

RED SEAL EXAM PREP

310S Automotive Service Technician

Free 50-Question Mock Exam

Practice for the Red Seal / Certificate of Qualification exam

Pass mark: 70% · Aligned to the published occupational standard topic weightings
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Mock Exam — answer all questions, then check the key

Q1. A mass air flow (MAF) sensor reads lower than expected at all RPM. The engine runs rich at idle and lean under load. The MOST likely cause is:

- A) Air entering the intake after the MAF sensor
- B) Throttle body dirty causing incorrect air metering
- C) Air filter restriction causing low airflow
- D) MAF sensor contaminated with oil deposits

Q2. A vehicle pulls consistently to the left on a flat, straight road. Tyres have been swapped front-to-front and the pull stays on the left. After swapping the two front tyres to the rear, the pull disappears. What caused the original pull?

- A) A defective (conical) tyre causing the pull
- B) A loose left front wheel bearing with play
- C) Alignment issue — caster or camber off on the left front
- D) Brake drag at the left front caliper

Q3. How does R-1234yf differ from R-134a in flammability, and what does that mean for servicing?

- A) R-134a is the mildly flammable refrigerant while R-1234yf is completely non-flammable in all service conditions
- B) R-1234yf is A3 (highly flammable like propane) and is therefore prohibited from being serviced inside an enclosed shop
- C) Both are non-flammable, so recovery, recharge, and leak-test service procedures are identical for the two refrigerants
- D) R-1234yf is A2L (mildly flammable) while R-134a is A1 (non-flammable) — use A2L-rated equipment and keep ignition sources away

Q4. A technician is diagnosing a parasitic battery drain. After pulling fuses one by one, the draw drops from 450mA to 35mA when fuse #14 (Body Control Module) is removed. What is the BEST next step?

- A) Unplug components on that fuse circuit one at a time
- B) Clear all BCM codes and retest after a full drive cycle
- C) Replace the Body Control Module without further testing
- D) Install a higher-amperage fuse in position #14

Q5. A vehicle has a hard start condition — the engine cranks normally but takes 3–4 seconds to start. The fuel pressure holds after key-off but drops to zero after 30 minutes. The most likely cause is:

- A) A clogged fuel filter restricting flow to the injectors
- B) A leaking injector or a failed fuel pump check valve
- C) A faulty crankshaft position sensor delaying start-up timing
- D) A weak battery causing slow fuel pump operation

Q6. When performing a cylinder contribution test, what does it indicate if RPM drop is significantly less when one cylinder is disabled compared to others?

- A) That cylinder is contributing less power — possibly misfiring or weak
- B) That cylinder has higher compression than the others
- C) The ignition timing for that cylinder is advanced
- D) The fuel injector for that cylinder is delivering too much fuel

Q7. An oxygen sensor (upstream) is showing a fixed rich signal (0.9V constant) with no switching. The MOST likely cause is:

- A) Fuel pressure that is too low at the rail
- B) A contaminated or failed sensor stuck reading rich
- C) A catalytic converter working at peak efficiency
- D) An engine running too lean at all speeds

Q8. A dual-zone system blows cold air on the driver side and warm air on the passenger side regardless of the temperature setting. What is the MOST likely cause?

- A) A failed blend door actuator or a broken blend door on the affected zone
- B) A failed compressor clutch preventing the compressor from engaging
- C) A low refrigerant charge that reduces cooling capacity across the system
- D) A clogged cabin air filter restricting total airflow to both zones

Q9. A vehicle has a P0171 code (System Too Lean, Bank 1). Short-term fuel trim (STFT) is +22%. What does this indicate?

- A) The engine is receiving too much fuel from the injectors
- B) The ECM is adding fuel to correct a lean condition
- C) The oxygen sensor is falsely reading rich
- D) The catalytic converter is failing and restricting flow

Q10. A brake-by-wire (BBW) system on a hybrid vehicle has no traditional brake booster. How is brake assist force generated?

- A) The drive motor reverses to provide all of the braking force
- B) The driver simply applies more pedal force by design
- C) An electric vacuum pump supplies conventional vacuum assist
- D) An electric motor-driven hydraulic pump builds pressure on demand

Q11. During a brake fluid service, a technician finds that the brake fluid boiling point is significantly lower than specification. What is the MOST LIKELY cause and what is the risk?

- A) Contamination with engine oil from a master cylinder leak
- B) Wrong viscosity grade fluid with a lower boiling point
- C) Oxidation thickening the fluid and lowering its boiling point
- D) Moisture absorbed by the hygroscopic fluid over time

Q12. What brake fluid specification is required for most vehicles equipped with ABS and electronic stability control?

- A) Glycol-based DOT 3, DOT 4, or DOT 5.1, as the OEM specifies
- B) Any SAE 30 hydraulic fluid can be substituted in an emergency
- C) DOT 5 (silicone-based) — required for all ABS-equipped vehicles
- D) Mineral oil — ABS modulators require non-hygroscopic fluid

Q13. A technician diagnoses a P0894 code: "Transmission Component Slipping." Line pressure tests are within specification. What area should be investigated next?

- A) The engine ignition timing, as retarded timing overloads the unit
- B) Clutch pack clearance, worn friction plates, or a weak solenoid
- C) The oil pump output, since correct pressure eliminates the pump
- D) The flexplate/flywheel, as it is the most common cause of P0894

Q14. An 8-speed automatic transmission is displaying harsh shifts and a fault code for "Transmission Control Module — solenoid circuit fault, shift solenoid E." What is the likely consequence if this solenoid fails permanently open?

- A) The transmission enters limp-home mode, locked in one gear
- B) The transmission locks out all forward gears — reverse only
- C) The engine torque is limited to idle when the fault is detected
- D) Only the commanded gear is affected — other gears work normally

Q15. What does a MAP (Manifold Absolute Pressure) sensor measure and how does it affect fuel injection?

- A) Exhaust back pressure — adjusts ignition timing
- B) Fuel rail pressure — controls injector opening
- C) Intake manifold vacuum/pressure — indicates engine load
- D) Oil pressure — protects engine bearings

Q16. What is the purpose of a shunt resistor in an automotive electrical system?

- A) To add resistance in high-current circuits to prevent damage
- B) To bypass a failed component and keep the circuit working
- C) To measure current from the voltage drop across a known resistance
- D) To limit the current flowing to sensitive electronics

Q17. During a wheel alignment, the technician finds the rear thrust angle is 0.5° to the right. The rear toe cannot be adjusted on this vehicle. What effect does this have and what is the correct procedure?

- A) Set front camber to compensate for the rear thrust angle
- B) Replace the bent rear axle or damaged suspension components
- C) Adjust front toe to match — this is normal alignment practice
- D) Adjust front caster to correct the thrust angle deviation

Q18. What is brake fade and what are the two main types?

- A) Brake noise; types are squeal fade (vibration) and groan fade (low-speed)
- B) Increased brake pedal travel; types are static fade (parked on slope) and dynamic fade (while moving)
- C) Gradual loss of braking efficiency; types are mechanical fade (worn pads) and hydraulic fade (low fluid)
- D) Gradual loss of braking efficiency; types are lining fade (overheated friction material) and fluid fade (boiling brake fluid)

Q19. What is the purpose of ABS (Anti-lock Braking System) and how does it prevent wheel lockup?

- A) ABS disables the brakes briefly to let the tires regain traction
- B) ABS applies the parking brake at the rear to stabilize the vehicle
- C) ABS raises pressure at all wheels at once to shorten the stop
- D) ABS modulates pressure at each wheel to prevent wheel lockup

Q20. A technician hears a rapid ticking from the top of the engine that increases with RPM. The oil level and pressure are normal. The MOST likely cause is:

- A) Excessive valve clearance or a stuck lifter
- B) An exhaust manifold heat shield rattling
- C) Normal fuel injector operating noise
- D) Crankshaft main bearing knock

Q21. A transmission slips in 2nd and 4th gear but operates normally in 1st, 3rd, and reverse. Using your knowledge of planetary gear sets, what component is MOST LIKELY faulty?

- A) The forward clutch pack that is common to all forward gears
- B) The clutch pack or band applied only in 2nd and 4th gear
- C) The valve body main pressure regulator affecting all gears
- D) The output shaft bearing allowing the shaft to move axially

Q22. A vehicle has excessive negative camber (top of tire tilts inward) on the front right wheel after a curb strike. What is the most likely damaged component?

- A) A bent strut, lower control arm, or steering knuckle
- B) A collapsed coil spring on the affected corner
- C) A broken anti-roll bar link allowing suspension droop
- D) A worn wheel bearing with excessive play

Q23. A vehicle wanders on the highway and requires constant steering correction. Which component should be checked FIRST?

- A) Engine and transmission mounts
- B) Tyre pressure and tyre wear
- C) Front brake caliper slides
- D) Front wheel hub bearings

- Q24.** When diagnosing a CAN bus communication fault (U-codes), what does a "Bus Off" condition indicate?
- A) The vehicle's power mode is in the accessory-off state
 - B) Outdated scan tool software losing communication
 - C) The CAN wiring has been disconnected from the battery
 - D) A module detected excessive errors and dropped off the bus
- Q25.** A vehicle with Electronic Stability Control (ESC) is experiencing unexpected brake application to one wheel during normal cornering. No warning lights are on. What is the MOST LIKELY cause?
- A) A misaligned steering angle sensor that has been recalibrated
 - B) A faulty wheel speed sensor sending incorrect speed data
 - C) A sticking ABS solenoid in the hydraulic control unit
 - D) Low brake fluid causing proportioning valve malfunction
- Q26.** Why must A/C refrigerant be recovered during service rather than released to the atmosphere?
- A) Releasing the old refrigerant helps the system pull a deeper vacuum during evacuation
 - B) Refrigerant is harmless to the atmosphere and may be vented outdoors in small amounts
 - C) Recovery equipment is only required when servicing older R-12 systems, not modern refrigerants
 - D) Venting refrigerant is illegal and environmentally harmful — it must be recovered with a recovery machine
- Q27.** A technician performs a relative compression test using a scan tool while cranking. Cylinder 4 shows significantly higher cranking RPM than the others during its compression stroke. This indicates:
- A) Cylinder 4 injector is delivering more fuel
 - B) The crankshaft is bent or twisted
 - C) Cylinder 4 has higher compression than others
 - D) Cylinder 4 has LOW compression
- Q28.** A customer complains of a clunking noise from the front suspension when going over bumps. The MOST likely component to check first is:
- A) Front wheel alignment settings
 - B) Power steering fluid level
 - C) Sway bar links and strut mounts
 - D) Tire pressure on all four corners
- Q29.** A manifold absolute pressure (MAP) sensor reading is consistently HIGHER than actual atmospheric pressure at key-on, engine off. This MOST likely indicates:
- A) Engine compression that is too high
 - B) A vacuum leak downstream of the throttle
 - C) A throttle body sticking closed at idle
 - D) A failed-high MAP sensor or blocked vacuum line

Q30. An automatic transmission shifts correctly but shudders during torque converter lock-up. The MOST likely cause is:

- A) Worn lock-up clutch lining or contaminated fluid
- B) A valve stuck in the valve body park circuit
- C) Low transmission fluid level causing foaming
- D) A worn transmission clutch pack assembly

Q31. What is the purpose of transmission fluid in an automatic transmission?

- A) It provides only the hydraulic pressure needed for gear shifts
- B) It acts only as a coolant for the torque converter assembly
- C) It only lubricates the moving parts to prevent internal wear
- D) It lubricates, applies clutches, cools, and drives the converter

Q32. In an A/C system that uses a thermostatic expansion valve (TXV), which component stores liquid refrigerant and desiccant, and where is it located?

- A) The evaporator core on the low side
- B) An accumulator on the low (suction) side
- C) A muffler on the compressor discharge line
- D) A receiver-drier on the high (liquid) side

Q33. A scan tool shows an active code P0128 — Coolant Temperature Below Thermostat Regulating Temperature. What is the MOST likely cause?

- A) The coolant temperature sensor has failed high (reads too cold)
- B) The radiator fan is running continuously at full speed
- C) Low coolant level causing the sensor to read incorrectly
- D) A stuck-open thermostat keeping the engine too cool

Q34. A vehicle has a "clunk" noise from the front suspension that occurs when going over bumps. The noise is most prominent when turning and going over a bump simultaneously. What is the most likely cause?

- A) Air ingestion in the rack from low power steering fluid
- B) A loose upper strut mount bearing
- C) A worn outer CV joint with excessive play
- D) A worn shock absorber topping out

Q35. An engine has a stretched timing chain. How would this most likely affect cam timing and what symptom would it produce?

- A) Cam timing retards — causes rough idle, low power, and may set VVT fault codes
- B) Cam timing advances — causes high idle and surging
- C) Cam timing becomes erratic — causes only a ticking noise at idle
- D) No effect on timing because the chain tensioner compensates fully

Q36. A dual-clutch transmission (DCT) hesitates and jerks during slow-speed manoeuvring (parking lots, traffic). Normal at highway speeds. What is the MOST LIKELY cause?

- A) Clutch engagement adaptation values drifting out of range
- B) A failed speed sensor mis-selecting gears at low speed only
- C) An inability of DCTs to operate at low speeds by design
- D) Contaminated fluid stopping DCT operation at any speed

Q37. What does the term "firing order" refer to in a multi-cylinder engine?

- A) The sequence in which cylinders produce a power stroke
- B) The sequence of valve timing events
- C) The sequence in which cylinders receive fuel injection
- D) The order spark plugs are replaced during a tune-up

Q38. A circuit has a 12V battery, a 4-ohm resistor, and a 2-ohm resistor connected in series. What is the total current flow?

- A) 4 amps
- B) 2 amps
- C) 3 amps
- D) 6 amps

Q39. A customer complains of a pulling to the left during braking. What is the MOST LIKELY cause?

- A) Incorrect tire rotation direction on the front tires
- B) Low tire pressure on the left front tire
- C) A faulty ABS sensor on the right front wheel
- D) A seized left front caliper applying extra brake force

Q40. A vehicle's EVAP system leak detection test stores a small leak code (P0442). The FIRST item to check is:

- A) Smoke test the charcoal canister vent hose
- B) Replace the charcoal canister assembly
- C) Replace the EVAP purge control valve
- D) Inspect and tighten the fuel filler cap

Q41. An ABS system stores a right rear wheel speed sensor fault code. The sensor resistance is within spec and voltage is present. The vehicle still activates ABS on every stop. The NEXT diagnostic step is:

- A) Inspect the tone ring for damaged or caked teeth
- B) Replace the wheel bearing assembly
- C) Replace the ABS hydraulic control module
- D) Check the brake pad thickness on that corner

Q42. Brake rotors with excessive lateral runout (wobble) cause:

- A) Brake pulling to one side
- B) Brake noise only — no performance issue
- C) Increased brake fade on hills
- D) Brake pedal pulsation on each rotation

Q43. What does "long-term fuel trim (LTFT)" tell a technician when diagnosing a driveability complaint?

- A) The learned correction the ECM applies to base fuel delivery
- B) The gap between coolant and intake air temperature readings
- C) A value that is only relevant at wide-open-throttle conditions
- D) The current fuel injection pulse width shown in milliseconds

Q44. A dual-clutch transmission (DCT) hesitates and jerks during low-speed maneuvering in parking lots. This is:

- A) A known low-speed characteristic of DCT clutch control
- B) A serious mechanical failure requiring immediate repair
- C) Indicates the clutch packs need replacement
- D) A software issue that cannot be repaired

Q45. When diagnosing automatic transmission shift quality, what does "hunting" (frequent up-down shifting at a steady speed) indicate?

- A) A faulty vehicle speed sensor giving incorrect speed readings
- B) A low fluid level preventing full clutch pack engagement
- C) A worn torque converter causing inefficient power transfer
- D) A shift point calibration, TPS, or shift solenoid fault

Q46. A scan tool shows an oxygen sensor is reading "stuck rich" (consistently high voltage ~0.9V) on bank 1 sensor 1 (upstream). What is the MOST likely cause?

- A) The oxygen sensor has failed internally — replace the sensor
- B) The catalytic converter failed, creating a false rich reading
- C) The engine really is rich — check injectors, pressure, and MAF
- D) A vacuum leak downstream is causing a false rich indication

Q47. What is "brake pedal pulsation" and what is the most common cause?

- A) A soft pedal that gradually firms — caused by air in the lines
- B) Intermittent brake grabbing from a sticking caliper piston
- C) Excessive pedal travel caused by badly worn brake pads
- D) A braking vibration in the pedal from rotor thickness variation

Q48. During brake fluid testing, the fluid boiling point is found to be significantly below the DOT specification. What should the technician do and why?

- A) Replace only the fluid in the master cylinder reservoir
- B) Perform a complete brake fluid flush with fresh fluid
- C) Ignore the result — boiling point does not affect braking
- D) Top up the reservoir with fresh fluid to raise the boiling point

Q49. A vehicle with an automatic transmission slips when accelerating from a stop but shifts normally once moving. The MOST likely cause is:

- A) A faulty vehicle speed sensor signal
- B) Low fluid level or a worn forward clutch pack
- C) A broken transmission mount bushing
- D) Torque converter lockup clutch failure

Q50. A vehicle with direct injection has a carbon buildup problem on the intake valves. Why does GDI (Gasoline Direct Injection) cause more valve carbon than port injection?

- A) GDI injectors use less detergent additive than port injectors
- B) GDI uses more fuel, leaving carbon deposits on all engine surfaces
- C) GDI fuel bypasses the valves, so PCV oil deposits are never washed off
- D) GDI engines run hotter, oxidizing oil faster on valve surfaces

Answer Key & Explanations

Q1. Answer: A

Air leak after MAF = MAF sees less air than enters engine. The unmetered air causes the MAF to under-report real airflow, and the ECM injects fuel based on that reading. Extra air (via a leak downstream of MAF) leans the mixture at high load (more air than fuel) while the ECM tries to compensate and may go rich at idle. Smoke test the intake tract from MAF to throttle body.

Q2. Answer: A

Pull stays with the tyre, not the corner = defective tyre (radial pull). A "conical" or "radial force variation" defect in a tyre causes consistent pull. Moving the suspect tyre side-to-side moves the pull. Moving it to the rear eliminates the pull (rear tyres don't affect steering). The defective tyre was the original right front — moved to the rear, problem gone.

Q3. Answer: D

R-1234yf is classified A2L (mildly flammable); R-134a is A1 (non-flammable). A2L means a low burning velocity and low ignition energy, so servicing requires A2L-rated recovery/recharge equipment, adequate ventilation, a refrigerant-specific electronic leak detector, and no open flames or ignition sources near the work. Systems are also designed with features to manage the small flammability risk.

Q4. Answer: A

Isolating a parasitic draw: after identifying the circuit, systematically unplug components on that circuit. The BCM fuse powers multiple subsystems. Use a wiring diagram to identify all circuits on that fuse, then unplug each module/component on the circuit one at a time while monitoring current draw to isolate the specific drain source. Many BCM-related drains are caused by accessories that the BCM controls — door modules, lighting modules, etc. — staying awake when they shouldn't. A wiring diagram is essential to find all components.

Q5. Answer: B

Pressure drops after key-off, hard start: check valve or injector leak-down. Fuel pressure should hold for at least 20–30 minutes after shut-off (varies by manufacturer spec). If pressure bleeds back: the check valve in the fuel pump allows back-flow to the tank (replace pump), or an injector is dripping fuel into a cylinder. The long prime time means the pump must re-fill the rail before starting.

Q6. Answer: A

Cylinder contribution test: less RPM drop = that cylinder contributes less power. When a healthy cylinder is disabled (by cutting fuel/spark), the engine stumbles noticeably — large RPM drop. A weak or misfiring cylinder barely contributes power, so disabling it causes minimal RPM change. This isolates problem cylinders before further diagnosis (compression, injector, coil testing).

Q7. Answer: B

Fixed high voltage (no switching) = sensor failure or contamination. A healthy upstream O2 sensor should rapidly switch between lean ($<0.2V$) and rich ($>0.8V$). A stuck-high sensor is usually contaminated (silicone, coolant, oil) or internally failed, locked in a rich reading. The ECM won't compensate correctly.

Q8. Answer: A

A blend door directs air through or around the heater core to set temperature; a failed actuator or broken door on one zone loses temperature control for that zone. Low charge or a failed compressor would affect cooling on both sides, not one zone. A failed blend door actuator often produces a clicking noise and sets an HVAC actuator fault code. Confirm actuator movement with a scan tool bidirectional test.

Q9. Answer: B

Positive fuel trim = ECM adding fuel = engine running lean. STFT +22% means the ECM is adding 22% more fuel to compensate — well above the normal $\pm 10\%$ range. Causes: vacuum/air leak (unmetered air), weak/clogged injector, faulty MAF sensor, low fuel pressure. Check for vacuum leaks first — cheapest and most common.

Q10. Answer: D

Brake-by-wire: electric hydraulic pump provides assist, blends with regen braking. Hybrid/EV brake systems use electric-motor-driven pumps (or electrohydraulic actuators) to provide brake pressure on demand without a conventional vacuum booster. The system must seamlessly blend regenerative braking (electric motor generates electricity while slowing) with friction brakes — prioritizing regen for energy recovery and using friction brakes to supplement, managing the transition smoothly. This requires sophisticated control.

Q11. Answer: D

DOT brake fluid is hygroscopic — absorbs moisture from the atmosphere through brake system seals and hoses. Water contamination significantly reduces the wet boiling point of brake fluid and increases the risk of vapour lock during heavy braking. DOT 3: dry $205^{\circ}C$ / wet $140^{\circ}C$. DOT 4: dry $230^{\circ}C$ / wet $155^{\circ}C$. Moisture-laden fluid can boil during sustained heavy braking (mountain descents, track use), creating vapour bubbles that are compressible — resulting in a spongy or non-existent brake pedal (vapour lock). This is why brake fluid should be replaced every 2–3 years regardless of appearance.

Q12. Answer: A

ABS/ESC vehicles: use OEM-specified DOT rating (usually DOT 4 or 5.1). Most modern ABS/ESC vehicles specify DOT 4 or DOT 5.1 for their higher boiling points. DOT 5 (silicone) is NOT compatible with systems designed for glycol-based fluid — it doesn't mix and can damage seals. Modern ABS systems require higher boiling point fluid due to the rapid thermal cycling of ABS modulator solenoids. Never mix DOT 5 with DOT 3/4/5.1. Always check OEM specification.

Q13. Answer: B

P0894 (slipping) with normal line pressure: focus on clutch pack wear, clearance, or solenoid control of specific elements. Normal line pressure confirms the pump and main pressure regulator are working. Slipping must be occurring at a specific clutch pack or band. Causes: worn friction plates (excess clearance), weak apply pressure at a specific solenoid circuit (solenoid not fully applying that clutch), or worn clutch pack seals. Use a clutch application chart to identify which elements are in use during slipping conditions.

Q14. Answer: A

Shift solenoid fault triggers limp-home mode — transmission locks into a safe fixed gear. Modern transmissions with electrical faults default to limp-home (fail-safe) mode. The TCM locks the transmission in one gear (commonly 2nd or 3rd) to allow the vehicle to be driven safely to a service facility while preventing further damage. This prevents: multiple gear engagement simultaneously (mechanical damage), loss of all drive. The driver experiences loss of all shifting ability, engine RPM limited by the fixed gear, and difficulty accelerating from stop.

Q15. Answer: C

MAP = engine load sensor. It measures pressure in the intake manifold. High vacuum (light load) = lean mixture. Low vacuum/high pressure (heavy load) = rich mixture. The ECM uses MAP data to calculate engine load and the correct injector pulse width, adjusting fuel delivery to match.

Q16. Answer: C

Shunt resistor: low-resistance, high-precision resistor used to measure current via voltage drop (Ohm's Law). By measuring the millivolt drop across a known, precise low resistance, current can be calculated ($I = V/R$). Used in battery management systems to monitor state-of-charge current flow, and in current clamp designs. The shunt must be in series with the circuit but its resistance is so low it doesn't significantly affect operation.

Q17. Answer: B

Rear thrust angle: non-adjustable means structural correction needed. Thrust angle is the direction the rear axle is pushing the vehicle (defined by rear toe) — it is fixed by the rear axle/suspension geometry. With 0.5° thrust angle, the vehicle "dog-legs" — the rear pushes it off-center. If non-adjustable, the rear axle/suspension must be inspected for damage (bent axle, shifted body mount, damaged rear cradle) and the damaged parts replaced. Set front toe relative to the thrust line, not the geometric centerline, to minimize dog-tracking.

Q18. Answer: D

Brake fade: reduced braking effectiveness from heat. Two types: lining fade and fluid/vapor lock fade. Lining fade: friction material overheats, its coefficient of friction drops, reducing braking force despite normal pedal pressure. Fluid fade (vapor lock): brake fluid boils, creating compressible gas bubbles — pedal goes low and spongy. Both occur during extended/severe braking (long downhill grades). Solutions: upgraded brake fluid (higher dry/wet boiling point), cross-drilled/slotted rotors, performance brake pads.

Q19. Answer: D

ABS modulates brake pressure per wheel to maintain tire slip in optimal range (10–20%) for maximum braking with steering control. Wheel speed sensors detect impending lockup (sudden deceleration). The ABS modulator releases, holds, then reapplies brake pressure in rapid cycles (10–15 times/sec). A locked tire has less friction than a rolling tire at controlled slip. ABS allows steering while braking hard — critical for obstacle avoidance.

Q20. Answer: A

Valve train tick: top of engine, RPM-proportional, normal oil pressure. Excessive valve clearance or a collapsed/stuck hydraulic lifter causes a regular tick that follows engine RPM. Distinct from a knock (lower in engine, heavier sound). Check valve clearance or hydraulic lifter condition. Some tick at cold startup is normal until lifters prime with oil.

Q21. Answer: B

Slipping in specific gears indicates the component common to those gears has failed. Automatic transmission planetary systems use different combinations of clutch packs and bands for each gear. If 2nd and 4th share a common clutch pack (e.g., the "even clutch" or "underdrive clutch" in some designs), failure of that pack causes slipping in those gears only. This diagnostic approach — identifying which gears fail, then tracing to the common holding element — is key to transmission diagnosis without complete disassembly.

Q22. Answer: A

Camber beyond adjustment range after impact: structural damage. Camber is primarily a function of suspension geometry — strut angle, control arm length, and knuckle design. These structural components control the camber angle; a hard impact can deform them, changing camber beyond the adjustment range permanently. Inspect with a straightedge and alignment rack. Replace bent components before alignment.

Q23. Answer: B

Highway wander: start simple. Underinflated tyres or uneven tyre wear cause wandering, so check them first. Then move to the steering linkage and alignment: tie rods, steering gear/rack play, and front wheel alignment (especially caster angle — low caster = wandering, directional instability).

Q24. Answer: D

"Bus Off" state: a CAN module has detected too many transmit errors and disconnected itself from the network to prevent disrupting other modules. The CAN protocol has error counting built in. If a module's transmit error counter reaches 255, it enters "Bus Off" and stops transmitting. Causes: short circuits in CAN wiring, module failure, or severe electromagnetic interference. Other modules may still communicate; missing data from the offline module causes cascading fault codes. Must diagnose the root cause (wiring, module) not just clear codes.

Q25. Answer: B

Faulty wheel speed sensor giving wrong data causes false ESC intervention. ESC compares wheel speeds, steering angle sensor input, yaw rate sensor, and lateral accelerometer to detect oversteer/understeer. A wheel speed sensor with intermittent erratic output can make the module incorrectly detect oversteer/understeer — thinking one wheel is spinning or locking — and trigger inappropriate brake application. No warning light because the sensor output is within plausible range — just wrong. Diagnose with live data, comparing wheel speed to vehicle speed.

Q26. Answer: D

Venting refrigerant is prohibited by law and environmentally harmful; it must be recovered and recycled with a proper recovery machine. In Canada, refrigerant handling is regulated (federal and provincial environmental regulations) and technicians require refrigerant-handling certification. Recover the charge before opening the system, use refrigerant-specific equipment, and never mix refrigerants in a recovery machine.

Q27. Answer: D

Higher RPM during compression = LOW compression in that cylinder. The starter motor's load decreases when a cylinder has low compression (less air to compress) — less resistance during cranking means the starter briefly speeds up. This is the relative compression test — no gauge needed, done via scan tool cranking RPM graph.

Q28. Answer: C

Clunking over bumps = loose or worn suspension components. Most common causes: sway bar end links and bushings (common, inexpensive), strut mount bearing (also causes clunk on steering), worn ball joints, loose control arm bushings. Each should be checked while the suspension is unloaded (lift the vehicle) and by pushing/pulling components for play.

Q29. Answer: D

MAP reads atmospheric or higher at rest = no vacuum signal. At key-on, engine off, MAP should read close to atmospheric (barometric pressure). At idle it should drop 30–60 kPa below atmospheric (intake vacuum). If MAP reads atmospheric at idle, the sensor sees no vacuum — blocked line, disconnected vacuum port, or failed sensor.

Q30. Answer: A

Lock-up shudder = lock-up clutch slip/grabbing. The lock-up clutch engages at highway speeds to provide direct mechanical drive (eliminating converter slip). Worn friction material or contaminated fluid (different friction modifiers) causes the clutch to grab-release-grab rapidly, creating shudder. Sometimes corrected by transmission fluid change with correct specification fluid.

Q31. Answer: D

ATF is multi-function: lubrication + hydraulic pressure for clutch/band actuation + coolant + torque converter fluid. ATF lubricates planetary gears, bearings, and bushings. It provides hydraulic pressure to apply clutch packs and bands for gear engagement. It carries heat to the transmission cooler. It fills the torque converter for fluid coupling and torque multiplication. Using the wrong ATF type (different friction modifiers) can cause shift quality issues, clutch slipping, and shudder.

Q32. Answer: D

TXV systems use a receiver-drier on the high (liquid) side; orifice-tube systems use an accumulator on the low (suction) side. The receiver-drier stores liquid refrigerant, holds desiccant to absorb moisture, and filters debris. The desiccant becomes saturated once the system is opened, so the receiver-drier (or the accumulator on orifice-tube systems) should be replaced whenever the system is opened for major service.

Q33. Answer: D

P0128: thermostat stuck open = engine never reaches operating temperature. A stuck-open thermostat allows too much coolant to circulate prematurely — the engine stays cold longer and may never reach the ECM's expected operating temperature. Symptoms: heater takes very long to get warm, poor fuel economy (cold-run enrichment runs too long), P0128 code.

Q34. Answer: C

Clunk when turning + bump = outer CV joint. CV joints allow power transmission through a range of angles. Combining suspension jounce and steering angle stresses the joint: a worn outer CV joint develops play that clunks when the joint is at a significant angle (turning) and simultaneously compressed (over a bump). Classic symptom: "clunk" when turning into a driveway over a lip. Strut mount noise is typically a clicking or creaking, not a clunk. Confirm: excessive play when rotating the axle shaft with the wheel at maximum steering lock.

Q35. Answer: A

Stretched timing chain retards cam timing, reducing power and causing rough running. Chain stretch effectively lengthens the chain, causing the camshaft to lag behind the crankshaft — retarded cam timing. Symptoms: reduced power especially at low-end, rough idle, rattling noise on start-up (tensioner over-extended), and VVT system codes because the ECM cannot achieve target cam advance. Chain stretch beyond tensioner range = timing jumps possible (catastrophic).

Q36. Answer: A

DCT low-speed jerk: clutch engagement adaptation values out of range from clutch wear or after clutch/TCM replacement. Dual-clutch transmissions learn clutch engagement points through adaptive control. Over time, clutch wear changes the engagement point. The TCM compensates via adaptive values. When wear exceeds the adaptation range, jerky or hesitant low-speed behaviour results. Adaptation reset (scan tool) allows the TCM to relearn. If adaptation reset does not resolve: clutch wear beyond service limit — clutch replacement needed.

Q37. Answer: A

Firing order: sequence of power strokes across cylinders. The firing order is engineered to balance engine loads and minimize vibration. A typical inline-4 firing order is 1-3-4-2; a V8 may be 1-8-4-3-6-5-7-2. Incorrect firing order (e.g., swapped ignition wires) causes rough running, backfiring, and poor performance.

Q38. Answer: B

Ohm's Law: $I = V/R$. Series circuit: total resistance = $4 + 2 = 6$ ohms. $I = 12V / 6\Omega = 2$ amps. In series circuits, resistances add. Total current is the same through all components. Voltage drops across each resistor proportionally: $V1 = 2A \times 4\Omega = 8V$; $V2 = 2A \times 2\Omega = 4V$; $8+4=12V$ (confirms calculation). Understanding Ohm's Law and series/parallel circuits is fundamental to automotive electrical diagnosis.

Q39. Answer: D

Brake pull toward the side with MORE braking force (seized caliper or stuck pad). A seized caliper applies more clamping force on one side than the other, creating unequal deceleration — the vehicle yaws toward the higher-force side. Pulling during braking only (not at cruise) confirms brake involvement. Check: compare wheel temperatures after a short drive, inspect pad thickness side-to-side, check for stuck slide pins or seized piston.

Q40. Answer: D

EVAP small leak: check fuel cap first. The fuel cap is the most common source of small EVAP leaks — a damaged seal or cap not fully tightened is responsible for a large percentage of P0442 codes. Inspect the cap O-ring and test with a cap tester. If cap tests good, proceed to smoke test the rest of the EVAP system.

Q41. Answer: A

Correct sensor but wrong signal = tone ring problem. Damaged, cracked, missing, or packed-with-debris tone ring (reluctor ring) teeth create an irregular signal that the ABS module interprets as wheel lockup. This triggers ABS unnecessarily. Clean the tone ring and inspect for damaged teeth. Common on vehicles that have driven through deep mud or water.

Q42. Answer: D

Lateral runout = pulsating brake pedal. As the warped rotor rotates, it pushes the pads and caliper pistons back and forth on each revolution. This creates a pressure pulse felt through the pedal. The pedal feels like it pushes back. Maximum allowable runout is typically 0.05mm (0.002"). Use a dial indicator to measure.

Q43. Answer: A

LTFT = learned fuel correction. Positive = running lean (ECM adding fuel to compensate), Negative = running rich (ECM removing fuel to compensate). The ECM uses O2 sensor feedback to continuously adjust fuel delivery. Short-term fuel trim (STFT) makes instant corrections; LTFT is the learned long-term correction stored in memory. $\pm 10\%$ is generally acceptable. LTFT > +10%: lean cause (vacuum leak, MAF under-reading, low fuel pressure, clogged injector). LTFT < -10%: rich cause (leaking injector, high fuel pressure, MAF over-reading).

Q44. Answer: A

DCT low-speed jerkiness: common and somewhat normal characteristic. DCTs use two dry or wet clutch packs engaged mechanically — clutch engagement at very low speed requires precise control that can be choppy, since the clutches can't slip as smoothly as a torque converter. Some manufacturers have issued software updates to improve low-speed feel. Compare to spec and known good vehicle before condemning a DCT.

Q45. Answer: D

Shift hunting: transmission cycles between two gears at steady speed — ECM/TCM control problem. Incorrect shift point calibration, throttle position sensor issues, or a shift solenoid fault are the usual causes. The TCM uses vehicle speed, throttle position, engine load, and gear ratio to determine shift points. If the TPS sends wrong data, the TCM may think load conditions keep alternating, causing constant gear hunting. A shift solenoid issue or incorrect ATF viscosity can also cause hunting. Check: TPS voltage sweep (smooth?), shift solenoid response, ATF level and condition.

Q46. Answer: C

Upstream O2 sensor stuck rich = engine is actually running rich, OR sensor is contaminated/failed. First determine if the engine is actually rich: check long-term fuel trim (LTFT) — if LTFT is negative (ECM removing fuel), the engine IS running rich and the sensor is accurate. Rich causes: leaking injector — dripping when off (injector balance test), high fuel pressure (regulator), coolant temp sensor error (ECM enriching for a cold engine that is actually warm), MAF under-reading causing over-fueling. If LTFT is at 0 with a stuck rich reading = sensor fault.

Q47. Answer: D

Pedal pulsation: rotor thickness variation (DTV). Pulsation is a vibration felt through the pedal during braking. A rotor that is not perfectly uniform in thickness around its circumference pushes the caliper pistons in and out as it rotates — this pressure variation is felt as a pulsation through the pedal. DTV is caused by excessive runout (rotor wobble) that lets the pads touch and wear the rotor unevenly, or by improper wheel torque (over-torquing warps rotors). Check: measure rotor thickness at 8+ points.

Q48. Answer: B

Low boiling point brake fluid: complete flush required. Glycol-based brake fluid (DOT 3/4/5.1) is hygroscopic — it absorbs moisture from the atmosphere over time, and moisture contamination lowers the boiling point dramatically. During hard braking, fluid can reach high temperatures — if it boils, vapour compresses and the pedal goes to the floor (vapour lock / brake fade). A complete flush removes all contaminated fluid. Flush interval: typically every 2 years regardless of appearance.

Q49. Answer: B

Slip from stop = forward clutch or low fluid. The forward clutch applies when driving from a stop in Drive. Low fluid reduces hydraulic pressure needed to hold clutch packs. Check fluid level and condition first — burnt smell = clutch damage already occurred.

Q50. Answer: C

GDI carbon on intake valves: no fuel wash effect. Port injectors spray fuel onto the back of intake valves — the fuel acts as a solvent, dissolving and washing away PCV oil deposits. GDI injects fuel directly into the cylinder, completely bypassing the valves. Over time, oil vapour from the PCV system deposits on intake valve faces and bakes into carbon. Solution: walnut blasting or catch can installation.

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