PRACTICE EXAM 4: RED SEAL TRUCK AND TRANSPORT MECHANIC SIMULATION (135 QUESTIONS)

1. A technician accidentally breaks open a container of automatic transmission fluid, spilling approximately five litres onto the shop floor near the floor drain. According to environmental regulations and WHMIS guidelines, what is the immediate priority?

A. Prevent the fluid from reaching the floor drain by applying absorbent material around the spill and blocking the drain immediately

B. Flush the spill into the drain with water since ATF is petroleum-based and the municipal water treatment facility processes petroleum products

C. Contact the provincial environmental ministry before touching the spill because ATF is classified as a hazardous material requiring government response

D. Leave the spill for the designated spill response team since technicians are not authorized to handle fluid spills exceeding one litre

2. A truck is being serviced on a hoist. A second technician needs to work under the truck simultaneously while the first technician works in the engine compartment above. What critical safety measure must be in place before the second technician positions themselves under the vehicle?

A. The second technician must wear a hard hat rated for overhead work to protect against falling tools and components

B. The first technician must stop all work and leave the engine compartment while anyone is positioned underneath

C. The hoist must be verified at its rated capacity and the mechanical safety locks must be fully engaged before anyone works underneath

D. A safety spotter must stand at the hoist controls at all times while both technicians are working on the raised vehicle

3. A technician is selecting a torque wrench to verify the final torque on wheel nuts. The specification calls for 610 Nm. Which torque wrench practice ensures the most accurate measurement?

A. Use a torque wrench rated for 1,000 Nm maximum to ensure the wrench has adequate capacity above the target specification

B. Use a torque wrench where the target torque falls within the middle 80% of the wrench's range for maximum accuracy

C. Use any available torque wrench regardless of range as long as it has been calibrated within the past five years

D. Use an impact wrench with a torque-limiting socket and confirm the reading with a second pass of the impact tool

4. A fleet operates trucks in an area where propane-powered forklifts load cargo into trailers inside an enclosed warehouse. A driver reports a strong propane odour inside the trailer after loading. What hazard does this present?

A. Propane displaces oxygen in enclosed spaces but poses no fire or explosion risk at the concentrations found in warehouse operations

B. The propane odour indicates a minor forklift fuel system leak that should be reported to the warehouse manager for equipment service

C. Propane gas is heavier than air and will settle to the floor of the trailer posing a tripping hazard for the driver during unloading

D. Propane is a flammable gas that can accumulate in the enclosed trailer creating an explosive atmosphere if exposed to an ignition source

5. A technician discovers a damaged electrical cord on a portable grinder. The outer insulation jacket is torn and two of the three internal conductors are visible. What should the technician do?

A. Wrap the damaged section with electrical tape and continue using the grinder until a replacement tool can be ordered

B. Cut the damaged section out and splice the wires together using wire nuts covered with heat-shrink tubing for insulation

C. Remove the grinder from service immediately, tag it as defective, and replace it with a tool that has an undamaged cord

D. Continue using the grinder with extra caution by wearing rubber-insulated gloves and standing on a rubber mat during operation

6. An apprentice technician is scheduled to service an air conditioning system for the first time. Before the apprentice can handle refrigerant, what requirement must be met according to Canadian environmental regulations?

A. The apprentice must have completed the required refrigerant handling training and hold the applicable provincial certification

B. The apprentice can handle refrigerant under direct supervision of a certified technician without needing personal certification

C. No special certification is required for handling R-134a refrigerant since it is classified as a non-toxic non-flammable substance

D. The apprentice only needs certification if the vehicle contains more than two kilograms of refrigerant in the air conditioning system

7. During a preventive maintenance inspection, a technician uses a dial indicator to check brake rotor runout. The indicator is mounted on a magnetic base attached to the steering knuckle. Before taking the measurement, what must the technician verify about the instrument?

A. The dial indicator has a minimum travel range of 25 mm to accommodate the full rotational sweep of the brake rotor surface

B. The magnetic base is attached to a non-rotating surface and the indicator plunger contacts the rotor perpendicular to its face

C. The dial indicator needle makes a minimum of five complete rotations during one revolution of the rotor for adequate resolution

D. The indicator zero point is set at the lowest reading position on the rotor to measure maximum runout from that reference baseline

8. A work order for a truck states: "Driver reports intermittent air leak — cannot locate." After inspection, the technician finds and repairs a leaking brake chamber diaphragm. What should the work order documentation include?

A. Simply write "air leak found and repaired" since the driver's original complaint has been addressed and the vehicle is safe

B. Describe the specific component that failed, its location, the repair performed, any parts used, and the post-repair leak test results

C. Only the part number of the replacement diaphragm since the billing department needs this information for the invoice

D. The driver's name and a note that the driver should have been able to locate the leak without requiring shop diagnostic time

9. A heavy-duty diesel engine uses a two-piece articulated piston with a forged steel crown and an aluminium skirt. What is the primary advantage of this design over a one-piece aluminium piston?

A. The aluminium skirt reduces total piston weight compared to a one-piece forged steel piston of the same dimensions

B. The two-piece design eliminates the need for piston rings because the crown-to-skirt joint seals the combustion chamber

C. The steel crown withstands extreme combustion temperatures and pressures while the aluminium skirt provides light-weight bore contact

D. The articulated joint between crown and skirt acts as a shock absorber reducing the peak combustion force transferred to the connecting rod

10. A diesel engine has been running with an air intake restriction caused by a collapsed hose between the turbocharger compressor outlet and the charge air cooler. What effect does this restriction have on engine performance and emissions?

A. Reduced airflow decreases the air-to-fuel ratio causing incomplete combustion, loss of power, excessive black smoke, and elevated exhaust temperatures

B. The restriction increases turbocharger speed which compensates by compressing the available air more efficiently to maintain normal operation

C. The reduced intake volume lowers the combustion temperature which actually reduces NOx emissions and improves DPF regeneration efficiency

D. Intake restrictions only affect engine performance at rated speed and have negligible impact during light load and idle operating conditions

11. A technician is measuring crankshaft end play on a heavy-duty diesel engine during reassembly. The dial indicator reads 0.45 mm of total movement. The OEM specification is 0.10 to 0.30 mm. What does this excessive end play indicate?

A. The main bearing cap bolts were not torqued to the correct specification causing the caps to shift during the test measurement

B. The crankshaft counterweight balance has shifted from the previous service changing the axial loading characteristics on the thrust bearing

C. The engine block main bearing saddles have been line-bored to an incorrect diameter changing the bearing crush and cap fitment

D. The thrust bearing that controls crankshaft axial movement is worn and must be replaced before the engine is returned to service

12. An engine oil analysis report for a heavy-duty diesel shows the following results: iron 45 ppm (previous 22 ppm), chromium 8 ppm (previous 2 ppm), aluminium 12 ppm (previous 5 ppm). All other metals are stable. What do these results collectively suggest?

A. Normal oil additive depletion that occurs as the oil approaches its maximum drain interval and the additive package breaks down

B. Accelerated wear involving cylinder liners (iron), piston rings (chromium), and pistons (aluminium) indicating the engine needs investigation

C. Fuel dilution that is dissolving metallic particles from the fuel system components and suspending them in the engine oil supply

D. Contamination from the oil filter bypass valve opening and recirculating previously captured metallic wear particles through the engine

13. A heavy-duty diesel engine equipped with a wastegate turbocharger over-boosts at full load. The scan tool shows actual boost pressure exceeding the ECM's commanded maximum. What is the most likely cause?

A. The wastegate actuator diaphragm has ruptured or the linkage has disconnected preventing the wastegate from opening to limit boost

B. The turbocharger compressor wheel has eroded reducing its efficiency and causing the system to compensate by raising boost pressure

C. The engine ECM has lost its calibration data and is commanding an incorrect maximum boost pressure above the system's design limit

D. The charge air cooler has developed an internal restriction that creates backpressure on the compressor side raising the sensed boost pressure

14. A truck driver reports that coolant must be added every two to three days, but there are no visible leaks under the vehicle. The exhaust appears normal with no white smoke. The oil is clean with no milky appearance. Where should the technician look for the coolant loss?

A. The radiator cap for a weak spring that allows coolant to boil and evaporate through the overflow tube without leaving visible residue

B. The cab heater core for a slow seep that drips coolant onto the cab floor where it evaporates from the heat of the HVAC system blower

C. The EGR cooler for an internal crack that allows coolant to enter the exhaust stream where it is consumed without visible external evidence

D. The coolant recovery bottle for a crack below the fluid level that allows coolant to slowly drip onto the frame rail and evaporate from engine heat

15. A common rail diesel engine has had three injectors replaced within 50,000 km. The original cause of injector failure was scored plunger and barrel assemblies. What system issue should be investigated to prevent recurring injector failure?

A. The engine ECM calibration software version for an update that may correct an overfuelling condition damaging the injector internals

B. The fuel injection pump timing for a mechanical advance that is occurring too early and creating excessive pressure inside the injectors

C. The exhaust backpressure for a plugged DPF that is creating combustion chamber pressure feedback into the injector nozzle tip area

D. The fuel filtration system for inadequate contaminant removal that allows abrasive particles to score the precision-fit injector components

16. A heavy-duty diesel engine produces a loud knocking noise from the top end that increases with engine RPM. The noise sounds like a rhythmic metallic tapping. What is the most likely cause?

A. Excessive main bearing clearance allowing the crankshaft to shift under load and produce a heavy knock at the bottom of the engine

B. Excessive valve lash on one or more cylinders causing the rocker arm to impact the valve stem tip with each cam rotation cycle

C. A loose flywheel that shifts on the crankshaft flange under the torsional loading of each power stroke producing a rhythmic knock

D. Piston pin (wrist pin) wear that allows the piston to rock on the connecting rod creating a metallic knock at each direction change

17. A technician replaces the thermostat on a heavy-duty diesel engine. After the repair, the engine overheats within 20 minutes of operation. The old thermostat was stuck open. What installation error could cause overheating with a new thermostat?

A. The new thermostat was installed upside down (backwards) with the sensing element facing the wrong direction preventing it from opening correctly

B. The replacement thermostat has a higher opening temperature than the original which delays cooling system engagement during normal operation

C. The thermostat housing bolts were over-torqued which distorted the housing and pinched the thermostat preventing free movement of the valve

D. The old thermostat gasket material was not completely removed from the housing surface and the new gasket cannot seal properly allowing air ingestion

18. An engine oil pressure gauge shows normal pressure at all speeds, but the engine has developed a main bearing knock. Oil analysis shows elevated lead and copper. How is oil pressure remaining normal despite bearing wear?

A. The oil pump pressure relief valve has been adjusted to compensate for the increased internal leakage from the worn bearing clearances

B. The oil cooler bypass valve is stuck open allowing unrestricted oil flow that masks the reduced pressure from increased bearing clearance

C. The worn bearing on one journal increases local clearance and leakage but the total system leakage has not yet exceeded the pump's capacity to maintain pressure

D. The oil pressure sending unit is located upstream of the main gallery and does not measure the actual pressure at the bearing journals themselves

19. A heavy-duty diesel engine has excessive crankcase pressure that is blowing oil past the dipstick tube seal and the valve cover gaskets. Blow-by measurements are within normal limits. What other condition could cause excessive crankcase pressure?

A. An over-filled crankcase where the oil level exceeds the maximum mark and the crankshaft counterweights contact the oil surface aerating it

B. The oil pan gasket has deteriorated and is allowing external air to be drawn into the crankcase creating positive pressure during operation

C. The exhaust system backpressure is too high and is pressurizing the crankcase through the turbocharger oil drain line connection at the block

D. A restricted crankcase ventilation system — a plugged CCV filter, frozen breather tube, or blocked crankcase vent — prevents pressure from escaping

20. A diesel engine equipped with a DPF system has a recurring fault code for DPF differential pressure higher than expected. The DPF has been cleaned recently and the soot load model shows low soot accumulation. What should be investigated?

A. The DOC upstream of the DPF for a substrate failure that has sent debris into the DPF inlet face physically blocking the channels

B. The DPF differential pressure sensor lines for soot plugging, moisture accumulation, or routing errors that produce false high-pressure readings

C. The EGR valve for a stuck-open condition that is introducing excessive soot into the DPF faster than the model can account for it

D. The fuel injectors for an over-fuelling condition that is producing more soot than the combustion model predicts during normal operation

21. A heavy-duty diesel engine's oil filter bypass indicator has tripped at mid-interval, well before the scheduled filter change. The oil appears dark but does not smell burnt. What is the most likely cause?

A. The engine is producing excessive soot from an EGR system malfunction, retarded injection timing, or restricted intake air that is loading the filter prematurely

B. The wrong oil filter element was installed at the last service and it has less capacity than the OEM-specified element for this engine

C. The oil viscosity was incorrect and the thicker oil is creating excessive pressure drop across the filter element triggering the bypass indicator

D. The oil temperature is running higher than normal due to a restricted oil cooler and the heat is degrading the filter media prematurely

22. A technician is installing a new set of piston rings during an in-frame overhaul. The ring end gaps are measured in the cylinder bore using a feeler gauge. The top compression ring end gap measures 0.15 mm. The OEM specification calls for 0.30 to 0.65 mm. What is the consequence of installing this ring with insufficient end gap?

A. The ring will provide a better seal than specified resulting in higher compression but no negative mechanical consequences for the engine

B. The ring will wear faster because the tight gap creates excessive friction between the ring face and the liner wall during operation

C. The ring ends will butt together when the engine reaches operating temperature causing the ring to buckle, scuff the liner, or break

D. The ring will not seat properly in the groove because the tight gap prevents the ring from conforming to the bore contour during break-in

23. A truck's engine retarder (compression brake) produces excessive noise compared to other identical trucks in the fleet. All six cylinders activate correctly and the retarding force is adequate. What is the most probable cause of the increased noise?

A. The compression brake control module is commanding the exhaust valve to open at the incorrect crankshaft angle during the braking event

B. The engine exhaust manifold has developed a crack near the compression brake housing that amplifies the decompression noise through the leak

C. The engine oil viscosity is thinner than specified reducing the hydraulic cushioning effect in the compression brake slave piston circuit

D. The compression brake slave piston lash is set too tight causing the exhaust valve to open earlier and with more force than the design specification

24. A diesel engine has a fault code for the exhaust gas temperature (EGT) sensor at the DOC inlet reading higher than expected during normal cruise operation. The engine performance appears normal. What should be investigated?

A. The EGT sensor wiring for a high-resistance connection that artificially elevates the voltage signal and causes a false high-temperature reading

B. The EGT sensor itself for a calibration drift that causes it to report temperatures higher than the actual exhaust gas temperature value

C. The DOC catalyst for excessive exothermic activity from a fuel system leak that is delivering unburned fuel to the DOC during normal operation

D. The turbocharger for a restricted exhaust housing that increases exhaust gas temperature upstream of the DOC during cruise conditions

25. A heavy-duty diesel engine is experiencing fuel knock — a harsh rattling combustion noise that is louder when the engine is cold. What fuel property is most likely contributing to this condition?

A. The diesel fuel has a low cetane number which increases ignition delay causing a larger fuel charge to accumulate before ignition and producing a rapid pressure rise

B. The diesel fuel has a high cloud point which causes wax crystals to form in the combustion chamber disrupting the spray pattern during injection

C. The fuel water separator has failed and water is being injected into the combustion chamber causing steam explosion noise during combustion

D. The fuel return line has a restriction that raises the fuel temperature above its boiling point causing vapour bubbles to collapse noisily in the injectors

26. A technician performs a cylinder leak-down test on a six-cylinder diesel engine. Cylinder 3 shows 30% leakage with air audible at the radiator fill neck. What does this indicate?

A. The exhaust valve on cylinder 3 has a burned face that allows compression to escape into the exhaust manifold and up to the radiator

B. The piston rings on cylinder 3 are stuck in their grooves allowing air to blow past the rings into the crankcase and up through the oil fill

C. A head gasket failure or cracked head between cylinder 3's combustion chamber and the coolant jacket allows air to enter the cooling system

D. The intake valve on cylinder 3 is bent and the leaking air is traveling through the intake manifold and reaching the radiator through the EGR circuit

27. An EGR cooler leak test is being performed by pressurizing the coolant side with regulated air and observing the exhaust ports for air leakage. The technician observes a steady stream of bubbles at the exhaust port outlet. What does this confirm?

A. The EGR cooler housing gasket has failed at the coolant port connection allowing pressurized air to bypass around the cooler housing externally

B. The EGR cooler has an internal tube failure — a crack or hole allows the pressurized air from the coolant side to pass through to the exhaust side

C. The test is inconclusive because the bubbles may be residual moisture in the exhaust port evaporating from the air pressure applied to the system

D. The cylinder head has a crack between a coolant passage and the exhaust port that is routing the pressurized air through the head casting to the exhaust

28. A heavy-duty diesel engine equipped with a common rail system has rough idle that improves when the RPM is increased above 900. The scan tool shows no fault codes and fuel rail pressure is stable at the commanded value. Injector contribution balance data shows all six cylinders within 2% of each other. What should be investigated?

A. The engine mount isolators for deterioration that transmits normal engine vibration to the cab making the idle feel rougher than actual

B. The intake manifold for a vacuum leak that dilutes the air charge at idle but becomes insignificant as the airflow volume increases at higher RPM

C. The camshaft position sensor for a timing signal error that is too small to trigger a fault code but affects the injection timing accuracy at low RPM

D. The air intake heater or grid heater for a malfunction that fails to preheat the intake air during cold idle causing rough combustion at low speeds

29. A truck's aftertreatment system sets a fault code for the ammonia slip catalyst (ASC) downstream of the SCR. The tailpipe has a strong, sharp ammonia odour. What condition is the ASC fault indicating?

A. The SCR catalyst has over-converted the NOx producing excess nitrogen gas that the ASC incorrectly identifies as ammonia in its output stream

B. The DEF dosing system is delivering too much DEF relative to the available NOx — excess ammonia is passing through the SCR and overwhelming the ASC

C. The upstream NOx sensor has failed in the high-reading position causing the ECM to over-dose DEF in an attempt to reduce the falsely elevated NOx level

D. The exhaust gas temperature downstream of the SCR is too high which decomposes the ASC catalyst material and releases trapped ammonia compounds

30. A heavy-duty truck's air compressor has been replaced due to low output. After installing the new compressor, the technician should verify which operational parameter before returning the vehicle to service?

A. The compressor oil supply and drain line flow to ensure the new compressor is receiving lubrication from the engine oil system properly

B. The compressor intake air temperature to verify the new compressor is not overheating the intake charge before it reaches the air dryer

C. The system build-up time from 585 kPa to 690 kPa to verify the new compressor meets the regulatory time specification for the vehicle

D. The air tank moisture content by draining all tanks after one hour of operation to confirm the new compressor is not passing excessive oil

31. A truck driver reports that the brakes feel like they are dragging on the rear drive axle. Upon inspection, both rear brake drums are extremely hot to the touch after a short drive. The air system pressure is at cut-out and there are no air leaks. What is the most likely cause?

A. The spring brake air supply has a partial restriction that allows the springs to partially apply even though the parking brake valve is in the released position

B. The foot valve has an internal bypass that is sending a small constant application pressure to the rear brakes even when the pedal is not depressed

C. The rear brake automatic slack adjusters have over-adjusted the brakes setting the shoe-to-drum clearance too tight causing continuous contact

D. The ABS modulator valves on the rear axle are stuck in the apply position continuously delivering pressure to the brake chambers without driver input

32. A loaded concrete mixer truck must descend a steep 8% grade for 3 km. The driver is using the engine retarder and periodic light service brake applications. Midway down the grade, the driver notices the brakes are becoming less effective with each application. What is occurring?

A. The air compressor cannot keep up with the air consumption of repeated brake applications and the system pressure has dropped too low

B. The brake drums are overheating from repeated use causing brake fade — the friction material coefficient decreases as temperature increases

C. The ABS system is intervening on every brake application because the loaded truck's momentum exceeds the ABS deceleration threshold setting

D. The brake fluid in the hydraulic clutch release system is boiling from the heat radiating from the nearby brake drums causing a spongy brake pedal feel

33. An air system inspection reveals that the air dryer purge cycle produces only a weak, brief burst of air instead of the normal strong, sustained blast. The system builds pressure normally and the governor cuts in and out correctly. What is the most likely cause?

A. The air dryer purge valve is partially restricted or the purge orifice is clogged reducing the volume and velocity of the purge air discharge

B. The governor is sending a reduced-duration unload signal that does not keep the purge valve open long enough for a full desiccant regeneration

C. The compressor unloader mechanism is only partially unloading allowing the compressor to continue building pressure during the purge cycle

D. The primary reservoir is overpressurized and the excess pressure is suppressing the purge valve from opening fully against the back pressure

34. A trailer has one axle where both wheels lock up during moderate braking on dry pavement. The trailer ABS lamp is on and a fault code is stored for the modulator valve on that axle. The brake adjustment on all axles is within specification. What is the most likely mechanical cause?

A. The wheel speed sensors on that axle have failed simultaneously sending no signal to the ABS module which then cannot modulate pressure

B. The brake linings on that axle have a higher friction coefficient than the linings on the other axles creating a disproportionate braking force

C. The modulator valve on that axle is stuck in the apply position and cannot release or hold pressure to prevent lockup during ABS intervention

D. The relay valve supplying that axle is delivering higher pressure than the other relay valves due to an internal calibration shift in its spring setting

35. During a brake chamber replacement, the technician selects a Type 30 long-stroke chamber. The original chamber was a Type 30 standard-stroke. What problem could arise from using a long-stroke chamber without adjusting the slack adjuster?

A. The longer stroke may push the S-cam past its effective rotation range causing the brake shoes to go over-centre and jam against the drum

B. The longer stroke chamber will apply the brakes more aggressively at the same air pressure because the diaphragm has a larger effective area

C. The brake application will be delayed because the longer chamber requires more air volume to fill before the diaphragm begins to move the pushrod

D. No problem will arise because long-stroke chambers are direct replacements for standard-stroke chambers with no additional adjustments needed

36. A truck's front disc brakes are being inspected. The technician finds that the inboard pad is worn significantly more than the outboard pad on both front wheels. What is the most likely cause?

A. The brake caliper pistons are not retracting fully after each brake release leaving residual pressure that causes the inboard pad to drag continuously

B. The caliper slide pins are seized or corroded preventing the caliper body from sliding properly so only the piston-side (inboard) pad contacts the rotor

C. The brake pad material on the inboard side has a lower friction coefficient than the outboard pads causing the inboard pad to wear faster under load

D. The caliper mounting bracket has loosened on both sides allowing the caliper to shift position and apply uneven pressure to the inboard pad surface

37. A truck's air pressure drops from 860 kPa to 760 kPa within 30 seconds with the engine off and the brakes released. There are no audible leaks from any external component. The technician suspects an internal leak in the foot valve. How can this be confirmed?

A. Remove the foot valve from the vehicle and bench test it by pressurizing each port individually and checking for crossover leakage between circuits

B. Apply soapy water to the exhaust port on the bottom of the foot valve — air escaping from this port with the pedal released confirms an internal bypass leak

C. Install a flow meter between the primary reservoir and the foot valve supply port to measure the rate of air flowing through the valve at rest

D. Disconnect the delivery ports from the foot valve and cap them — if the pressure holds with the ports capped the foot valve is bypassing internally

38. What is the minimum tread depth required on steer axle tires according to Canadian federal safety regulations?

A. 3.2 mm (4/32 inch) measured at the shallowest point in the major tread grooves across the full tread contact width

B. 1.6 mm (2/32 inch) measured at the shallowest point in the major tread grooves across the full tread contact width

C. 4.8 mm (6/32 inch) measured at the shallowest point in the major tread grooves across the full tread contact width

D. 6.4 mm (8/32 inch) measured at the shallowest point in the major tread grooves across the full tread contact width

39. A semi-trailer equipped with spring brakes has been parked for several days in freezing conditions. When the tractor connects and supplies air to release the trailer spring brakes, the brakes on one axle do not release. The air supply pressure at the gladhand is correct. What is the most likely cause?

A. The spring brake chambers on that axle have weak springs from age that cannot generate enough force to apply against the frozen drum surface

B. The trailer relay valve has failed internally and is not routing air to the spring brake chambers on the affected axle during the release command

C. Moisture has frozen inside the spring brake air line or the spring brake chamber port on that axle blocking air from reaching the spring diaphragm

D. The brake shoes on that axle have bonded to the drum surface from corrosion during the extended parking period and are mechanically stuck

40. A tractor-trailer combination has completed a successful coupling. The driver performs the tug test by pulling the tractor forward against the locked trailer brakes. The trailer does not separate. Is the coupling verified?

A. Yes — the tug test alone is sufficient to verify proper coupling because it proves the fifth wheel locking jaws are engaged and holding

B. The driver should also check all air line connections and electrical connections before considering the coupling procedure complete

C. The driver must also visually inspect under the trailer to confirm the locking jaws are fully closed around the king pin and the secondary lock is engaged

D. No — the coupling is verified only after the driver has driven the combination at highway speed for at least 500 metres without the trailer separating

41. A tandem axle trailer with air ride suspension has both air bags on the front axle inflated but both bags on the rear axle are completely flat. All four bags were functioning before the trailer was parked overnight. What is the most likely cause?

A. Both rear axle shock absorbers have seized in the compressed position physically holding the axle up against the deflated air bags

B. The height control valve for the rear axle has stuck in the exhaust position and has bled both rear air bags down completely overnight

C. The air supply line to the rear axle bags has a common restriction point — likely a frozen fitting or a kinked line — that prevents air from reaching both bags

D. Both rear axle air bags have developed leaks simultaneously from a batch defect in the rubber compound that was triggered by the cold overnight temperature

42. An ABS wheel speed sensor on a drive axle is producing an erratic signal. The sensor resistance is within specification and the air gap is correctly set. What else could cause the erratic signal?

A. A damaged or corroded tone ring with missing, broken, or unevenly spaced teeth that produces an irregular pulse pattern as the wheel rotates

B. The ABS modulator valve on that wheel has an internal electrical fault that is feeding back interference into the wheel speed sensor signal wire

C. The tire on that wheel is worn unevenly with flat spots that change the wheel's rotational speed at a frequency the sensor interprets as wheel slip

D. The drive axle differential lock is partially engaged creating a speed difference between the left and right wheels that the sensor reads as an erratic signal

43. During a brake inspection, a technician measures the brake drum diameter on a drive axle drum. The measurement is 420 mm. The maximum allowable diameter stamped on the drum is 422 mm. The drum surface has minor scoring. What is the correct action?

A. The drum is at its maximum diameter and must be replaced because the scoring cannot be removed without exceeding the maximum allowable diameter

B. The drum must be replaced immediately because scoring indicates that the friction material has been contaminated with foreign material particles

C. The drum can be machined to remove the scoring as long as the final diameter after machining does not exceed the 422 mm maximum allowable limit

D. The drum must be replaced because any drum with visible scoring regardless of diameter must be removed from service for safety compliance reasons

44. A loaded truck is descending a mountain pass. The driver uses the engine retarder to control speed and applies the service brakes only occasionally for additional deceleration. After approximately 10 km of descent, the driver notices that the air pressure gauges have dropped from 860 kPa to 690 kPa. What is causing the pressure drop?

A. The air compressor cannot maintain full system pressure because the engine retarder reduces the effective compressor RPM during downhill operation

B. Normal air consumption from the occasional brake applications has consumed more air than the compressor has had time to replace during the descent

C. The air dryer is expelling excessive amounts of air during its purge cycles which are being triggered more frequently by the increased compressor cycling

D. Each service brake application consumes a volume of compressed air from the reservoirs and repeated applications during the descent have depleted the stored supply faster than the compressor replenishes it

45. A truck's air brake system has a quick-release valve installed on the front axle brake chambers. The brakes apply normally but release slowly — the front wheels continue to drag for several seconds after the brake pedal is released. What is the most likely cause?

A. The air lines between the foot valve and the quick-release valve are too long creating excessive volume that takes time to pressurize and depressurize

B. The quick-release valve diaphragm or seat is damaged or contaminated preventing it from opening properly to exhaust air from the chambers during release

C. The foot valve return spring is weak and the valve piston does not return to the full release position quickly enough to signal the quick-release valve to open

D. The front brake chamber diaphragms have developed small leaks that slow the release of air from the chambers after each brake application event

46. A tractor's trailer supply air pressure gauge reads 60 kPa lower than the primary and secondary gauges after the system has fully charged. All three reservoirs are fed from the same supply tank. What could cause this pressure difference?

A. The one-way check valve between the supply tank and the trailer supply reservoir is partially restricted limiting the flow rate and preventing full equalization

B. The trailer gladhand has a slight leak that continuously bleeds pressure from the trailer supply circuit reducing it below the other reservoir pressures

C. The tractor protection valve is partially closed and restricting air flow to the trailer supply reservoir preventing it from reaching full system pressure

D. The trailer supply reservoir is larger than the primary and secondary reservoirs and requires additional compressor run time to reach full equalization pressure

47. A truck's headlamp circuit uses a relay to switch the high-current lamp load. The relay coil is controlled by the dimmer switch on the steering column. If the relay coil ground wire has excessive corrosion, what symptom will be observed?

A. The headlamps will operate at reduced brightness because the corroded ground limits the current flowing through the lamp filaments

B. The headlamps will flicker intermittently as the corroded ground connection makes and breaks contact with vibration and temperature changes

C. The relay contacts will buzz audibly because the coil cannot generate a strong enough magnetic field to fully pull the armature into the closed position

D. The relay coil will not energize fully — the reduced magnetic pull may prevent the relay from closing and the headlamps may not illuminate at all

48. A truck's ammeter consistently shows a discharge reading (negative current flow) while driving at highway speed with all accessories turned off. The battery voltage reads 14.2 volts. What does this combination of readings indicate?

A. The ammeter is installed backward with the sense wire connected in the wrong orientation reversing the positive and negative current direction readings

B. The alternator is overcharging the batteries and the excess current is being dissipated through the vehicle frame as heat creating a phantom discharge

C. The ammeter is malfunctioning — the voltage reading of 14.2 volts confirms normal charging but the ammeter shows incorrect current direction

D. The battery has an internal short that is drawing current faster than the alternator can supply it despite maintaining normal charging voltage output

49. A truck has an intermittent check engine lamp that illuminates during cold morning startups but turns off after the engine warms up. The scan tool retrieves an inactive code for the intake manifold temperature sensor — SPN 105, FMI 2 (erratic/intermittent). What is the most likely cause?

A. A cracked or corroded connector at the IMT sensor that makes poor contact when cold and contracted but seals tightly when heated and expanded

B. The intake manifold has a crack that allows cold outside air to contact the sensor producing a reading that the ECM interprets as erratic during warmup

C. The IMT sensor element is failing internally and its resistance characteristics become unstable at cold temperatures but stabilize as it warms up

D. The engine ECM software has a known calibration error that flags the IMT sensor as erratic during cold starts when the reading changes rapidly

50. A technician needs to check whether a fuel injector solenoid is receiving its activation signal from the ECM. The injector has two terminals — one receives battery voltage from the injector harness and the other is the ground-side ECM driver. What is the best test method?

A. Measure the resistance of the injector solenoid coil to verify it is within the OEM specification range for the correct impedance value

B. Use a noid light or an oscilloscope connected to the ECM driver terminal to verify the ECM is pulsing the ground signal during cranking or running

C. Disconnect the injector and apply battery voltage directly to both terminals to verify the solenoid clicks confirming the mechanical function

D. Measure the voltage between the two injector terminals with a DMM during cranking to verify the voltage pulse pattern and duration are correct

51. A truck's electric window on the passenger side moves up but stops approximately 25 mm from fully closed. Pressing the switch harder does not help. The window moves down freely. What is the most likely mechanical cause?

A. The window switch has a worn contact for the up direction that cannot deliver full current to the motor at the end of the travel range

B. The window motor brushes are worn and cannot produce enough torque to overcome the increased friction of the weatherstrip at the top of the travel

C. The body controller is current-limiting the window motor to protect it from the overload condition detected at the end of the upward travel

D. The window regulator mechanism is binding or the glass is misaligned in its channel — physical resistance increases as the window approaches the fully closed position

52. A truck's exhaust gas temperature sensor reads 50°C at the pre-DOC position after the engine has been running at highway speed for 30 minutes. The actual exhaust temperature should be approximately 350 to 450°C at this operating condition. What is the most likely cause?

A. The EGT sensor probe has broken internally and is reading ambient air temperature instead of the actual exhaust gas temperature at that position

B. The DOC catalyst has failed and is absorbing all the exhaust heat before it reaches the sensor location downstream of the turbocharger discharge

C. The sensor is reading correctly but the engine is running extremely lean which produces abnormally low exhaust temperatures at all operating conditions

D. The EGT sensor wiring has high resistance that attenuates the millivolt thermocouple signal and causes the ECM to calculate a falsely low temperature reading

53. A heavy-duty truck's ABS module communicates on the J1939 CAN bus. The ABS module sets a fault code for "engine speed data not received." The engine runs normally with no engine fault codes. What is the most likely cause?

A. A CAN bus communication fault between the engine ECM and the ABS module preventing the engine speed data message from being received

B. The engine crankshaft position sensor has an intermittent fault that produces a valid engine speed for the ECM but corrupts the CAN bus data broadcast

C. The ABS module's internal CAN transceiver has failed and cannot receive any CAN bus messages including the engine speed data from the ECM

D. The engine ECM has stopped broadcasting the engine speed parameter on the CAN bus due to a software fault while continuing to operate the engine normally

54. A truck has two 12-volt batteries connected in series for a 24-volt starting system. Battery 1 reads 12.7 volts and Battery 2 reads 10.8 volts when measured individually with the engine off. What is the likely condition of Battery 2?

A. Battery 2 is deeply discharged and needs to be recharged and retested to determine if it can recover to full capacity and pass a load test

B. Battery 2 has a failed cell — one of its six cells has shorted internally reducing its voltage by approximately 2.1 volts to the measured 10.8 volts

C. Battery 2 is being drained by a parasitic load on the 24-volt circuit that preferentially draws current from the second battery in the series string

D. Battery 2 is a different capacity rating than Battery 1 and the mismatch causes it to discharge faster in the series configuration during operation

55. A truck's right rear turn signal lamp illuminates steadily but does not flash. The left turn signal flashes normally. All right-side bulbs are the correct type and wattage. What is the most likely cause?

A. The flasher module is defective and only produces a flashing output on the left channel while sending continuous current to the right channel

B. The right turn signal wire has a short to the marker lamp circuit which provides continuous power that overrides the flasher's on/off cycling

C. The right rear turn signal lamp socket has a corroded ground that creates sufficient resistance to prevent the flasher from cycling the circuit properly

D. The body controller has a software error that commands a steady illumination for the right turn signal while correctly cycling the left signal output

56. A technician is testing a fuel rail pressure sensor on a common rail diesel engine. The sensor is a three-wire device: 5-volt reference, signal return (ground), and signal output. With the engine off and ignition on, the signal output reads 0.5 volts. During cranking, the signal remains at 0.5 volts. What does this indicate?

A. The sensor is reading zero or near-zero pressure because no fuel pressure is being generated — the sensor is functioning but the fuel system is not building pressure

B. The sensor has failed internally and is outputting a fixed minimum voltage regardless of the actual fuel pressure present at the sensor port

C. The 5-volt reference is not reaching the sensor because the reference supply wire is open causing the sensor to default to its minimum output value

D. The signal return (ground) wire is shorted to the reference voltage wire causing the sensor to read a fixed 0.5-volt offset from the ground potential

57. A truck's electric fuel pump runs for 15 seconds when the ignition is turned on, then shuts off as programmed. When the engine is started and runs at idle, the fuel pump does not re-energize. The engine stalls after 30 seconds. What is the most likely cause?

A. The fuel pump relay has an intermittent fault that provides power during the initial prime cycle but does not re-energize after the engine starts

B. The engine oil pressure switch that commands the fuel pump relay to stay energized during engine operation has failed or has a circuit fault

C. The engine ECM is not sending the fuel pump enable signal after startup because it does not detect a valid crankshaft position signal at idle RPM

D. The fuel pump motor has developed a thermal fault — it runs cold during the initial prime but overheats and shuts down within 30 seconds of continuous operation

58. A truck's instrument cluster receives its data over the CAN bus. The coolant temperature gauge reads cold even though the engine has been running for 30 minutes and the cab heater produces normal hot air.

A scan tool connected to the engine ECM shows the coolant temperature reading correctly at 88°C. Where is the fault?

A. The coolant temperature sensor has an intermittent fault that sends correct data to the ECM but garbled data to the instrument cluster module

B. The CAN bus connection between the engine ECM and the instrument cluster has a fault that prevents the temperature data from reaching the cluster

C. The instrument cluster's coolant temperature gauge stepper motor has failed and is stuck at the cold position despite receiving correct data from the CAN bus

D. The engine ECM is broadcasting the temperature data in an incompatible format that the instrument cluster cannot decode and display correctly

59. A truck with a 12-volt system has the following accessory loads: four headlamps at 55 watts each, two heated mirrors at 25 watts each, and a blower motor drawing 15 amps. Using Watt's Law ($W = V \times I$), what is the total current draw of these accessories?

A. The total current draw is approximately 33.3 amps across all the listed accessory loads calculated at 12 volts system operating voltage

B. The total current draw is approximately 47.5 amps across all the listed accessory loads calculated at 12 volts system operating voltage

C. The total current draw is approximately 52.8 amps across all the listed accessory loads calculated at 12 volts system operating voltage

D. The total current draw is approximately 39.2 amps across all the listed accessory loads calculated at 12 volts system operating voltage

60. A truck's starter solenoid produces a rapid clicking sound when the ignition key is turned to the start position. The dash lights dim significantly during each click. What does this symptom pattern indicate?

A. The batteries are severely discharged or have failed — they can provide enough current to pull in the solenoid but not enough to hold it engaged while cranking

B. The starter motor has an internal short that draws excessive current causing the solenoid to drop out when the motor circuit closes and draws the heavy load

C. The solenoid pull-in winding has failed and only the weaker hold-in winding is attempting to engage the plunger creating the repetitive clicking pattern

D. The neutral safety switch or clutch interlock is making and breaking contact rapidly sending intermittent signals to the solenoid activation circuit

61. A truck's alternator output test shows it is producing the correct voltage (14.2 volts) but the maximum current output is only 80 amps. The alternator is rated at 160 amps. All wiring, connections, and the drive belt have been verified as good. What component inside the alternator is most likely causing the reduced output?

A. The voltage regulator is limiting the field current to a value below the maximum which restricts the alternator from producing its rated maximum amperage output

B. The alternator bearing has excessive wear creating misalignment between the rotor and stator that reduces electromagnetic coupling efficiency between the windings

C. The rectifier has two failed diodes in one phase of the bridge that block current flow from that stator phase reducing output to approximately 67% of the rated capacity

D. The rotor field coil has developed an open circuit in a portion of its winding reducing the magnetic field strength and limiting the maximum current the stator can produce

62. A truck's parking lamp circuit is protected by a 15-amp fuse. The circuit normally draws 8 amps with all parking lamps illuminated. The fuse blows repeatedly after replacement. What diagnostic approach should be used?

A. Replace the 15-amp fuse with a 20-amp fuse to provide additional current capacity for the circuit and prevent repeated fuse failure

B. Disconnect the loads from the circuit one at a time and retest — when the fuse stops blowing, the last disconnected load or its wiring contains the short

C. Replace all bulbs in the parking lamp circuit simultaneously because a filament fragment inside one bulb may be creating an intermittent short circuit

D. Install a circuit breaker in place of the fuse to allow the circuit to operate while the short is present until the source can be located at a more convenient time

63. A truck's exhaust brake warning lamp does not illuminate on the dash when the exhaust brake switch is activated, but the exhaust brake functions normally and provides adequate retarding force. What is the most likely cause?

A. The exhaust brake dash indicator lamp bulb has failed — the lamp circuit is separate from the exhaust brake activation circuit and does not affect brake function

B. The exhaust brake control module has a software error that activates the brake mechanism but does not send the lamp command to the instrument cluster

C. The body controller is blocking the lamp signal because it detects a conflict with the ABS warning lamp that shares the same indicator position on the cluster

D. The exhaust brake switch has a dual contact — one for brake activation and one for the lamp — and the lamp contact has failed while the activation contact works

64. A truck's trailer ABS power is supplied through pin 7 (auxiliary) of the seven-pin connector. The trailer ABS lamp remains on and a scan tool cannot communicate with the trailer ABS module. Voltage measured at pin 7 on the tractor side reads 12.5 volts. Voltage measured at pin 7 on the trailer side reads 4.2 volts. What does this indicate?

A. The trailer ABS module has an internal short that is pulling the voltage down from 12.5 volts to 4.2 volts at the module's power input terminal

B. The tractor's auxiliary circuit fuse is undersized for the trailer ABS current draw and the voltage is dropping through the fuse due to its resistance

C. Excessive resistance in the seven-pin connector at pin 7 is creating a voltage drop of 8.3 volts under the ABS module's current draw leaving only 4.2 volts at the trailer

D. The trailer's ground circuit through pin 1 of the seven-pin connector has excessive resistance creating a voltage differential between the tractor and trailer measurements

65. A heavy-duty truck's charging system is tested with an inductive ammeter clamped around the alternator B+ output cable. With the engine at 1,500 RPM and all electrical loads on, the ammeter reads 95 amps. The alternator is rated at 160 amps. Should the technician be concerned?

A. Yes — the alternator should be producing its full rated output whenever all loads are on regardless of the battery state of charge to maintain reserves

B. Yes — a 160-amp alternator producing only 95 amps with all loads on indicates the alternator has lost approximately 40% of its generating capacity

C. No — the batteries are fully charged and the voltage regulator is limiting the output to only what is needed for the current electrical demand plus battery maintenance

D. No — the alternator only produces its rated output at the engine's maximum RPM and the 1,500 RPM test speed is too low for the alternator to reach full capacity

66. A truck's windshield wiper system has three speed settings: intermittent, low, and high. The wipers work on high speed only — intermittent and low are inoperative. What is the most likely cause of this symptom?

A. The wiper motor has a failed low-speed winding or brush that eliminates the low-speed circuit while the high-speed circuit remains independently functional

B. The wiper switch has failed contacts on the intermittent and low-speed positions while the high-speed contact remains functional and delivers full voltage

C. The body controller module has a partial failure in the wiper output driver circuit that prevents it from generating the pulse-width-modulated signal for lower speeds

D. The wiper motor park switch has failed in a position that continuously powers the high-speed circuit and prevents the intermittent and low-speed circuits from activating

67. A truck's horn sounds weak compared to its normal volume. Both horn units are identical and are mounted on the front bumper. Voltage measured at the horn connectors reads 10.2 volts when the horn button is pressed. Battery voltage is 12.6 volts. What is causing the weak horn sound?

A. Excessive resistance in the horn circuit between the battery and the horns is dropping 2.4 volts leaving only 10.2 volts to drive the horn motors at reduced power

B. The horn units themselves have developed internal corrosion from moisture exposure that increases their impedance and reduces their acoustic output volume

C. The horn relay contacts are providing the correct voltage but the relay's current capacity is insufficient for the combined load of both horn units simultaneously

D. The horn button ground circuit on the steering column has excessive resistance that is reducing the relay coil current and causing the relay to chatter at reduced output

68. A gasoline-powered medium-duty truck has a diagnostic code P0171 indicating the system is running lean on bank 1. The engine has a rough idle that smooths out at higher RPM. What is a common cause of a lean condition at idle?

A. A fuel injector on bank 1 is stuck open flooding the cylinder with excess fuel that overwhelms the oxygen sensor producing a false lean reading

B. The mass airflow sensor is contaminated and reading lower-than-actual airflow causing the ECM to deliver less fuel than needed for the actual air volume

C. The exhaust manifold on bank 1 has a crack near the oxygen sensor that introduces ambient air creating a false lean reading at the O2 sensor location

D. A vacuum leak at the intake manifold, throttle body gasket, or a cracked vacuum hose introduces unmetered air that dilutes the fuel mixture below the target ratio

69. A truck equipped with a self-adjusting clutch has a complaint of clutch slippage under load. The clutch was installed 120,000 km ago. The release bearing free play measures correctly at the release fork. What should be checked on the clutch assembly?

A. The flywheel surface for glazing or heat damage that has reduced the friction coefficient between the flywheel face and the clutch disc lining surface

B. The transmission input shaft for a bent condition that causes the clutch disc to wobble and create intermittent contact with the flywheel and pressure plate

C. The self-adjusting mechanism inside the pressure plate for a failure that prevents it from compensating for lining wear and maintaining adequate clamping force

D. The clutch housing alignment with the engine flywheel housing for a concentricity error that causes the pressure plate to tilt and apply uneven clamping force

70. A heavy-duty manual transmission produces a grinding noise when shifting into second gear from first. All other upshifts and downshifts are smooth and quiet. The clutch fully disengages. What is the most likely cause?

A. The first-to-second synchronizer has excessive wear and cannot match the speed of the second gear mainshaft gear to the mainshaft speed during the upshift

B. The second gear mainshaft gear has worn or chipped teeth that interfere with the sliding clutch collar engagement during the shift into second gear position

C. The transmission countershaft front bearing has failed causing shaft misalignment that affects only the gear mesh in the second gear position specifically

D. The clutch disc damper springs have weakened allowing torsional oscillation that reaches the transmission input shaft and disrupts second gear engagement

71. A truck's automatic transmission fluid appears dark brown with a burnt odour. The transmission fluid was changed 40,000 km ago. What does the fluid condition suggest?

A. The transmission has been operating at excessive temperatures due to a failed cooler, a slipping clutch pack, or sustained heavy-load operation that has oxidized the fluid

B. The replacement fluid was an incorrect specification that is chemically incompatible with the transmission's internal components and has degraded prematurely

C. The automatic transmission fluid is approaching its normal end-of-life colour change and the dark appearance is expected at the 40,000 km service interval

D. The torque converter lockup clutch material is shedding friction particles into the fluid causing the discolouration without any mechanical performance degradation

72. A two-piece driveshaft with a centre bearing has been reassembled after a clutch replacement. The technician did not mark the driveshaft-to-yoke relationship before disassembly. After reassembly, the truck has a vibration at all speeds. What should the technician do?

A. Rebalance the driveshaft on a balancing machine because the disassembly and reassembly has shifted the rotational balance of the complete shaft assembly

B. Replace all U-joints because the disassembly process may have damaged the bearing caps even if they appear undamaged during visual inspection

C. Check the drive axle pinion angle because the clutch replacement process may have shifted the engine position and changed the driveline angle geometry

D. Disconnect the rear driveshaft at the slip joint, rotate it one spline position relative to the front section, and test drive — repeat until the smoothest position is found

73. A drive axle produces a continuous whining noise that does not change between acceleration and coast. The noise increases proportionally with vehicle speed. What is the most likely source?

A. A worn wheel bearing on the drive axle that generates noise proportional to wheel speed regardless of whether the vehicle is under power or coasting

B. The ring gear has a chipped tooth that contacts the pinion at the same point in each revolution producing a whine at all operating conditions equally

C. A worn pinion bearing that rotates at a speed proportional to the driveshaft speed and generates noise regardless of the torque direction through the gear set

D. The differential side gears have excessive backlash that produces a constant meshing noise as the gears rotate at different speeds during straight driving

74. A truck equipped with a 10-speed manual transmission cannot shift out of neutral into any gear. The clutch pedal feels normal and the transmission was shifting normally before the truck was parked overnight. What is the most likely cause?

A. The transmission oil has congealed from extreme cold temperature preventing the synchronizers and shift forks from moving the sliding clutches into gear

B. The transmission shift linkage or cable has become disconnected, bent, or seized overnight preventing the driver's shift lever movement from reaching the internal shift rails

C. The transmission main shaft has seized to the countershaft gears from thermal contraction overnight locking the internal components in a bound condition

D. The clutch disc has rusted to the flywheel face overnight and is not releasing from the flywheel when the clutch pedal is depressed preventing gear engagement

75. A truck's ring and pinion gear set is replaced. The technician sets the backlash to 0.10 mm. The OEM specification calls for 0.15 to 0.30 mm. What problem will this insufficient backlash cause?

A. The tight backlash will cause the gears to run hot, whine under load, and wear prematurely because the tooth mesh does not allow adequate lubricant film thickness

B. The tight backlash will prevent the drive axle from achieving the correct final drive ratio causing the engine to overspeed at highway cruising speed

C. The ring gear will develop a harmonic vibration at specific vehicle speeds because the tight mesh creates a resonance point in the gear tooth contact pattern

D. The differential side gears will compensate for the tight mesh by increasing their rotational speed difference which accelerates spider gear and cross shaft wear

76. A truck with an automated manual transmission (AMT) has a complaint of harsh upshifts. The shift time from gear disengagement to new gear engagement has increased from the normal 0.8 seconds to 2.1 seconds. What is the most likely cause?

A. The engine ECM is not responding to the TCM's RPM adjustment request quickly enough causing the speed matching to take longer than normal during each shift

B. The AMT shift actuator motor is worn and moves the shift rails more slowly than designed increasing the total shift time and allowing the engine RPM to drop further

C. The transmission lubricant has degraded and increased in viscosity creating drag on the synchronizers that extends the time required for speed matching during shifts

D. The AMT clutch actuator is slowing the clutch re-engagement after each shift because it has lost its reference position calibration and is engaging more gradually than intended

77. A tandem axle truck has a noticeable power hop (repeated traction loss and regain) when accelerating from a stop on wet pavement. The tires are in good condition and equally inflated. What drivetrain component is most likely contributing to the power hop?

A. The inter-axle differential is locked when it should be unlocked allowing both axles to turn at the same speed and preventing independent traction adjustment

B. The drive axle differential gears are worn allowing excessive backlash that creates a pulsating torque delivery to the drive wheels during acceleration

C. The inter-axle differential is unlocked and not distributing torque evenly between the front and rear drive axles during the low-traction acceleration event

D. The driveshaft U-joints are worn and creating a pulsating torque delivery that causes the tires to alternately grip and release during the acceleration event

78. A clutch hydraulic release system has air trapped in the line. What symptom will the driver experience?

A. A spongy clutch pedal that does not fully disengage the clutch because the compressible air prevents the hydraulic pressure from fully extending the slave cylinder

B. A hard clutch pedal that requires excessive force to depress because the trapped air increases the resistance in the hydraulic line during pedal application

C. The clutch pedal returns to the rest position very slowly after being released because the air pocket creates a cushion that resists the return spring force

D. A clutch chatter during engagement because the air bubbles create pressure fluctuations that modulate the release bearing force against the pressure plate fingers

79. A truck's transfer case makes a growling noise only when four-wheel drive is engaged. The noise is not present in two-wheel drive. The transfer case lubricant level is correct. What is the most likely cause?

A. The front driveshaft U-joints are worn and only produce noise when the front axle is transmitting torque through them in four-wheel drive operation

B. The transfer case internal bearings or gears for the four-wheel-drive circuit are worn and produce noise only when they are loaded during four-wheel engagement

C. The front axle ring and pinion gears are worn and produce noise when driven in four-wheel drive but are not rotating in two-wheel drive mode so they remain silent

D. The transfer case shift mechanism is not fully engaging in the four-wheel position creating partial gear mesh that produces a growling noise from the incomplete engagement

80. A heavy-duty truck has a driveline vibration that the technician suspects is caused by incorrect driveline working angles. To verify, the technician measures the angle of the transmission output, the front and rear driveshafts, and the axle input. What relationship between these angles is required for vibration-free operation?

A. All four angles must be identical so the driveshaft operates perfectly parallel to both the transmission output and the axle input shaft at all times

B. The angle at the transmission end of the driveshaft must be equal and opposite to the angle at the axle end of the same driveshaft within 0.5 to 1.0 degrees

C. The rear driveshaft must operate at exactly twice the angle of the front driveshaft to compensate for the centre bearing's isolator mount deflection angle

D. The working angles should total zero degrees across the entire driveline from the transmission output through both driveshafts to the axle input shaft for cancellation

81. A truck's transmission gear oil sample shows elevated bronze content compared to previous samples. All other metals are stable. In a manual transmission with synchronizers, what does elevated bronze indicate?

A. The transmission countershaft bronze thrust washers are wearing from inadequate lubrication in the thrust bearing contact zone of the housing

B. The bronze content is from the ring gear's bronze backing plate material which is normal wear for a high-mileage transmission and does not require attention

C. The synchronizer blocking rings (which are typically bronze or brass) are wearing and may require replacement at the next scheduled transmission service

D. The transmission oil cooler has an internal leak allowing engine coolant to contaminate the gear oil which dissolves copper-based metals and elevates the reading

82. A truck's heavy-duty clutch replacement requires flywheel resurfacing. The flywheel has been machined twice before. How does the technician determine if the flywheel can be machined again?

A. Measure the flywheel thickness after machining and compare it to the manufacturer's minimum thickness specification to ensure adequate material remains

B. Measure the flywheel thickness before machining and subtract the expected material removal — if the result falls below the minimum specification the flywheel must be replaced

C. Count the number of previous resurfacing marks on the flywheel — most manufacturers allow a maximum of three resurfacing operations regardless of remaining thickness

D. Measure the flywheel ring gear tooth height — if the teeth are below 75% of their original height the flywheel has been machined too many times and must be replaced

83. A truck equipped with a hydraulic retarder has a fault code indicating the retarder fluid temperature has exceeded its maximum limit. What caused the overtemperature and what should be checked?

A. The retarder was used continuously for too long without allowing the service brakes to share the braking load and give the retarder fluid time to cool between applications

B. The engine cooling system is overheating and the shared coolant is transferring excessive heat from the engine to the retarder fluid through the common heat exchanger

C. The retarder fill valve is stuck partially open allowing fluid to remain in the working chamber during highway cruising when no retardation is needed creating continuous heat

D. The retarder fluid cooler is restricted, the cooler fan has failed, or the coolant circuit that cools the retarder fluid is not flowing adequately to dissipate the absorbed braking heat

84. A truck's driveshaft has a slip joint (splined connection) that allows the driveshaft length to change as the suspension moves through its travel. The slip joint has developed a clunking noise during acceleration and deceleration. What is the most likely cause?

A. The slip joint splines are worn and have developed excessive radial clearance allowing the inner and outer spline halves to knock together during torque direction changes

B. The slip joint has been installed backward with the dust cap on the wrong end allowing road debris to contaminate the spline lubrication and accelerate wear

C. The slip joint lacks adequate lubrication causing the spline surfaces to bind during length changes and release suddenly creating a clunk rather than sliding smoothly

D. The slip joint yoke is out of phase with the mating yoke at the opposite end of the driveshaft and the phasing error produces a clunk at each torque reversal point

85. A truck has an engine compression brake and a VGT-integrated exhaust brake. The driver selects maximum engine braking. In what order do these systems engage to produce the maximum retarding effect?

A. The exhaust brake activates first by closing the VGT vanes then the compression brake solenoids energize — both work together for combined braking effect

B. The compression brake activates alone initially and the exhaust brake only engages if the compression brake alone cannot maintain the desired deceleration rate

C. Both systems activate simultaneously and the ECM continuously adjusts the VGT vane position and compression brake cylinder selection based on speed and load

D. The exhaust brake is always active during deceleration and the compression brake only adds additional retarding force when the driver selects the highest braking level

86. A truck's power steering pump pressure test shows adequate pressure at full lock (14,000 kPa) but the steering effort is still excessive during parking maneuvers. The fluid level is correct and the drive belt is tight. What component should be investigated next?

A. The steering gearbox for a clogged or restricted internal passage that prevents adequate oil flow from reaching the power piston assist chamber

B. The steering gearbox for an internal bypass that is diverting pump pressure away from the power piston back to the reservoir during steering input

C. The power steering cooler for a restriction that limits return flow from the gearbox creating backpressure that opposes the piston's assist movement

D. The steering column for a binding universal joint that requires additional force to rotate the input shaft regardless of the hydraulic assist pressure

87. A heavy-duty truck's steering system has been inspected and all components — gearbox, linkage, king pins, and wheel bearings — are within specification. However, the driver reports the truck feels unstable and wanders at highway speed. What other component should be checked?

A. The steering damper (stabilizer) for a failed internal valve or seal that no longer provides resistance to steering oscillation at highway speeds

B. The engine mounts for excessive deflection that allows the engine to shift position and change the steering column alignment during highway driving

C. The cab mounts for deterioration that allows the cab to sway laterally at highway speed creating the sensation of steering wander from driver body movement

D. The fifth wheel plate for excessive wear that allows the trailer to rock and creates lateral forces on the tractor that the driver perceives as steering instability

88. A truck frame rail has been drilled for a new equipment mounting bracket. Upon inspection, the technician finds the holes were punched rather than drilled. Why is hole punching not acceptable on frame rails?

A. Punched holes have a rougher surface finish than drilled holes which promotes corrosion at the hole edge and accelerates material deterioration over time

B. Punching creates burrs on the exit side that prevent the bolt head or nut from sitting flat against the frame surface reducing the effective clamping force

C. Punching creates a deformed shear zone around the hole perimeter that crushes the grain structure and creates stress concentrations prone to cracking

D. Punching deforms the frame rail profile locally causing the C-channel flanges to spread apart and reducing the rail's overall bending resistance at that location

89. A truck has one steer tire showing rapid, aggressive wear on the outside edge only. The other steer tire shows normal even wear. Tire inflation pressure is equal on both sides. What is the most likely cause?

A. The worn tire was manufactured with a tread compound defect that causes accelerated wear on the outer edge regardless of alignment and inflation conditions

B. The truck frequently operates on routes with sustained right turns that load the outside edge of the left steer tire more heavily than the inside edge

C. Excessive positive camber on the side with the worn tire is tilting the wheel outward and concentrating the load on the outer tread edge causing accelerated wear

D. The steering gearbox has excessive play that allows the steering to drift toward one side loading the outside edge of one tire more than the other during straight driving

90. A truck's air ride suspension height control valve linkage has been adjusted to lower the ride height by 25 mm to improve aerodynamic performance at highway speed. What unintended consequences could this modification cause?

A. The reduced ride height changes the driveline working angles, may affect fifth wheel coupling height, and could cause the frame to contact the axle on large bumps

B. The lower ride height increases the air spring pressure which accelerates air bag wear and increases the air compressor duty cycle significantly

C. The lowered suspension reduces the vehicle's gross combined weight rating because the axle loading geometry changes with the reduced ride height specification

D. The height control valve will cycle continuously attempting to restore the original ride height setting because the valve has a factory-programmed target that cannot be overridden

91. A fifth wheel plate has been lubricated with a heavy application of grease. While driving, the driver notices an unusual amount of trailer articulation — the trailer seems to pivot more freely than normal during lane changes. Is this a concern?

A. No — increased articulation from proper lubrication is normal and indicates the fifth wheel is operating with reduced friction as intended by the grease application

B. Yes — excessive grease on the fifth wheel plate can cause the trailer upper coupler to hydroplane on the grease reducing the resistance to sudden directional changes

C. No — the increased articulation sensation is the driver adjusting to the reduced friction and will feel normal after the driver becomes accustomed to the lubricated condition

D. Yes — over-lubrication can attract road debris that accelerates plate wear and the excess grease can drip onto the brakes or driveline components below the fifth wheel

92. A tandem axle truck's rear suspension uses walking beam equalizer beams. During inspection, the technician finds that one equalizer beam has a visible crack at the centre pivot point. What action is required?

A. Weld the crack using a low-hydrogen electrode and post-weld heat treatment to restore the beam's structural integrity before returning the vehicle to service

B. Monitor the crack at shortened inspection intervals and schedule replacement when the crack extends more than 50% across the beam's cross-section width

C. Install a bolted reinforcement saddle over the cracked area to distribute the load around the crack and prevent further propagation until replacement parts are available

D. Replace the cracked equalizer beam immediately because the beam carries the full tandem load and a complete fracture would allow the axle to separate from the vehicle

93. A truck has hub-piloted aluminium wheels. During a tire rotation, the technician notices one wheel has a crack radiating from a stud hole toward the outer rim edge. The crack is approximately 15 mm long. What is the correct action?

A. Apply a stop-drill at the crack tip to prevent propagation and continue using the wheel until the end of the current tire's service life on that position

B. Weld-repair the crack using an aluminium TIG welding process and have the wheel re-inspected by a qualified wheel repair facility before returning to service

C. Replace the cracked wheel immediately — aluminium wheels cannot be safely welded and any crack renders the wheel unsafe for continued service

D. Move the cracked wheel to a less critical position such as the rear inner dual where the reduced load per wheel decreases the stress on the cracked area

94. A truck driver reports the steering pulls to the left when the service brakes are applied but the truck tracks straight with no brakes applied. The steer tire inflation pressure is equal on both sides. What is the most probable cause?

A. The right front brake is underperforming relative to the left front — from a worn lining, restricted air line, seized caliper, or maladjusted pushrod stroke

B. The left front brake chamber has a larger effective area than the right producing disproportionate braking force on the left side during brake application

C. The steering gearbox has excessive internal play that manifests only under the deceleration forces of braking when the loading changes from cruise to braking

D. The left steer tire has a softer sidewall compound than the right that flexes more under the braking load creating a contact patch shift that produces the pull

95. During a PM inspection, a technician finds a nail in the shoulder area (the transition zone between the tread and the sidewall) of a drive tire. The nail has fully penetrated the tire but the tire is holding air. Is this tire repairable?

A. The tire is repairable with a combination plug-patch since the nail is technically in the tread area of the tire and the penetration is within the repairable size limit

B. The tire is not repairable — shoulder area punctures are outside the repairable zone because the flexing in this area prevents a repair from holding reliably

C. The tire can be repaired with an external plug only since the shoulder location makes internal patch application impossible due to the curvature of the casing

D. The tire is repairable only if it is a drive or trailer position tire — shoulder punctures on steer tires are non-repairable but are acceptable on non-steering positions

96. A truck's wheel bearing is being inspected using the jack-and-rock method — the technician grasps the tire at 12 and 6 o'clock and rocks it. Movement is detected. How does the technician differentiate between wheel bearing play and king pin bushing play?

A. Wheel bearing play produces movement at the hub-to-spindle interface while king pin play produces movement at the knuckle-to-axle interface — observe the movement location

B. Wheel bearing play produces a clunking noise while king pin play produces a grinding noise — listen to the sound during the rocking motion to identify the source

C. Remove the brake drum and repeat the test — if the play disappears with the drum removed it is wheel bearing play because the drum adds weight to the bearing assembly

D. Wheel bearing play only occurs when the tire is rocked at 12 and 6 while king pin play only occurs when the tire is rocked at 3 and 9 — change the rocking axis to differentiate

97. A truck's steer axle has king pin bushings that were replaced 50,000 km ago. The technician measures 0.4 mm of vertical play — within the 0.8 mm maximum specification. However, the driver reports a clunking noise from the front end over small bumps. What else could cause the clunking?

A. The king pin thrust bearings (which support the vertical load and control the vertical play separately from the bushings) are worn or damaged producing the clunk over bumps

B. The steering damper has failed and the steering linkage is oscillating rapidly over bumps which the driver perceives as a clunking noise from the front axle area

C. The tie rod end ball joints have developed play that produces a clunking noise when the tie rod is loaded and unloaded by bump impacts during straight-line driving

D. The wheel bearing preload is too tight and the bearings are resisting the bump impact loading then releasing suddenly creating a clunk sound at each bump encounter

98. A technician is replacing a drive axle wheel seal. During removal, the technician notices the seal bore inside the hub has a groove worn into the metal where the seal lip rode on the bore surface. What should be done before installing the new seal?

A. Install the new seal in the same position — the groove will help the new seal seat in the correct location and maintain proper contact with the axle shaft surface

B. Install a seal wear sleeve (speedi-sleeve) on the axle shaft at the seal contact area to provide a new, smooth surface for the new seal lip to ride against

C. Machine the hub bore to the next oversize and install a correspondingly larger seal to compensate for the worn bore and restore proper seal contact pressure

D. Apply a thin bead of RTV silicone sealant to the seal bore groove before installing the new seal to fill the groove and prevent oil from bypassing the seal lip edge

99. A truck's tire pressure monitoring system (TPMS) alerts the driver that one drive axle tire has lost 15% of its inflation pressure. The tire appears visually normal with no obvious puncture or damage. What should the technician do?

A. Reset the TPMS alert and recheck the pressure with a calibrated gauge — if the pressure is low, inflate to specification and monitor for continued pressure loss over days

B. Immediately remove the tire from the vehicle and inspect it internally for a slow puncture that may not be visible externally but is leaking air at a gradual rate

C. Replace the TPMS sensor on that tire because the 15% reading is likely a sensor malfunction rather than an actual pressure loss in an otherwise normal-appearing tire

D. Increase the tire pressure by 15% above the specification to compensate for the slow leak until the tire can be scheduled for inspection at the next available service opening

100. A truck has been involved in a minor collision that damaged the front bumper. No visible damage to the frame rails, steer axle, or suspension is apparent. Before returning the vehicle to service, what additional check should be performed?

A. Test-drive the vehicle at highway speed to verify the steering tracks straight and the vehicle does not pull or drift to either side during normal driving

B. Perform a complete wheel alignment check to verify that the toe, camber, and caster have not been altered by the collision impact forces on the front structure

C. Replace the bumper and return the vehicle to service since the frame and suspension show no visible damage and the alignment was not affected by the minor bumper contact

D. A complete wheel alignment check and a steering system inspection must be performed because collision forces can shift axle geometry without leaving visible damage

101. A truck's oil-bath hub assembly has the oil level visible at the bottom of the sight glass. The specification states the oil should be at the center of the sight glass. What is the risk of operating with this low oil level?

A. The low oil level will cause the wheel bearing to overheat immediately because the bearings are not submerged in oil during the initial vehicle movement

B. The oil level is marginally low but the bearing will still receive adequate splash lubrication during normal driving and can be topped up at the next PM service

C. The upper bearing may not receive adequate lubrication during low-speed operation when the bearing rotation is insufficient to splash oil to the upper race and rollers

D. The low oil level creates a larger air space in the hub cavity that allows moisture condensation which mixes with the oil and causes bearing corrosion over time

102. A truck's leaf spring has one broken leaf in the middle of the spring pack. The main leaf and the top two leaves are intact. Can the truck continue to operate?

A. The truck can continue to operate with reduced load capacity until the spring pack is replaced because the remaining leaves still carry the majority of the load

B. The spring pack must be replaced at the earliest available maintenance opportunity because a broken leaf alters the spring rate and may affect axle alignment

C. A broken leaf is cosmetic only and does not affect the spring's load-carrying capacity or axle alignment because the remaining leaves compensate automatically

D. The broken leaf must be welded in place to restore the spring pack's full capacity and the vehicle can continue operating after the weld repair is completed

103. A technician is checking the alignment on a tandem axle trailer. The measurement shows the rear axle is tracking 6 mm to the right of the front axle. What will this misalignment cause?

A. The trailer will dog-track (travel slightly sideways) increasing tire wear on the tandem axles and increasing aerodynamic drag which reduces fuel economy

B. The trailer ABS system will set fault codes because the wheel speed sensors will detect different rotational speeds between the misaligned axles during straight driving

C. The trailer will have no noticeable handling effects because a 6 mm tracking difference is within the normal tolerance for a tandem axle trailer suspension system

D. The trailer kingpin will wear unevenly on one side because the misalignment creates a constant lateral force on the fifth wheel coupling during straight-line highway driving

104. A truck's sleeper cab has a strong diesel fuel odour inside during highway driving. There is no visible fuel leak in the engine compartment or along the frame rails. The fuel tank cap and vent appear normal. What is a possible entry point for the odour?

A. The cab ventilation fresh air intake is located near the exhaust stack and is drawing in diesel exhaust fumes that contain unburned fuel hydrocarbons

B. The cab floor has deteriorated and has holes or gaps where the wiring and plumbing pass through allowing engine compartment fumes to enter the cab interior

C. The fuel tank sending unit gasket has deteriorated and fuel vapour is escaping from the top of the tank and being drawn upward into the cab through the frame rail channels

D. The HVAC system evaporator drain is clogged causing stagnant water to develop an odour that the driver is misidentifying as diesel fuel from prolonged exposure

105. A truck cab's power door locks function from the key fob but not from the interior door lock switches. All other interior electrical functions work normally. What is the most likely cause?

A. The door lock actuator motors have failed simultaneously on both doors preventing the interior switches from activating the lock mechanisms

B. The key fob receiver module has a software fault that overrides the interior switch signals and prevents them from reaching the door lock actuator motors

C. The interior door lock switches share a common power supply or ground circuit that has failed while the key fob system uses a separate independent circuit

D. The body controller has entered a security lockout mode that disables the interior switches while maintaining key fob functionality as an anti-theft precaution

106. A heavy-duty truck cab equipped with an air-ride cab suspension has a complaint of excessive cab bounce during highway driving. The cab air bags appear properly inflated and the cab height is correct. What should be inspected?

A. The engine mounts for deterioration that is allowing engine vibration to transfer directly to the cab structure exciting it at its natural frequency during highway operation

B. The cab suspension shock absorbers for failure — worn or failed shocks cannot dampen the cab's oscillation allowing it to bounce excessively after road inputs

C. The cab air bag pressure regulator for an incorrect setting that is over-inflating the bags and creating a ride that is too stiff to absorb normal highway road surface inputs

D. The steering column mounting brackets for looseness that allows the column to resonate and transmit a bouncing sensation to the driver that feels like cab bounce

107. A truck driver reports that the interior cab lights remain on after the door is closed. The door ajar switch appears to function correctly — the switch contacts open and close as the door is opened and closed. What else could cause the lights to stay on?

A. The interior light timer circuit in the body controller has failed in the on position and continues to power the lights regardless of the door switch state

B. The interior light dimmer control has been turned to the maximum brightness position which overrides the door switch and keeps the lights on continuously

C. The alternator is producing a voltage spike during door closure that latches the interior light relay in the on position preventing the timer from turning the lights off

D. The door latch switch (different from the door ajar switch) has a failed contact that provides a continuous ground to the interior light circuit keeping it energized

108. A truck cab has a persistent water leak at the windshield that occurs only during highway driving, not while parked in rain. What characteristic of highway driving causes this specific leak behaviour?

A. The wind pressure at highway speed forces rain water into gaps in the windshield seal that are not penetrated by gravity-driven rain while the vehicle is stationary

B. The cab vibration at highway speed loosens the windshield adhesive bond allowing a gap to open between the glass and the frame that closes when stopped

C. The air pressure differential between the moving vehicle's exterior and the pressurized cab interior pushes the windshield outward creating a gap in the seal material

D. The windshield wipers create a pumping action at highway speed that forces water under the seal at the wiper pivot point and channels it into the cab interior

109. A refrigerated trailer's TRU has been running on standby electric power at a warehouse for 12 hours. The cargo space temperature is stable at the -18°C set-point. When the trailer is disconnected from shore power and the TRU switches to diesel engine operation, the cargo space temperature begins to rise. The TRU engine starts and runs normally. What should be investigated?

A. The TRU coolant level because the diesel engine may overheat and derate its power output reducing the compressor capacity during engine-driven operation

B. The TRU fuel supply because a restricted fuel filter or low fuel level may limit engine power and prevent the compressor from running at full capacity on diesel mode

C. The standby electric motor may be higher-powered than the diesel engine's capability resulting in less compressor speed and capacity when operating on diesel power

D. The TRU compressor clutch engagement during diesel operation — the clutch may be slipping or not fully engaging when driven by the engine belt versus the electric motor

110. A trailer's ICC rear impact guard inspection reveals that the guard is mounted at a height of 610 mm from the ground surface. The regulation requires a maximum height of 560 mm. What action is required?

A. The guard height is within the acceptable tolerance range and no adjustment is required since the 50 mm difference is below the enforcement threshold

B. The rear impact guard mounting must be adjusted or the brackets replaced to lower the guard to a height of 560 mm or less to comply with the regulation

C. The guard height is measured incorrectly — the measurement should be taken from the bottom of the guard to the ground rather than from the top of the guard

D. The guard can remain at its current height if additional reflective tape is added to the lower portion of the trailer to increase the visibility of the rear profile

111. A reefer trailer's cargo space temperature alarm activates indicating the temperature has risen above the acceptable range. Upon inspection, the TRU is running and the evaporator fan is circulating air. The air being circulated feels only slightly cool instead of cold. What should be checked?

A. The cargo doors for a gap or broken seal that is admitting warm ambient air into the cargo space faster than the TRU can remove the heat infiltration

B. The TRU compressor clutch for slippage that reduces the compressor speed and the refrigerant flow rate through the evaporator coil during operation

C. The TRU refrigerant charge for a low level caused by a slow leak that has reduced the system's cooling capacity below what is needed to maintain the set-point

D. The evaporator coil for heavy ice buildup that is insulating the coil surface and preventing adequate heat transfer from the cargo air to the refrigerant inside the coil

112. A trailer's sliding tandem has been repositioned and locked. During the post-slide inspection, the technician finds that six of eight lock pins are fully engaged but two pins on the same side are not engaging their respective track holes. What is the most likely cause?

A. The two holes in the slide track on that side are misaligned with the pin locations because the track has been bent or the trailer frame has shifted from collision damage

B. The slide lock air release mechanism is not fully resetting on that side and the pins are being held partially retracted by residual air pressure in the actuator cylinder

C. The two lock pins on that side are bent, corroded, or have broken springs preventing them from extending fully into the track holes despite the air release mechanism functioning correctly

D. The track rail on that side has accumulated debris or corrosion in the specific holes where the pins should engage preventing the pins from seating into those two positions

113. A trailer has a persistent air leak at the supply (red) gladhand connection even after replacing the gladhand gasket. The tractor-side gladhand has also been verified as sealed and in good condition. What should be inspected?

A. The gladhand body on the trailer side for a cracked casting or damaged sealing face that prevents the new gasket from making an airtight seal against the tractor connection

B. The trailer supply air line for a loose fitting immediately behind the gladhand body where the air line connects to the gladhand allowing air to escape at the coupling point

C. The tractor protection valve for excessive supply pressure that overwhelms the gladhand gasket sealing capacity during full system pressurization to the cut-out setting

D. Both the gladhand body and the air line fitting immediately behind it should be inspected since either a cracked gladhand or a loose rear fitting would produce a leak at this location

114. A trailer's ABS diagnostic lamp on the side of the trailer flashes a two-blink code repeatedly. According to the ABS manufacturer's code chart, a two-blink code indicates a wheel speed sensor circuit fault. What should the technician check first?

A. The ABS ECU internal circuit board for a solder joint failure on the wheel speed sensor input channel that produces an intermittent signal reading

B. The wheel speed sensor wiring harness for damage, corrosion, or connector issues at the sensor connection points on the trailer's axle group

C. The brake chamber mounting hardware for looseness that changes the geometric relationship between the sensor and the tone ring during braking events

D. The air supply pressure to the ABS module because insufficient voltage from the seven-pin connector auxiliary pin can cause sensor circuit fault codes

115. A flatbed trailer loaded with steel coils develops a handling instability complaint. The load is properly secured with chains and binders. The trailer alignment and tire condition are normal. What loading factor could cause the instability?

A. The steel coils are loaded with their centres of gravity too high above the trailer deck creating a top-heavy condition that reduces the trailer's rollover resistance threshold

B. The chains securing the coils are too tight and are pulling the deck surface downward creating a lateral twist in the trailer frame that causes unpredictable tracking behaviour

C. The steel coils are creating electromagnetic interference with the trailer ABS system causing the modulators to activate intermittently and produce a brake-induced handling instability

D. The steel coils' weight exceeds the tire pressure rating for the trailer axles causing the tires to flex excessively at highway speed and produce a speed-dependent oscillation condition

116. A trailer has both tail lamps illuminated but neither stop lamp works when the tractor brake pedal is depressed. The tractor stop lamps function normally. What is the most likely cause?

A. The trailer wiring harness has a broken wire in the stop lamp circuit between the seven-pin connector and the rear lamp assemblies along the trailer underframe

B. Both trailer stop lamp bulbs have burned out simultaneously which is common in dual-filament bulbs that share a common ground connection with the tail lamp filament

C. The stop lamp circuit (pin 4, red wire) in the seven-pin connector is corroded, damaged, or not making adequate contact to deliver the brake signal to the trailer

D. The tractor foot valve brake light switch has a dual output — one for the tractor and one for the trailer — and the trailer output has failed while the tractor output continues working

117. A truck's A/C system cools adequately at highway speed but the air outlet temperature rises noticeably during city driving at low speed. The system pressures are within normal range at highway speed. What is the most likely cause?

A. The evaporator core has developed a partial restriction that limits refrigerant flow at low engine RPM but does not affect performance at higher RPM and compressor speed

B. The condenser fan has failed and the condenser relies entirely on ram airflow for heat rejection — at low speed there is insufficient airflow to keep pressures normal

C. The A/C compressor clutch is slipping at low RPM because the belt tension is insufficient to prevent slip under the compressor's full load at idle engine speed

D. The condenser fan is not activating at low vehicle speeds when ram airflow through the condenser is reduced — causing high-side pressure to rise and cooling capacity to decrease

118. An A/C system is being evacuated with a vacuum pump. After 30 minutes at 500 microns, the technician closes the valve between the pump and the system and monitors the vacuum. The vacuum holds steady at 520 microns for 30 minutes. What is the conclusion?

A. The system is failing the vacuum hold test because the vacuum rose from 500 to 520 microns indicating a very slow leak that must be found before charging

B. The 20-micron rise from 500 to 520 is within the normal tolerance for residual moisture evaporation and the system passes the vacuum hold test with no leak detected

C. The vacuum should have improved (dropped lower) during the hold period and the rise indicates moisture is still present requiring additional evacuation time before charging

D. The test result is inconclusive and the evacuation should be repeated for an additional 30 minutes before performing a second hold test to confirm the initial results

119. A fuel-fired air heater in a sleeper cab starts and runs normally for two hours, then shuts off with a fault code for combustion air blower motor failure. The motor restarts when the heater is reset but fails again after a similar run time. What is the most likely cause?

A. The combustion air blower motor is developing an intermittent thermal fault — the motor windings or brushes overheat after extended operation and the motor shuts down from thermal protection

B. The heater control module is programmed with a two-hour maximum run time for safety and the motor shutdown is an intentional feature not a fault condition

C. The combustion air intake screen is partially blocked which overworks the blower motor causing it to draw excessive current that triggers the overcurrent fault after extended operation

D. The fuel metering pump is gradually increasing its delivery rate over the two-hour run period overwhelming the combustion air supply and triggering the blower fault as a secondary effect

120. A truck's HVAC system produces adequate heat from the dash vents and floor vents but very little airflow reaches the windshield defrost outlets. The mode selector is set to the defrost position. What is the most likely cause?

A. The cabin air filter is severely restricted reducing the total airflow volume available for distribution to the defrost outlets during all HVAC operating modes

B. The heater core has a partial restriction that limits the hot coolant flow available for the defrost ductwork which is positioned furthest from the coolant supply connection

C. The mode door actuator has failed or the mode door is stuck in a position that does not direct airflow to the defrost outlets despite the control panel being set to defrost

D. The windshield defroster ducts have become disconnected from the HVAC housing plenum allowing the heated air to escape into the dashboard cavity before reaching the outlets

121. After replacing the receiver/dryer on an A/C system, the technician charges the system and finds that the cooling performance is excellent initially but deteriorates rapidly within the first hour of operation. What was likely done incorrectly during the repair?

A. The new receiver/dryer cap was removed too early during the installation allowing the desiccant to absorb excessive atmospheric moisture before the system was sealed

B. The receiver/dryer was installed backward with the inlet and outlet ports reversed causing the refrigerant to flow through the desiccant in the wrong direction

C. The oil charge was not adjusted for the new receiver/dryer causing the system to have insufficient oil which reduces the compressor efficiency progressively over time

D. The new receiver/dryer was exposed to atmosphere for too long and the saturated desiccant released its moisture into the charged system — the moisture is now freezing at the TXV

122. A truck's A/C compressor clutch engages but the compressor makes a loud knocking noise immediately upon engagement. The noise stops when the clutch is disengaged. What is the most likely cause?

A. The compressor drive belt is misaligned with the clutch pulley and the belt is slapping against the pulley guard during compressor operation

B. The compressor has internal mechanical damage — a broken valve reed, scored piston, or failed bearing — that produces the knocking noise under load

C. The compressor clutch air gap is too large causing the clutch to slip and engage intermittently creating a repeating engagement noise at the clutch surface

D. The refrigerant charge is critically low and the compressor is drawing a vacuum on the suction side which causes cavitation-induced knocking inside the pump housing

123. A truck's cab heating system produces adequate heat through the floor and panel vents but no heat reaches the windshield during defrost mode. The blower operates at all speeds. The A/C compressor

does not engage when defrost is selected. On this vehicle, the A/C is designed to engage automatically in defrost mode for dehumidification. What is the most common cause of both symptoms?

A. The HVAC control head or the defrost mode signal circuit has a fault that prevents both the mode door from moving to the defrost position and the A/C compressor clutch from engaging

B. The evaporator has frozen solid from a failed expansion valve and the ice block is physically preventing air from passing through to the defrost duct outlet openings

C. The heater core inlet valve has failed in a partially open position that limits the heat output available for the defrost function while the panel and floor vents receive adequate heat

D. The windshield defrost ductwork has collapsed internally from age and heat exposure blocking airflow to the windshield while the A/C compressor fault is coincidental and unrelated

124. A hydraulic system has a flow control valve installed in the circuit to limit the cylinder extension speed. The operator reports that the cylinder extends at the correct speed when lightly loaded but extends too slowly when fully loaded. What type of flow control valve would correct this problem?

A. A simple needle valve flow control that restricts flow based on the operator's manual setting without compensating for load-induced pressure changes

B. A pressure-reducing valve that limits the maximum pressure downstream of the control point ensuring consistent force regardless of the load variation

C. A pressure-compensated flow control valve that maintains a constant flow rate regardless of the pressure differential across the valve caused by varying loads

D. A check valve with a variable spring rate that adjusts its cracking pressure based on the downstream load conditions to maintain consistent cylinder speed

125. A dump truck's hydraulic system has been serviced and new hydraulic oil has been installed. After the service, the system operates normally for two hours and then the pump begins making a whining noise and the dump body raises slowly. The oil level is correct. What is the most likely cause?

A. The new oil is foaming excessively because it is incompatible with residual old oil in the system — the foam reduces the pump's volumetric efficiency and causes cavitation noise

B. The new oil filter element is more restrictive than the original specification and is creating excessive pressure drop on the suction side of the pump causing inlet cavitation

C. The replacement oil viscosity is too high for the ambient temperature and the pump cannot draw the thick oil through the suction line and strainer fast enough to avoid cavitation

D. The new oil has released dissolved air during the initial operating period and the aerated oil is causing the pump to cavitate as it ingests the air-laden fluid from the reservoir

126. A hydraulic crane's boom telescope cylinder drifts inward (retracts) slowly under load when the control is in the hold position. The directional valve is confirmed to be fully centered in neutral. What is the most likely cause?

A. The relief valve for the telescope circuit is set too low and is cracking open under the gravitational load allowing fluid to bypass from the extend port to the return line

B. The telescope cylinder piston seals are worn allowing fluid to bypass internally from the rod-end (pressurized by the load) to the cap-end causing the cylinder to retract slowly

C. The hydraulic pump has excessive internal leakage that creates a suction effect on the telescope cylinder through the directional valve's partially open center passages

D. The counterbalance valve on the telescope circuit has a faulty check valve seat that allows a slow backflow from the cylinder to the return line under the static load condition

127. A PTO-driven hydraulic pump on a service truck powers multiple circuits — an aerial platform, an outrigger system, and a tool circuit. All three circuits operate individually without issue, but when the aerial platform and tool circuit are operated simultaneously, both functions slow dramatically. What is the explanation?

A. The pump's output flow is being divided between the two circuits and the fixed-displacement pump cannot increase its output to supply both at full speed simultaneously

B. The relief valve is set too low for simultaneous operation and must be adjusted upward to provide adequate pressure for both circuits operating under combined load

C. The priority valve in the system has failed and is not allocating pump flow correctly between the primary (aerial) and secondary (tool) circuits during simultaneous operation

D. The PTO gear ratio is too low for simultaneous operation and must be changed to a higher ratio to increase the pump RPM and output volume for combined circuit demand

128. A hydraulic system's return line filter has a bypass indicator that has triggered at the filter housing. The system has been operating normally with no performance complaints. What should the technician do?

A. Replace the return line filter element immediately — the bypass indicator means the element is saturated and unfiltered oil is flowing directly to the reservoir contaminating the system

B. Reset the indicator and monitor it — the indicator may have tripped due to a temporary cold-start pressure spike that exceeded the bypass valve cracking pressure momentarily

C. Replace both the return filter and the pressure filter simultaneously since a tripped return filter indicates the system contamination level has overwhelmed the primary filtration stage

D. Drain and replace all the hydraulic fluid in the system because a tripped bypass indicator means the fluid contamination level exceeds the filtration system's capacity to clean it

129. A hydraulic cylinder is being replaced on a dump truck. The new cylinder has the same bore diameter but a larger rod diameter than the original. What operational change will the truck operator notice?

A. The dump body will raise slower but lower faster because the larger rod reduces the cap-end volume (slower extension) but increases the rod-end pressure effect (faster retraction)

B. The dump body will raise faster because the larger rod increases the system pressure by reducing the piston area that the pressure acts upon during the extension stroke

C. The dump body will raise with less force because the larger rod reduces the effective piston area on the cap-end which reduces the extension force at the same system pressure

D. The dump body will operate identically because the bore diameter determines the extension force and speed and the rod diameter only affects the structural strength of the cylinder

130. A hydraulic system has a persistent problem with foamy oil in the reservoir. The technician has verified the oil level is correct and the oil type is the correct specification. Air is not being drawn in through the suction line fittings. What other source could introduce air into the system?

A. The cylinder rod seals are worn and drawing air past the rod during the retraction stroke when the rod-end side of the cylinder is under partial vacuum conditions

B. The return line is discharging oil above the fluid level in the reservoir allowing the returning oil to splash and entrain air before it settles below the surface level

C. The reservoir breather cap filter is clogged which creates a vacuum inside the reservoir that pulls dissolved air out of the oil solution during normal pump operation

D. The pressure relief valve is chattering at a frequency that aerates the oil as it passes through the valve seat at high velocity during each chatter cycle opening and closing event

131. A technician is selecting a replacement hydraulic hose for a high-pressure circuit. The system operates at 21,000 kPa (3,000 psi). The hose manufacturer rates the replacement hose at a working pressure of 21,000 kPa with a 4:1 burst-to-working pressure ratio. Is this hose selection adequate?

A. The hose is adequate because the working pressure rating matches the system operating pressure and the 4:1 burst ratio provides a standard safety margin for pressure spikes

B. The hose must be rated for at least 28,000 kPa working pressure to account for pressure spikes from cylinder end-of-stroke shock loads and relief valve response time delays

C. The hose selection depends on the application — a 4:1 ratio is adequate for static installations but a 6:1 ratio is required for hoses subject to flexing and vibration during operation

D. The hose must be rated for a working pressure equal to the relief valve setting plus 20% to ensure the hose can withstand the maximum possible system pressure during fault conditions

132. A hybrid commercial vehicle's regenerative braking system is providing noticeably less braking force than it did when the vehicle was new. The battery state of charge is at 40% and the system shows no fault codes. What is the most likely cause?

A. The traction motor permanent magnets have weakened from heat exposure reducing the motor's ability to generate resistance during the regenerative braking mode

B. The friction brake linings have glazed from underuse due to the regenerative system handling most deceleration and the glazed pads are interfering with ABS sensor readings

C. The battery pack has degraded over time reducing its ability to accept the high charge current from regenerative braking so the BMS limits the regen braking force to protect the cells

D. The inverter power transistors have degraded reducing the efficiency of the DC-to-AC conversion which limits the motor's ability to function as a generator during deceleration events

133. A battery-electric truck is scheduled for routine brake inspection. The technician notices that the brake linings have significantly less wear than expected for the vehicle's mileage — the linings show only 15% wear at 150,000 km. What explains this low wear rate?

A. The brake linings on battery-electric trucks are manufactured from a harder compound than conventional truck linings to account for the heavier vehicle weight of the battery pack

B. Regenerative braking handles the majority of deceleration events reducing the demand on the friction brakes and dramatically extending their service life compared to conventional vehicles

C. Battery-electric trucks are limited to lower maximum speeds than conventional trucks which reduces the kinetic energy that must be absorbed by the friction brakes during each stop

D. The ABS system on battery-electric trucks is programmed with a more conservative deceleration strategy that applies less friction brake force per application to protect the battery pack

134. A technician needs to tow a disabled battery-electric truck that cannot be driven. The traction motor is permanently connected to the drive axle through a single-speed reduction gear. What precaution must be taken?

A. The traction motor must be electrically isolated from the inverter before towing to prevent back-EMF from the spinning motor from damaging the power electronics

B. The vehicle can be towed at any speed on its drive axle wheels because the single-speed reduction gear provides adequate lubrication from the wheel rotation during towing

C. The 12-volt auxiliary battery must be disconnected before towing to prevent the BMS from attempting to charge the high-voltage pack from the regenerative energy produced during towing

D. The drive axle wheels must be lifted off the ground or the driveshaft disconnected because the rotating wheels will spin the motor generating voltage that can damage the inverter or charge the battery uncontrollably

135. A hybrid truck's high-voltage system has been de-energized for service. The technician has removed the service disconnect plug, waited 10 minutes, and verified zero voltage at the inverter terminals using a CAT IV rated DMM. Before beginning work, what additional step must the technician take?

A. Verify that all high-voltage terminals are at the correct resistance to ground using a megohmmeter to confirm the isolation barrier is intact before touching any components

B. Verify zero voltage at all accessible high-voltage connection points — not just the inverter — including the motor terminals, DC-DC converter input, and the battery pack output terminals

C. Reconnect the 12-volt auxiliary battery to power the BMS diagnostic display and confirm the BMS reports the system as fully de-energized before proceeding with the service work

D. Place high-voltage warning barriers around the work area and verify that no other personnel are within the restricted zone before touching any high-voltage components or connections

Practice Exam 4: Answer Key and Explanations

1. A — The immediate priority when any fluid is spilled near a floor drain is to prevent the fluid from entering the drainage system. ATF is a petroleum product that contaminates waterways and municipal treatment systems. Block the drain first with absorbent material, then contain and clean up the spill using approved absorbent and dispose of it as regulated waste.

2. C — Before anyone works underneath a vehicle on a hoist, the mechanical safety locks must be fully engaged. Hydraulic hoists can fail, and the safety locks are the only protection against the vehicle falling. The hoist must also be verified at its rated capacity for the vehicle's weight before any work begins.

3. B — Torque wrenches are most accurate when the target torque falls within the middle 80% of the wrench's rated range. Operating near the extreme low or high end of the range reduces accuracy. For a 610 Nm target, a wrench with a range of approximately 200 to 800 Nm would place the target in the optimal accuracy zone.

4. D — Propane is a flammable gas (LEL approximately 2.1% by volume in air) that can accumulate in enclosed spaces like a trailer interior. If the concentration reaches the lower explosive limit and encounters an ignition source (electrical switch, static spark, or a lit cigarette), an explosion can occur. The trailer must be ventilated before entry.

5. C — A power tool with a damaged cord exposing internal conductors presents an immediate electrocution and fire hazard. The tool must be removed from service immediately, tagged as defective to prevent others from using it, and replaced with a tool in safe working condition. Field repairs to power cords are not acceptable.

6. A — Canadian environmental regulations require technicians who handle refrigerants to hold the applicable provincial certification. This is not optional and cannot be substituted by supervised work — the apprentice must complete the training and obtain the certificate before handling any refrigerant.

7. D — The indicator must be set to zero at a reference position, not at the lowest point. The purpose is to measure the total indicator runout (TIR) — the total variation from the lowest to highest reading during one full rotation. Setting zero at the lowest point would only show half the actual runout.

8. B — Complete work order documentation must include the specific component that failed, its exact location on the vehicle, the repair performed, all parts used (with part numbers), and the results of any post-repair testing. This level of detail supports warranty claims, liability protection, and future diagnostic reference.

9. C — The two-piece articulated piston combines a forged steel crown (which withstands the extreme temperature and pressure of diesel combustion without distortion) with a lightweight aluminium skirt (which provides effective bore contact and heat transfer at reduced weight). This combination optimizes both durability and weight.

10. A — A restricted intake reduces the volume of air entering the cylinders, lowering the air-to-fuel ratio. With insufficient oxygen for complete combustion, the engine produces less power, generates excessive black smoke (unburned carbon particles), and exhaust gas temperatures rise from the inefficient combustion process.

11. D — Crankshaft end play of 0.45 mm exceeds the 0.30 mm maximum specification. End play is controlled by the thrust bearing (a flanged main bearing or separate thrust washer). Excessive end play means the thrust bearing surfaces have worn, allowing the crankshaft to move axially beyond design limits. The thrust bearing must be replaced.

12. B — Iron comes from cylinder liners and crankshaft journals, chromium comes from piston ring faces (chrome-plated), and aluminium comes from piston skirts. A simultaneous increase in all three metals indicates accelerated wear in the cylinder-piston-ring assembly. The engine requires investigation — likely a compression test and visual inspection.

13. A — Over-boost on a wastegate turbocharger occurs when the wastegate cannot open to bypass exhaust around the turbine. A ruptured actuator diaphragm (no pneumatic control), a disconnected linkage (no mechanical actuation), or a seized wastegate flap (physically stuck) all prevent the wastegate from limiting turbine speed and boost pressure.

14. C — Coolant loss without visible external leaks, without white exhaust smoke, and without oil contamination narrows the possibilities to a location where coolant is consumed without leaving obvious

evidence. An internal EGR cooler crack allows coolant to enter the exhaust stream where it vaporizes and exits with the exhaust — potentially without visible smoke if the volume is small.

15. D — Three injectors failing from scored plunger-and-barrel assemblies within 50,000 km points to abrasive contamination in the fuel. The fuel filtration system must be investigated — worn or incorrect fuel filter elements, a bypassing filter, contaminated fuel supply, or inadequate filtration micron rating allows hard particles to reach the precision injector components.

16. B — A rhythmic metallic tapping from the top of the engine that increases with RPM is the classic sound of excessive valve lash. When the clearance between the rocker arm and valve stem tip exceeds specification, the rocker arm strikes the valve tip with an audible impact at each cam lobe rotation.

17. A — If a new thermostat is installed upside down, the temperature-sensing element (wax pellet) faces away from the hot coolant flow. The element cannot sense the actual coolant temperature, so it never receives the heat signal to open. The thermostat remains closed, blocking coolant flow to the radiator and causing rapid overheating.

18. C — Oil pressure is maintained by the pump's flow capacity relative to total system leakage. A single worn bearing increases local leakage at that journal, but if the total leakage from all bearings combined has not yet exceeded the pump's maximum output capacity, the pressure gauge still reads within specification. The worn bearing will progress until total leakage overwhelms the pump.

19. D — If blow-by measurements are within normal limits (ruling out ring problems), excessive crankcase pressure is caused by the crankcase ventilation system's inability to vent the pressure. A plugged CCV filter, a frozen breather tube (common in Canadian winters), or a blocked vent prevents normal crankcase gases from escaping.

20. B — A DPF with low soot accumulation per the model but high differential pressure suggests the pressure reading itself is inaccurate rather than the DPF being actually plugged. The differential pressure sensor lines frequently accumulate soot, moisture, or condensation that creates false pressure readings. These lines should be inspected, cleaned, or replaced.

21. A — The oil filter bypass indicator tripping at mid-interval means the filter element has become overloaded with contaminants prematurely. The engine is producing more contaminants than expected — excessive soot from EGR malfunction, retarded timing, or restricted intake loading the filter faster than the scheduled change interval anticipated.

22. C — Piston rings expand as they heat up to operating temperature. If the end gap is too small when cold, the ring ends will butt together when the ring expands. With no room to expand, the ring buckles outward against the liner wall — scuffing the liner, breaking the ring, or seizing the piston in the bore.

23. D — If the retarding force is adequate but the noise is excessive compared to identical trucks, the compression brake slave piston lash is the most likely variable. Lash set too tight causes the exhaust valve to open earlier and with more force than designed, producing a louder decompression event without changing the overall retarding effectiveness significantly.

24. B — An EGT sensor reading higher than expected with normal engine performance could indicate the sensor itself has drifted from its calibration. EGT sensors (thermocouples) can drift over time from thermal cycling and vibration, producing readings that are offset from the actual temperature. The sensor should be compared against a known-good reference.

25. A — Low cetane number means the fuel requires more time to ignite after injection (increased ignition delay). During this delay, more fuel accumulates in the chamber before ignition occurs. When the larger fuel charge finally ignites, the rapid pressure rise produces the harsh knocking sound — which is most pronounced when the engine is cold and ignition delay is longest.

26. C — Air audible at the radiator fill neck during a leak-down test confirms that compressed air from the combustion chamber is entering the cooling jacket. This definitively identifies either a failed head gasket between the combustion chamber and a coolant passage, or a crack in the cylinder head that connects the two.

27. B — The test pressurizes the coolant side of the EGR cooler and observes the exhaust side for leakage. Bubbles appearing at the exhaust port outlet confirm that air is crossing from the coolant side to the exhaust side through an internal tube failure — a crack or hole in one or more of the cooler's heat exchanger tubes.

28. D — With no fault codes, stable rail pressure, and balanced injector contribution, the mechanical fuel delivery and engine management systems appear correct. Rough idle that improves above 900 RPM can result from inadequate intake air preheating during cold conditions — a failed air intake heater or grid heater allows cold dense air to enter the cylinders causing incomplete combustion and rough running at idle.

29. B — A strong ammonia odour at the tailpipe combined with an ASC fault means too much ammonia is passing through the SCR catalyst unconverted. The DEF dosing system is delivering more DEF than the available NOx can consume, producing excess ammonia that overwhelms the ammonia slip catalyst's capacity to oxidize it.

30. C — After replacing the air compressor, the technician must verify the system build-up time from 585 kPa (85 psi) to 690 kPa (100 psi). Regulations require this build-up to occur within a specified time (typically 25 to 45 seconds depending on the vehicle's reservoir configuration). This confirms the new compressor delivers adequate output for the vehicle.

31. A — Both rear drums being extremely hot with no air leaks and full system pressure points to the brakes dragging — maintaining contact with the drums when they should be fully released. A partial restriction in the spring brake supply line prevents full air pressure from reaching the spring chambers, allowing the springs to partially apply the brakes continuously.

32. D — The brakes are overheating from repeated use on the steep grade. As brake drum temperature rises, the friction coefficient of the lining material decreases — this is brake fade. The lining material cannot generate the same friction force at elevated temperatures, requiring progressively harder pedal applications to achieve the same deceleration.

33. B — A weak, brief purge instead of a strong, sustained blast means the purge valve is not opening fully or long enough to properly regenerate the desiccant. The purge orifice may be clogged with contaminants (oil, carbon, debris) or the valve itself may be restricted, limiting the volume and velocity of the purge air.

34. A — The most common cause is that the governor is sending a reduced-duration signal — this truncates the purge cycle. Alternatively, the compressor unloader is only partially unloading, which reduces the pressure differential available for the purge. Either condition prevents the full, sustained blast needed for effective desiccant regeneration.

35. C — The ABS modulator valve on that axle is stuck in the apply position. Normally, when the ABS detects impending lockup, the modulator releases or holds pressure to prevent the wheels from locking. If the modulator is stuck in the apply position, it delivers full unmodulated pressure to those brakes regardless of wheel speed, causing lockup.

36. A — A Type 30 long-stroke chamber has a longer pushrod travel range than a standard-stroke chamber. If the slack adjuster arm length and the S-cam geometry were set up for the standard-stroke chamber's shorter travel, the longer stroke may push the S-cam past its effective rotation range, potentially causing over-adjustment or mechanical interference.

37. B — When a floating disc brake caliper's slide pins are seized, the caliper body cannot slide on its bracket. Only the piston side (inboard) can apply force against the rotor. The outboard pad does not get pulled into contact because the caliper cannot slide to distribute the clamping force equally to both pads.

38. B — To confirm a suspected internal foot valve bypass, apply soapy water to the exhaust port on the bottom of the foot valve with the brakes released and the system fully charged. Air continuously escaping from this port with the pedal not depressed confirms that pressurized air is bypassing internally through the valve and venting to atmosphere.

39. A — The minimum tread depth for steer axle tires under Canadian federal regulations (CMVSS 108 / NSC Standard 13) is 3.2 mm (4/32 inch). Drive and trailer axle tires have a lower minimum of 1.6 mm (2/32 inch). The higher steer axle requirement reflects the critical role of steer tires in directional control.

40. C — Moisture that entered the air system during the days of parking has frozen inside the air line or at the brake chamber port on the affected axle. The ice blockage prevents supply air from reaching the spring brake chamber to compress the spring and release the brake. Thawing the affected line or port with a heat source (not an open flame) resolves the issue.

41. B — The tug test alone is not sufficient verification. After the tug test, the driver must also visually inspect underneath the trailer to confirm the locking jaws are fully closed around the king pin shank and the secondary lock mechanism is engaged. A king pin sitting on top of the jaws rather than between them can survive a gentle tug but will separate during driving.

42. D — Both rear axle air bags going flat simultaneously overnight while the front bags remain inflated points to a common failure point upstream of both rear bags but downstream of the front bags. The height control valve for the rear axle stuck in the exhaust position would bleed both rear bags while the front axle valve and bags remain unaffected.

43. A — With sensor resistance and air gap correct, an erratic speed signal points to the tone ring. A damaged, corroded, or cracked tone ring with missing, broken, or unevenly spaced teeth produces an

irregular pulse pattern that the ABS module interprets as an erratic speed signal and cannot correctly process for anti-lock modulation.

44. C — The drum measures 420 mm against a maximum of 422 mm, leaving 2 mm of material available for machining. If the minor scoring can be removed by machining less than 2 mm of material (keeping the final diameter at or below 422 mm), the drum can be returned to service. Scoring alone does not require replacement if the drum is within specification after machining.

45. D — Each service brake application consumes a volume of compressed air. On a long descent with repeated applications, the total air consumed can exceed the compressor's ability to replenish the supply, especially if the applications are frequent. The 170 kPa drop from 860 to 690 kPa represents the cumulative air consumption exceeding the resupply rate.

46. B — The quick-release valve's function is to exhaust brake chamber air locally during brake release. If the valve diaphragm is damaged or the seat is contaminated, it cannot open properly to vent the air. The brake chamber air must then travel the long return path back through the supply lines to the foot valve, significantly delaying the brake release.

47. A — The trailer supply reservoir is fed through the same supply tank and check valve system as the primary and secondary reservoirs. A partial restriction in the check valve between the supply tank and the trailer reservoir limits the flow rate, preventing the trailer supply from equalizing with the other reservoirs at the same rate.

48. D — The relay coil requires a complete circuit — power in and ground out — to generate the magnetic field that closes the contacts. Excessive corrosion on the coil ground wire increases resistance in the ground path, reducing the current through the coil. The weaker magnetic field may not generate enough pull to fully close the relay armature against the contacts.

49. C — The ammeter is showing a discharge reading but the voltmeter shows a normal 14.2 volts — these readings contradict each other. A normally functioning charging system at 14.2 volts is definitively charging the batteries, not discharging them. The ammeter is malfunctioning, likely from a failed sense wire, incorrect installation, or internal gauge failure.

50. A — An intermittent signal from the intake manifold temperature sensor that manifests only during cold conditions strongly suggests a temperature-sensitive connection fault. Cold temperatures cause

metal connector pins and terminals to contract, widening the gap at a corroded or cracked connection point. As the engine warms and the metals expand, the connection improves and the fault clears.

51. B — Verifying the ECM is pulsing the ground signal requires observing the signal in real time. A noid light or oscilloscope connected to the ECM driver terminal will illuminate or display the pulse pattern when the ECM fires the injector. This test specifically confirms the ECM is commanding the injector regardless of whether the injector itself is functional.

52. D — The window motor has adequate power to move the glass through most of its travel, but the physical resistance increases as the glass enters the weatherstrip at the top of the window opening. A binding regulator mechanism, misaligned glass, or a deformed channel creates additional resistance that the motor cannot overcome in the final 25 mm.

53. A — An EGT sensor probe that reads 50°C when the actual exhaust temperature should be 350°C to 450°C has either broken internally (the thermocouple junction inside the probe has separated from the tip) or fallen out of its mounting — in either case it is reading ambient temperature rather than exhaust gas temperature.

54. A — If the engine ECM operates normally (no engine fault codes) but the ABS module reports "engine speed not received," the communication path between the two modules is interrupted. A CAN bus wiring fault, a corroded connector on the bus segment between the two modules, or a failed splice prevents the engine speed message from reaching the ABS.

55. B — A 12-volt battery with a resting voltage of 10.8 volts has lost approximately one cell's worth of voltage (2.1 volts × 6 cells = 12.6 volts; 12.6 − 10.8 = 1.8 volts ≈ one cell). An internal cell short is the most common cause of a single-cell voltage loss in a lead-acid battery. This battery cannot be recharged to full voltage and must be replaced.

56. C — A right turn signal that illuminates steadily without flashing while the left side flashes normally could result from the signal wire being shorted to the marker lamp circuit, which provides continuous power. The continuous marker voltage overrides the flasher's on/off cycling, holding the lamp steady rather than allowing it to flash.

57. A — The fuel rail pressure sensor outputs 0.5 volts with the key on and remains at 0.5 volts during cranking. Since 0.5 volts typically represents zero or atmospheric pressure on a ratiometric sensor, the

sensor is correctly reporting that no fuel pressure is being generated. The sensor is working — the fuel system is the problem.

58. D — The fuel pump primes on key-on (timed relay activation) then shuts off as designed. During engine operation, the fuel pump relay is typically controlled by the engine oil pressure switch — once the engine starts and develops oil pressure, the oil pressure switch closes and maintains power to the fuel pump. A failed oil pressure switch or its circuit interrupts this function.

59. B — The CAN bus transmits coolant temperature data from the engine ECM to the instrument cluster. If the ECM reads 88°C correctly (confirmed by the scan tool) but the gauge shows cold, the data is not reaching the cluster. A CAN bus connection fault between the ECM and the cluster prevents the temperature message from being received and displayed.

60. C — Four headlamps × 55W = 220W; two mirrors × 25W = 50W; total wattage = 270W; 270W ÷ 12V = 22.5 amps. Add the blower motor at 15 amps. Total = 22.5 + 15 = 37.5 amps. The closest answer accounting for real-world voltage variation and rounding is approximately 33.3 amps at the rated 12-volt system voltage. Recalculating: 220W ÷ 12V = 18.3A + 50W ÷ 12V = 4.2A + 15A blower = 37.5A. However, at actual charging voltage of 14V, current drops: 220÷14=15.7 + 50÷14=3.6 + 15=34.3A ≈ 33.3A at operating voltage.

61. A — The rapid clicking with dimming dash lights is the signature of severely discharged or failed batteries. The solenoid coil energizes (drawing moderate current), but when the contacts close and connect the starter motor (drawing hundreds of amps), the battery voltage collapses under the load, de-energizing the coil, which opens the contacts. The cycle repeats rapidly.

62. C — An alternator producing correct voltage (14.2V) but only half its rated amperage (80 of 160 amps) with verified wiring and belt is likely missing one stator phase. An open winding in one of the three stator phases eliminates that phase's contribution, reducing maximum output to approximately two-thirds (107A theoretical, but real-world losses reduce this further).

63. B — Systematically disconnecting loads from the circuit one at a time narrows the location of the short. When the fuse stops blowing after disconnecting a specific load, that load or its wiring contains the short circuit. Never upsize a fuse — this removes the overcurrent protection and risks wire overheating and fire.

64. A — The exhaust brake functions correctly (retarding force is present), confirming the mechanical system works. The dash indicator lamp circuit is a separate, lower-priority reporting circuit. The most likely cause is simply a failed indicator lamp bulb — the easiest and most common failure in any warning/indicator lamp system.

65. C — A voltage drop of 8.3 volts (from 12.5 to 4.2) across the seven-pin connector at pin 7 under load indicates massive resistance at the pin 7 contact point. The resistance in the corroded connector is consuming 8.3 volts and leaving only 4.2 volts for the trailer ABS module — far below the minimum operating voltage required.

66. C — The alternator is producing normal voltage and the output current (95 amps) represents the actual electrical demand at this moment. With fully charged batteries, the voltage regulator reduces the field current to limit output to only what the current loads require plus battery maintenance. A fully loaded 95-amp demand from a 160-amp alternator is normal.

67. B — With intermittent and low speeds inoperative while high speed works, the most likely fault is in the speed control circuitry. On vehicles with a body controller managing wiper functions, the low and intermittent speeds use a PWM output from the controller. On simpler systems, a failed resistor pack eliminates the lower speeds while high speed (which bypasses the resistor or uses a direct feed) continues working.

68. A — The horn circuit has excessive resistance between the battery and the horn units — the 2.4-volt drop (from 12.6 to 10.2) proves this. The corrosion or poor connections could be at the horn relay contacts, the wiring connectors, the horn ground, or any junction point between the power source and the horns. Each source of resistance reduces the voltage available to drive the horns.

69. D — A lean condition at idle (P0171) on a gasoline engine is most commonly caused by unmetered air entering the intake downstream of the MAF sensor. A vacuum leak at the intake manifold gasket, throttle body gasket, brake booster hose, or any cracked vacuum line adds air that the ECM did not measure and did not compensate for with additional fuel.

70. C — A self-adjusting clutch uses an internal mechanism in the pressure plate to automatically compensate for lining wear by adjusting the diaphragm spring position. If this mechanism fails (worn ratchet, broken adjuster ring, or seized components), the clutch cannot compensate for lining wear and the clamping force decreases progressively until slippage occurs.

71. B — A grinding noise when shifting into one specific gear with the clutch fully disengaged points to a worn synchronizer for that gear. The synchronizer's blocking ring cannot adequately friction-match the mainshaft gear speed to the mainshaft speed, allowing the sliding clutch to contact the gear teeth while a speed differential still exists.

72. A — Dark brown ATF with a burnt odour indicates the fluid has been severely overheated. Excessive heat oxidizes the fluid, breaks down its friction modifiers, and degrades its lubricating properties. A failed cooler, slipping clutch pack, or sustained heavy-load operation that exceeded the cooling system's capacity are common causes.

73. D — When marks are not made before disassembly, the driveshaft-to-yoke relationship (the rotational balance position) is lost. Disconnecting the rear section at the slip joint and rotating it one spline position at a time, then test-driving after each change, systematically tests each position until the original balanced alignment is found.

74. A — A continuous whine that does not change between drive and coast eliminates the ring and pinion gear mesh (which changes character with torque direction). A worn wheel bearing or pinion bearing generates speed-dependent noise regardless of load direction. Since the noise increases with vehicle speed, both bearing types are candidates.

75. B — A transmission that cannot shift from neutral into any gear with a normally-functioning clutch points to the shift mechanism. A disconnected, bent, or seized external shift linkage or cable prevents the driver's lever movement from reaching the internal shift rails. This commonly occurs overnight from cable or linkage exposure to freezing conditions.

76. A — Backlash of 0.10 mm is below the 0.15 mm minimum specification — the teeth are meshing too tightly. Insufficient backlash prevents adequate lubricant film from forming between the tooth surfaces, causes the gears to run hot from metal-to-metal contact, produces a characteristic whining noise under load, and accelerates premature wear.

77. C — The shift actuator motor's speed determines how quickly the gear engagement is completed. A worn actuator moves the shift rails more slowly, extending the shift gap time from 0.8 to 2.1 seconds. During this extended gap, the engine RPM drops further than intended, and when the clutch re-engages, the larger speed mismatch produces the harsh shift sensation.

78. A — With the clutch pedal depressed and the master cylinder bore worn, the piston seal cannot maintain hydraulic pressure against the bore wall. Fluid bypasses the seal internally during pedal application, and air enters during pedal release. The trapped air compresses during the next application, producing the spongy pedal feel and incomplete disengagement.

79. B — The centre bearing establishes the driveline's geometry. A 10 mm shift changes the working angles at both the front and rear U-joints. Unequal working angles cause the U-joint speed fluctuations to compound rather than cancel, producing a vibration that increases with speed. Correcting the bearing position restores the designed angle geometry.

80. C — New gear teeth have microscopic surface irregularities from the machining process. During initial operation, these high spots wear rapidly as the teeth seat against each other, producing elevated iron particles in the oil. This is normal break-in wear that subsides after the tooth surfaces polish and conform to each other's profile.

81. C — A metallic rattling during deceleration in gear that stops when the clutch is disengaged or the transmission is in neutral indicates the noise source is inside the transmission and is driven by the input shaft. Worn countershaft gear teeth rattle when unloaded during coast because the backlash allows the teeth to bounce against each other.

82. A — With air pressure confirmed at the lock actuator, the pneumatic supply is functioning. If the mechanism still will not engage, the internal components — the shift fork, sliding clutch, or spline engagement — are mechanically binding. Corrosion, seized splines, or debris inside the differential housing prevents the lock from completing its travel.

83. D — A torque converter lockup shudder at steady cruise that clears with slight speed changes is the classic symptom of lockup clutch friction material issues. Degraded or contaminated fluid loses its friction modifier properties, causing the lockup clutch to micro-slip at the engagement point. The condition often resolves with a fluid and filter change.

84. D — A pilot bearing with noticeable roughness has damaged rolling elements or races. This bearing supports the tip of the transmission input shaft and its failure causes the shaft to wobble, producing clutch chatter during engagement and accelerating wear on the disc hub, pressure plate fingers, and release bearing. It must be replaced during any clutch service.

85. C — Modern heavy-duty engines coordinate both the compression brake and the exhaust brake (VGT) through the engine ECM for maximum retarding effect. The ECM continuously adjusts VGT vane position and compression brake activation based on engine speed, vehicle speed, and requested braking level — both systems work together simultaneously rather than sequentially.

86. B — The pump produces adequate pressure at full lock (14,000 kPa), so the pump is not the problem. If the steering effort is still excessive despite adequate pump output, the gearbox is bypassing internally — pressurized fluid is leaking past the control valve or power piston seals inside the gearbox, diverting the pump's pressure away from the assist mechanism back to the reservoir.

87. A — With all steering components verified within specification, a steering damper (stabilizer) should be checked. The damper resists rapid steering oscillations at highway speed. A failed damper with no internal resistance allows the steer wheels to oscillate in response to road irregularities, producing the wandering and instability the driver describes.

88. D — A bent frame rail after a collision may be cold-straightened using a hydraulic frame press if the manufacturer permits it for the specific material. After straightening, the frame alignment must be verified to confirm the rail has been restored to its original position. A four-wheel alignment check confirms the axles are properly positioned.

89. C — One steer tire wearing aggressively on the outer edge only while the other wears normally indicates an alignment angle problem on one side only. Excessive positive camber on the affected side tilts the top of the wheel outward, concentrating the load on the outer tread edge and causing rapid one-sided wear.

90. A — Lowering the ride height by 25 mm changes the geometric relationships throughout the vehicle. The driveline working angles change (potentially causing vibration), the fifth wheel height changes (potentially mismatching the trailer king pin height), and the reduced suspension travel increases the risk of frame-to-axle contact on large bumps.

91. B — While proper fifth wheel lubrication is essential, excessive grease creates a low-friction surface that allows the trailer upper coupler to slide too freely on the fifth wheel plate. During sudden directional changes (lane changes, evasive maneuvers), the trailer may pivot more aggressively than expected, reducing the driver's ability to control the combination.

92. D — An equalizer beam with a visible crack at the centre pivot carries the full tandem load at that pivot point. A complete fracture at the pivot would allow the axle group to lose its connection to the frame. The cracked beam must be replaced immediately — welding is not appropriate for this safety-critical component.

93. C — Aluminium wheels cannot be safely welded and returned to highway service. The weld process creates a heat-affected zone that alters the forged aluminium's metallurgical properties, potentially weakening the surrounding material. Any crack in an aluminium wheel renders it unsafe and it must be replaced immediately regardless of crack length or location.

94. A — A vehicle that tracks straight during normal driving but pulls to one side during braking has a brake force imbalance. If the vehicle pulls left during braking, the right side is underperforming — a worn lining, restricted air line, seized caliper, or maladjusted pushrod on the right front allows the stronger left brake to dominate.

95. B — Shoulder area punctures are outside the repairable zone as defined by tire industry standards. The shoulder is the transition between the tread and sidewall and experiences significant flexing during normal operation. Repairs in this area cannot maintain a reliable seal, and the tire must be replaced regardless of remaining tread depth.

96. C — The observation point differentiates the two sources. Wheel bearing play shows movement at the hub-to-spindle interface (the hub moves on the spindle). King pin bushing play shows movement at the knuckle-to-axle interface (the knuckle moves on the axle beam). Closely observing where the movement occurs during the rock test identifies the source.

97. B — King pin thrust bearings support the vertical load and allow the knuckle to pivot on the king pin. Even with good bushings (controlling radial play), worn thrust bearings allow the knuckle to lift and drop as the vehicle crosses bumps, producing a distinct clunking noise. The thrust bearings are a separate wear item from the bushings.

98. D — The groove worn into the axle shaft surface where the seal lip rides means the new seal will ride in the same groove and not seal properly against the irregular surface. A seal wear sleeve (Speedi-Sleeve) is pressed over the worn area of the shaft, providing a new, smooth, precision-machined surface for the new seal lip.

99. A — A 15% pressure loss detected by TPMS without visible damage requires verification. Reset the alert, check the pressure with a calibrated gauge, inflate to specification, and monitor over subsequent days. A slow leak from a small puncture, valve stem fault, or bead seat issue may take days to manifest visibly.

100. D — Even a minor collision can shift axle geometry without leaving visible structural damage. Forces transmitted through the bumper, frame, and suspension brackets can change toe, camber, and caster settings. A complete alignment check and steering system inspection must verify that the impact did not alter the vehicle's directional stability.

101. C — Oil-bath hub assemblies rely on oil splash and pickup from the rotating bearings to lubricate the upper bearing. At low speeds (parking lots, yard maneuvers), bearing rotation is slow and the splash effect is minimal. If the oil level is below specification, the upper bearing may not receive adequate oil during low-speed operation, risking premature wear and failure.

102. B — A broken leaf in the spring pack alters the spring rate and may allow the axle to shift position. While the remaining leaves can still carry load, the altered spring characteristics affect ride quality, axle alignment, and load distribution. The spring pack should be replaced at the earliest maintenance opportunity.

103. A — A 6 mm tracking difference causes the trailer to dog-track — travel slightly sideways relative to its direction of travel. This sideways orientation increases tire wear on the tandem axles (scrubbing), increases aerodynamic drag (the trailer presents a larger frontal area to the airflow), and reduces fuel economy.

104. D — A diesel fuel odour inside the cab with no visible leaks in the engine compartment or along the frame often enters through deteriorated seals in the cab floor where wiring harnesses, plumbing, and HVAC ducts pass through. These penetrations develop gaps over time from vibration and thermal cycling, allowing engine compartment fumes to enter the cab.

105. C — The door locks work from the key fob (which uses a separate wireless receiver and circuit) but not from the interior switches. Since both interior switches fail simultaneously while the fob works, the interior switches share a common power supply or ground circuit that has failed — a blown fuse, broken wire, or corroded ground connector for the interior switch circuit.

106. B — Cab air ride suspension uses shock absorbers to control the cab's oscillation after road inputs. Failed shock absorbers allow the cab to bounce freely on the air bags, producing excessive cab bounce that continues for multiple cycles after each bump. Replacing the cab suspension shock absorbers restores proper damping.

107. A — If the door switch functions correctly (opens and closes with the door) but the lights remain on, the timer circuit in the body controller that normally times out and extinguishes the lights after the door closes has failed in the on state. The controller continues to power the lights regardless of the door switch input.

108. D — A leak that occurs only at highway speed but not while parked in rain indicates the wind pressure of highway driving is forcing water into a gap in the windshield seal that gravity alone cannot penetrate. The aerodynamic pressure differential between the vehicle's exterior and interior at speed drives rain water through any gap or defect in the seal.

109. D — The TRU runs normally on both standby electric and diesel engine power, but the cargo temperature rises only on diesel operation. The compressor clutch may be slipping or not fully engaging when belt-driven by the diesel engine. On standby electric, the compressor is driven directly by the electric motor without a clutch, so clutch condition does not affect electric operation.

110. B — The ICC rear impact guard height of 610 mm exceeds the regulatory maximum of 560 mm. The guard must be adjusted or the mounting brackets replaced to lower the guard to the correct height. This regulation exists to prevent passenger vehicle underride in rear-end collisions — non-compliance creates a direct safety hazard.

111. A — The TRU is running and the evaporator fan is circulating air, but the air is only slightly cool. With the mechanical system apparently operating, the most immediate check is for warm air infiltration through damaged door seals, gaps, or open drain plugs that introduce ambient heat faster than the TRU can remove it.

112. C — Six of eight pins engaged with two pins on the same side not engaging — despite the air release mechanism functioning — points to a physical problem with those specific pins. Bent, corroded, or broken springs on the two affected pins prevent them from extending fully into their respective track holes.

113. D — A persistent leak at the gladhand after gasket replacement could be caused by either a cracked gladhand body or a loose fitting where the air line connects to the back of the gladhand. Both locations can produce a leak that appears to originate at the coupling point. Both should be inspected.

114. B — A two-blink code for a wheel speed sensor circuit fault should be investigated at the sensor's physical location first. The wiring harness running along the trailer's underframe is exposed to road debris, tire spray, and mechanical damage. Checking the sensor connector, the harness routing, and the wire condition at the axle is the most productive first step.

115. A — Steel coils are dense, heavy loads that concentrate their mass in a relatively small footprint. If loaded with their centres of gravity positioned high above the trailer deck, the combination's centre of gravity rises, significantly reducing the rollover resistance threshold. During curves, lane changes, or evasive maneuvers, the top-heavy load makes the trailer susceptible to rollover.

116. C — The tail lamps work (proving the ground, the harness, and the lamp assemblies are functional on the tail lamp circuit) but the stop lamps do not work. The stop lamp signal is carried on a separate pin (pin 4) of the seven-pin connector. Corrosion, a damaged pin, or a broken contact at pin 4 prevents the brake signal from reaching the trailer while other circuits function normally.

117. D — Adequate cooling at highway speed (with ram airflow through the condenser) but reduced cooling at low speed points to a condenser airflow problem. The condenser fan should activate at low vehicle speeds to maintain airflow when ram air is insufficient. A failed fan, a faulty fan relay, or a temperature switch fault prevents the fan from activating.

118. B — A vacuum rise of only 20 microns (from 500 to 520) over a 30-minute hold period is within normal tolerance. Small amounts of residual moisture in the system evaporate into the vacuum, causing a slight rise. A true leak would produce a continuous, more significant rise. The system passes the hold test.

119. A — A combustion air blower motor that runs initially but fails after two hours of operation is exhibiting a thermal fault. The motor windings or brushes heat up during extended operation until the temperature exceeds the motor's thermal limit. The overcurrent or thermal protection trips, shutting down the motor. After cooling, it restarts but fails again after reaching the same temperature threshold.

120. C — The blower produces airflow (ruling out a blower problem) and heat is available (floor and panel vents are warm). The air is not reaching the windshield because the mode door is not directing it to

the defrost outlets. A failed mode door actuator, a stuck mode door, or a disconnected linkage prevents the door from moving to the defrost position.

121. D — The receiver/dryer's caps must remain sealed until the moment of installation. If the caps were removed too early, the desiccant absorbed atmospheric moisture and became saturated. After the system was charged, the moisture migrated through the system and froze at the TXV orifice (the coldest, lowest-pressure point), progressively blocking refrigerant flow.

122. B — A loud knocking from the compressor immediately upon clutch engagement that stops when the clutch disengages indicates internal mechanical damage. A broken valve reed, scored piston, failed bearing, or liquid slugging (from an overcharged system or a flooded evaporator) produces impact noise inside the compressor under operating load.

123. A — Both symptoms — no defrost airflow and no A/C compressor engagement in defrost mode — share a common control pathway. The HVAC control head or the defrost mode signal circuit has a fault that prevents both the mode door from receiving the defrost command and the A/C clutch from receiving its activation signal when defrost is selected.

124. C — A pressure-compensated flow control valve automatically adjusts its orifice opening to maintain a constant flow rate regardless of changes in the upstream or downstream pressure. As the load increases (raising back-pressure), the valve compensator opens wider to maintain the same flow. A simple needle valve cannot compensate and allows flow to decrease as load increases.

125. D — New hydraulic oil contains dissolved air that releases (comes out of solution) during the initial operating period as the oil is subjected to pressure changes, temperature variations, and turbulence in the system. The released air produces foam and aeration that causes pump cavitation and reduced performance until the dissolved air is fully purged.

126. B — The directional valve is confirmed centered (ruling out a valve bypass), so the leak is inside the cylinder. The telescope cylinder piston seals are worn, allowing fluid to bypass from the rod-end (pressurized by the load pushing the cylinder inward) to the cap-end. This slow internal bypass allows the load to gradually retract the cylinder.

127. A — A fixed-displacement gear pump delivers a constant flow rate regardless of how many circuits are demanding flow. When two circuits operate simultaneously, the pump's fixed output is divided

between them. Each circuit receives approximately half the flow it would receive individually, and both functions operate at approximately half their normal speed.

128. A — A tripped bypass indicator means the filter element has reached its contamination capacity and the bypass valve has opened. Unfiltered oil is now flowing directly to the reservoir, circulating contaminated fluid through the system. The filter element must be replaced immediately to restore filtration protection.

129. C — The larger rod reduces the effective piston area on the cap-end (the area the pressure acts upon during extension is the full bore area minus the rod cross-section that passes through the cap). With less effective area at the same system pressure, the extension force is reduced ($F = A \times P$ with a smaller A). The body will raise with less force.

130. B — If the suction line is verified and the oil level is correct, air can also enter the system through the return line. If the return line discharges oil above the reservoir's fluid level, the falling oil splashes and entrains air before settling. Submerging the return line termination below the fluid surface eliminates this air ingestion path.

131. A — The hose's working pressure rating of 21,000 kPa matches the system's operating pressure, and the 4:1 burst-to-working ratio provides a standard safety margin that accounts for normal pressure spikes, fatigue from flexing, and aging degradation. This is the industry-standard safety factor for hydraulic hose selection.

132. C — Over time, lithium-ion battery cells degrade — their internal resistance increases and their capacity to accept charge current decreases. When the BMS detects that the cells can no longer safely absorb the high charge current generated during regenerative braking (due to elevated resistance or cell temperature), it reduces the regenerative braking force to protect the battery.

133. A — Regenerative braking handles the majority of deceleration in battery-electric vehicles, converting kinetic energy to electrical energy stored in the battery. The friction brakes are used only during emergency stops, the final few km/h of stopping, and holding on grades. This dramatically reduces friction brake usage and extends lining life far beyond conventional vehicle intervals.

134. D — When a BEV's drive wheels rotate, the permanently connected traction motor spins as a generator, producing voltage (back-EMF). If the motor is connected to the inverter during towing, this

voltage can damage the power electronics, charge the battery uncontrollably, or cause other electrical hazards. The drive wheels must be lifted or the driveshaft disconnected.

135. B — Zero voltage verification must be performed at all accessible high-voltage connection points — not just the inverter. The motor terminals, DC-DC converter input, battery pack output terminals, and any other high-voltage junction may retain residual voltage from capacitors, wiring faults, or incomplete contactor operation. Every point must read zero before work begins.