduces HVAC effectiveness in extreme temperatures.

109. D — A clogged floor drain on a refrigerated trailer allows water to accumulate and freeze on the cargo floor. The ice layer can damage the floor material (particularly composite floors), create a slip hazard for loading dock workers, and acts as a thermal bridge that increases heat transfer into the cargo space raising the TRU's workload and fuel consumption.

110. A — A cracked outer skin on a composite panel allows moisture to enter the panel's internal structure. Once inside, the moisture degrades the foam insulation core (reducing its R-value), promotes

corrosion on any internal metal structural components, and the freeze-thaw cycles of moisture trapped inside the panel progressively expand the damage from the original crack.

111. C — Trailer ABS modules must be programmed with the specific configuration of the trailer's sensor and modulator arrangement — the number of sensors, number of modulators, and their channel assignments. A new module arrives with default settings that must be reprogrammed using the manufacturer's diagnostic tool to match the trailer's actual ABS hardware configuration.

112. B — The TRU vibrates excessively when the compressor runs. The unit-to-trailer mounting bolts that attach the TRU to the front wall must be checked first because loose mounting is the most common cause of transmitted vibration. Loose bolts allow the entire TRU assembly to vibrate on the trailer face, amplifying normal operational vibration into the structure and fifth wheel.

113. D — The marker lamp and ABS sensor wiring typically share the same harness bundle. The rodent damage may have affected both circuits. The splice repair introduced resistance in shared ground paths, and the electrical tape creates a potential moisture trap. The increased ground resistance from the compromised shared ground path degrades the ABS sensor signal quality.

114. A — Corroded stake pockets with 1 mm of wall thickness loss have reduced structural capacity. Stakes inserted under cargo loading forces may bend or break through the thinned pocket walls, releasing the cargo securement. The reduced wall thickness directly lowers the pocket's rated load capacity for securing cargo, creating a securement safety concern.

115. C — Walking beam equalizer wear pads must slide freely to allow the beam to pivot and equalize the load between axles. Scored and galled wear pads create metal-to-metal binding that prevents smooth pivoting under load. The binding affects axle load equalization — one axle may carry more weight than the other because the beam cannot redistribute the load evenly.

116. B — A mud flap hanging at an angle that blocks the tire sidewall view prevents the driver from performing a complete visual tire inspection during pre-trip and en-route walk-around inspections. Sidewall damage, bulges, cuts, or low inflation that would be visible with a properly mounted flap are hidden by the dangling flap, potentially allowing a damaged tire to remain in service.

117. D — The compressor runs continuously without cycling and the evaporator reaches 0°C. The system needs temperature feedback to cycle the compressor off before the evaporator freezes. The low-pressure switch (which opens when suction pressure drops to the freeze-point threshold) was most likely not reconnected after the receiver/dryer replacement. Without it, nothing signals the compressor to stop.

118. A — Heat is available at the defrost outlets (confirming the heater core works) but the airflow velocity at the defroster is reduced compared to floor and panel positions. The defroster ductwork between the HVAC plenum and the dash-top outlets has a separation, collapse, or partial obstruction that restricts the volume of air reaching the windshield.

119. B — A new compressor that produces a rattling noise increasing with RPM should be checked for loose mounting first. A compressor that is not fully secured shifts on its bracket during operation, and the movement between the compressor body and the bracket produces the rattle. Verifying and correcting the mounting bolt torque is the simplest and most common fix.

120. C — The flame sensor detects the initial flame correctly (the heater starts and runs for 10 minutes) but then loses detection and shuts down. Excessive carbon buildup in the combustion chamber gradually insulates the flame sensor from direct flame contact during operation. The sensor detects the flame initially but the growing carbon layer reduces its exposure over the 10-minute run time.

121. C — A clear sight glass (no bubbles) with elevated pressures on both sides and reduced cooling indicates an overcharged system. Excess refrigerant fills the condenser with liquid, reducing the available surface area for heat rejection (high-side rises). The excess liquid floods the evaporator, reducing heat absorption efficiency (low-side rises). The sight glass is clear because it is solid liquid.

122. A — A chemical odour (not musty — chemical) on initial A/C startup suggests a refrigerant leak at the evaporator. A small leak releases refrigerant vapour into the HVAC housing, and the blower carries the chemical odour into the cab when first activated. The odour dissipates as the leaked refrigerant disperses and the A/C operation circulates fresh air through the system.

123. B — The APU A/C system and the main vehicle A/C system are separate circuits on most installations. However, some configurations share components or refrigerant circuits. If the APU A/C drew refrigerant from the main system during overnight operation, the main system would be undercharged the next morning. The main system must recover adequate charge before reaching full performance.

124. D — The packer speed decreases as temperature rises because the oil's viscosity drops. Thinner oil increases internal leakage at every clearance point in the system — worn pump gears, cylinder piston seals, valve spool clearances, and motor internals all allow more bypass flow as the oil thins. The cumulative leakage across all worn components reduces the net flow available to the packer.

125. B — The cylinder cushion's needle valve controls the deceleration rate by metering the oil escape during the cushion stroke. If the valve is closed too far, the oil escape is overly restricted, producing an abrupt deceleration instead of the designed gradual slowdown. Opening the needle valve slightly increases the flow during the cushion stroke for a smoother deceleration.

126. A — Two gauges at the same test point produce different readings — the replacement gauge reads 500 kPa higher. The simplest explanation is the replacement gauge is miscalibrated. The second gauge reading the correct pressure confirms the system is functioning normally. The replacement gauge should be verified against a known standard or replaced with a calibrated unit.

127. B — The pump delivers adequate flow, the valve provides full flow, and the pressure is correct — but the motor speed has decreased gradually. A hydraulic gear motor with worn internal clearances (between the gears and the housing) allows more fluid to bypass without performing work. The motor receives full flow but converts less of it to mechanical rotation, reducing the output speed.

128. D — The directional valve shifts to lower and oil flows freely from the rod-end port back to the reservoir when the line is disconnected at the cylinder. This confirms the pump, valve, and rod-end circuit are all functioning. The cylinder itself cannot retract — the piston is seized, the rod is broken internally, or the piston has separated from the rod preventing retraction.

129. A — The accumulator's hydraulic pressure does not increase above the pre-charge level. This means hydraulic fluid cannot enter the accumulator. A ruptured bladder allows nitrogen to fill the entire accumulator volume — with no bladder separation, the gas occupies all space and the incompressible hydraulic fluid cannot push the bladder aside to enter and store energy.

130. C — The holding test isolated the circuit by shutting down the hydraulic system. With the system off, the directional valve spool is in neutral and is not a factor (no supply pressure drives fluid through the spool). The two remaining leak sources are the pilot-operated check valve's seat and the cylinder's piston seal — either can independently cause the 10 mm drift.

131. C — The crane's load chart is engineered by the manufacturer to match the hydraulic system pressure, structural component strength, and stability (tipping) limits. Increasing the relief valve pressure alters this calibrated relationship — the hydraulic force may exceed the structural capacity of the boom, cylinder pins, mounting bolts, or the crane's stability envelope. The manufacturer's engineered limits must not be modified.

132. D — At 90% SOH, the battery's capacity reduction is only 10% — not enough to explain the noticeable change in regen feel. The traction motor's permanent magnets gradually weaken from thermal cycling over the vehicle's life. Weaker magnets produce less back-EMF during regenerative generation, which reduces the deceleration force per unit of speed.

133. C — The stop-start functions (proving the belt transmits adequate torque for engine cranking) but regenerative recovery has dropped 50%. The belt tensioner was not reset to the ISG specification after the belt change. The tensioner's automatic range may not provide adequate tension for the high-torque regenerative events, allowing belt slippage during energy recovery.

134. A — Charging port connector pins may have live high voltage present when the vehicle's HV system is energized, even when not actively charging. Some systems maintain voltage at the port for communication with the charger. Exposed pins from the broken cover create a direct electrocution hazard from moisture, debris, or accidental human contact with the energized conductors.

135. B — The vehicle moves in EV mode confirming the motor and drivetrain work. The grinding noise during electric-only driving suggests a component that should be stationary is being dragged. The engine clutch not fully disengaging causes the clutch disc to drag against the flywheel, and the motor must drive both the transmission and the dragging engine mass, producing the grinding noise.