BONUS SECTION 6: EVAP SYSTEM DEEP DIVE

50 Questions — Targeted Review

1. A vehicle has a P0442 — EVAP System Small Leak Detected. The OBD II EVAP monitor specification defines a small leak as:

A. Any leak that allows more than 0.040 inches of fuel vapor escape per minute under test conditions

B. A leak equivalent to or larger than a 0.020-inch diameter orifice — the OBD II small leak threshold is standardized at 0.020 inches (approximately 0.5 mm) and represents the minimum leak size the EVAP monitor is required to detect under EPA mandated specifications

C. A leak that causes fuel trim deviation greater than ±10% during the EVAP monitor test

D. Any EVAP leak detectable by the vent solenoid pressure decay test that does not qualify as a large leak

2. A vehicle has a P0455 — EVAP System Large Leak Detected. The technician performs a smoke test — no smoke is visible anywhere in the EVAP system. The MOST likely cause is:

A. The smoke machine pressure is insufficient to pressurize the EVAP system through a large leak

B. A missing or loose fuel filler cap — a missing or improperly seated fuel cap creates a large unrestricted path for EVAP smoke to escape directly at the fill neck before it can pressurize the system — the smoke exits immediately at the cap and may not be visible as a plume if the rate of escape equals the rate of smoke introduction

C. A failed EVAP canister that is absorbing smoke before it can exit at the leak point

D. The P0455 was set by a fuel cap that was loose during a previous fill and has since been reseated — the code is historical and no current leak exists

3. A vehicle has a P0442 — Small Leak. The technician performs a nitrogen pressure test on the EVAP system. After pressurizing to 14 inches of water column and isolating the system, pressure decays from 14 to 11 inches in 10 minutes. The MOST likely next step is:

A. Use an electronic leak detector or ultrasonic leak detector to locate the source of the confirmed pressure decay — a confirmed pressure decay of 3 inches in 10 minutes confirms a leak exists. The next step is locating the specific leak point using a detection method

B. Replace the EVAP canister — canister leakage always produces gradual pressure decay

C. Replace the purge solenoid — purge solenoid leakage is the most common source of small EVAP leaks

D. Replace the fuel cap — the most common cause of P0442 is a failed fuel cap seal

4. A vehicle has a P0446 — EVAP Vent Control Circuit. The vent solenoid is located at the EVAP canister. The vent solenoid is normally open (open to atmosphere when de-energized). The MOST likely cause of P0446 is:

A. A stuck-open vent solenoid — a normally open solenoid is open by default; the monitor tests for the ability to close

B. A stuck-closed vent solenoid — a stuck-closed vent solenoid prevents the EVAP system from venting to atmosphere after monitor completion, trapping vacuum in the system and preventing the monitor from completing correctly

C. A stuck-open vent solenoid that cannot close when commanded — P0446 is a control circuit fault indicating the PCM cannot control the vent solenoid, often caused by an open or short in the vent solenoid wiring, a failed solenoid, or a PCM driver fault

D. A clogged EVAP canister vent line preventing atmospheric air from entering during refueling

5. A vehicle has a P0171 — System Lean, and separately a P0442 — Small EVAP Leak. The technician should:

B. Diagnose both codes simultaneously — the lean condition may be caused by unmetered air entering through the EVAP leak — EVAP system leaks on the intake-manifold side of the purge solenoid allow unmetered air into the intake manifold, causing lean fuel trims in addition to the EVAP leak code

A. Diagnose the P0171 first as it is the more critical fault

C. Diagnose the P0442 first as EVAP faults must be repaired before fuel trim faults can be accurately diagnosed

D. Replace the purge solenoid — a failed purge solenoid causes both P0171 lean condition and P0442 simultaneously

6. A vehicle has a P0441 — EVAP Incorrect Purge Flow. The PCM commands the purge solenoid open and monitors the O2 sensor response. When the purge solenoid opens, the O2 sensor should detect a rich excursion from fuel vapor entering the intake. No O2 response is detected. The MOST likely cause is:

A. A stuck-open purge solenoid — a stuck-open solenoid continuously purges and the O2 sensor would show a chronic rich response, not no response

B. A clogged EVAP canister — a clogged canister prevents fuel vapor from reaching the purge solenoid

C. An EVAP purge line disconnected or blocked between the canister and the purge solenoid, or between the purge solenoid and the intake manifold — no O2 sensor response to purge command means no fuel vapor is reaching the intake manifold despite the solenoid opening, confirming a flow path fault

D. A failed O2 sensor — a failed O2 sensor would produce fuel trim faults, not P0441 specifically

7. A vehicle has a P0497 — EVAP System Low Purge Flow. The PCM commands maximum purge and monitors for expected fuel trim enrichment. Fuel trims shift negative (rich) only slightly — far less than expected. The technician checks the purge solenoid with a scan tool command — the solenoid clicks audibly. Purge line vacuum at the solenoid outlet measures 2 inches Hg. Specification is minimum 8 inches Hg at idle. The MOST likely cause is:

A. A restricted EVAP canister preventing adequate vapor flow to the purge solenoid

B. A clogged purge line between the solenoid and the intake manifold — the solenoid is confirmed audibly functioning; the 2-inch vacuum at the solenoid outlet versus the required 8 inches confirms the solenoid is not receiving adequate manifold vacuum to drive purge flow — a blocked or kinked purge line between the solenoid and the intake manifold port is restricting vacuum delivery to the solenoid

C. A failed purge solenoid — the audible click confirms solenoid mechanical function

D. A clogged intake manifold purge port — a clogged intake manifold vacuum port prevents manifold vacuum from reaching the purge solenoid, producing low solenoid outlet vacuum despite the solenoid opening correctly

8. A vehicle has a P0172 — System Rich, Both Banks at idle. The technician commands the EVAP purge solenoid OFF with a scan tool. Fuel trims shift from -18% to -2% within 30 seconds. The MOST likely conclusion is:

A. The EVAP canister is saturated and must be replaced — canister saturation always produces a rich condition at idle

B. The fuel pressure regulator is the secondary rich source confirmed by the trim shift

C. A stuck-open or leaking EVAP purge solenoid was delivering excess fuel vapor to the intake manifold at idle — when purge was commanded off and trims shifted to near-zero, the purge solenoid was confirmed as the sole active rich source. The solenoid is not fully closing when commanded off

D. The O2 sensor was producing a false rich reading that was corrected when the purge solenoid circuit was interrupted

9. A vehicle has a P0441 — EVAP Incorrect Purge Flow. The purge solenoid is commanded open — O2 sensor shows a rich excursion confirming vapor is flowing. The EVAP monitor then tests vent solenoid function — the monitor fails. The MOST likely cause is:

A. A stuck-closed EVAP vent solenoid — vapor is confirmed flowing (purge side is functional), but if the vent solenoid cannot open for the vent function portion of the test, the overall EVAP flow test fails — some platforms include vent function in P0441 evaluation

B. A clogged EVAP canister preventing the vent solenoid from opening

C. A purge solenoid that is only partially opening — a confirmed rich excursion rules out a completely blocked purge path

D. A failed fuel tank pressure sensor — the FTP sensor is used in some monitor strategies, not all P0441 evaluations

10. A vehicle has both P0442 and P0455 stored simultaneously — both a small and large leak code on the same drive cycle. The MOST likely cause is:

A. A small leak and a large leak at separate locations in the EVAP system that were both detected on the same monitor run

B. A PCM software fault generating both codes simultaneously without genuine leaks present

C. A large leak that the monitor detected during the large leak test and a separate small leak at a different location detected during the small leak phase of the same monitor cycle

D. A missing fuel cap — a completely missing fuel cap produces a large unrestricted leak that causes the monitor to fail both the large and small leak thresholds simultaneously, generating both P0455 and P0442 from the same single-source fault

11. A vehicle has a P0452 — Fuel Tank Pressure Sensor Low Voltage. The technician checks sensor supply voltage at the FTP sensor connector — 5V reference is confirmed. Ground voltage drop = 0.05V (normal). Signal wire voltage = 0.1V. Normal sensor signal at atmospheric conditions is approximately 1.5–2.0V. The MOST likely cause is:

A. A short to ground on the FTP sensor signal wire — 0.1V on the signal wire with confirmed normal supply and ground points to the signal wire being pulled toward ground by an external short or an internal sensor failure pulling the signal output toward zero

B. A clogged canister vent line reducing pressure in the system and causing low sensor output

C. A failed 5V VREF supply — confirmed at 5V, ruling out a supply fault

D. A failed PCM analog input circuit — the signal wire reads 0.1V at the sensor connector, confirming the fault is in the sensor or signal wire before it reaches the PCM

12. A vehicle has a P0453 — Fuel Tank Pressure Sensor High Voltage. The technician measures FTP sensor signal voltage at the PCM harness connector = 4.9V. At the FTP sensor connector = 4.9V. Normal atmospheric signal voltage is 1.5–2.0V. The MOST likely cause is:

A. A clogged EVAP canister causing pressure buildup in the fuel tank producing a genuine high-pressure reading

B. A short to the 5V reference on the signal wire, or an internal sensor failure pulling the signal toward 5V — 4.9V on both the sensor connector and the PCM connector rules out a wiring fault between the connectors and confirms the signal wire or sensor is the fault source. A signal near 5V indicates the signal wire is shorted to the 5V reference, or the sensor's internal signal circuit has failed high

C. A stuck-closed vent solenoid causing fuel tank overpressure and a genuine high sensor reading

D. A failed PCM — a failed PCM input circuit reads signal voltage high when the input impedance is lost

13. A vehicle has a P0440 — EVAP System Malfunction (general). This code is a non-specific EVAP fault that does not specify a leak or a component. The MOST common cause on most platforms is:

A. A failed fuel tank pressure sensor — P0440 is the default code when the FTP sensor circuit fails

B. A purge solenoid that has completely failed open — P0440 is the general malfunction code generated when the EVAP monitor cannot run due to enabling criteria not being met

C. A fault that prevents the EVAP monitor from running or completing — this includes enabling criteria not met (fuel level out of range, cold soak requirement not satisfied), a component circuit fault that prevents the monitor from initiating, or a platform-specific EVAP monitor fault that generates P0440 as the parent code before a more specific code identifies the specific failure mode

D. A large EVAP system leak — P0455 is the large leak code; P0440 is a separate monitor completion fault

14. A vehicle has a P0442. The technician performs a fuel cap pressure test — the cap holds pressure to 30 inches of water column (specification minimum 14 inches). The MOST appropriate next step is:

A. Replace the fuel cap — the cap holding above specification does not rule out a leak at the cap-to-filler neck seal

B. Replace the EVAP purge solenoid — the purge solenoid is the most common cause of P0442 after the fuel cap is ruled out

C. Inspect the fuel cap O-ring and filler neck seal surface — the fuel cap pressure test confirms the cap's check valve functions correctly but does not test the sealing ability of the cap O-ring against the specific filler neck it is seating on. A damaged O-ring or a corroded, damaged filler neck can cause P0442 even when the cap itself tests acceptable

D. Perform a smoke test on the EVAP system to locate the leak source — the fuel cap test eliminates the cap, so the smoke test is the next logical step to locate an EVAP leak elsewhere in the system

15. A vehicle has a P0442. A smoke test is performed. Smoke emerges from a small crack in the EVAP charcoal canister body. The canister is replaced. After repair, the EVAP monitor runs and passes on the first drive cycle. The technician should:

A. Verify the repair by confirming P0442 does not return over three drive cycles

B. Clear the DTC and release the vehicle — monitor pass on the first drive cycle after repair confirms the leak is resolved and the repair is complete

C. Also inspect the purge and vent solenoids before releasing the vehicle — canister cracks are often caused by solenoid faults that can damage the canister

D. Perform a nitrogen pressure decay test to quantify the leak was fully repaired before releasing the vehicle

16. A vehicle has a P0441 — EVAP Incorrect Purge Flow. The purge solenoid is commanded on — no O2 rich excursion is detected. The purge solenoid resistance measures 26 ohms. Specification is 22–32 ohms. Supply voltage at the solenoid = 12.4V. PCM driver ground = 0.2V voltage drop within spec. The technician applies 12V directly to the solenoid — it clicks audibly. The MOST likely cause is:

A. A failed PCM driver — all circuit inputs are confirmed normal but the solenoid only operates when powered externally, not by the PCM

B. A clogged purge line — the solenoid operates correctly when powered; the fault is in the vapor flow path, not the solenoid circuit

C. A purge solenoid with an internal mechanical fault — external resistance and external power test are acceptable, but the solenoid may have an internal poppet that sticks during PCM-commanded duty-cycle operation

D. A PCM enabling criteria fault preventing purge command despite correct circuit — the PCM may be inhibiting purge due to an unmet condition such as engine temperature, MAP pressure, or EVAP monitor state

17. A vehicle has a P0496 — EVAP High Purge Flow. This code is set when the PCM detects fuel vapor purging when the purge solenoid is commanded closed. The MOST likely cause is:

A. A clogged EVAP canister pushing vapor through the purge solenoid at high pressure

B. A stuck-open or leaking EVAP purge solenoid — a solenoid that does not fully close when commanded off allows continuous vapor flow from the canister to the intake manifold, producing fuel trim enrichment (negative trims) when purge should be zero — the PCM detects this uncommanded flow and sets P0496

C. An EVAP vent solenoid stuck open — an open vent solenoid allows vapor to bypass the canister

D. A fuel tank overpressure condition forcing vapor through the purge solenoid despite it being closed

18. A vehicle has a P0422 — EVAP System Leak Detected (large). A smoke test reveals smoke emerging from a cracked fuel tank sending unit gasket. The gasket is replaced and the repair is confirmed with a post-repair smoke test — no smoke is observed. The technician clears the DTC. What is the MOST appropriate next step?

A. Verify the EVAP monitor runs and passes before releasing the vehicle — after repairing a confirmed EVAP leak and confirming the repair with a smoke test, the EVAP monitor must run and pass to confirm OBD II readiness. Some states require EVAP monitor complete status for emissions testing

B. Release the vehicle immediately — the smoke test confirmation is sufficient proof of repair

C. Perform a fuel pressure hold test to confirm the fuel system integrity after the sending unit gasket replacement

D. Replace the fuel tank pressure sensor — a cracked sending unit gasket damages the FTP sensor in its vicinity

19. A vehicle has a P0442. The EVAP monitor runs on the correct drive cycle profile — the monitor tests, sees a leak, and the DTC sets. The technician uses a smoke machine to pressurize the EVAP system. After 4 minutes of smoke injection at correct pressure, no smoke is visible anywhere. The MOST likely explanation is:

A. The EVAP canister is absorbing all the smoke before it can exit the system

B. A loose fuel cap that was tightened before the smoke test — the P0442 may have been caused by a cap that was loose during a prior fuel fill and is now correctly seated, making the current smoke test negative

C. The smoke machine is defective — a functional smoke machine always produces visible smoke at P0442-sized leaks

D. The vent solenoid is stuck closed trapping smoke inside the system — a stuck vent solenoid prevents smoke from entering through the vent path

20. A vehicle has a P0452 — FTP Sensor Low Voltage. The technician disconnects the FTP sensor. The signal wire voltage at the harness connector (sensor disconnected) = 4.8V. The MOST likely cause is:

A. The FTP sensor was pulling the signal voltage low — with the sensor disconnected, the signal wire floats to near the 5V reference, which is normal behavior for a sensor with a shorted signal output

B. A broken signal wire between the sensor and the PCM — a broken signal wire would produce 0V at the harness connector, not 4.8V

C. A failed PCM 5V reference — a failed 5V reference would affect multiple sensors, not just the FTP

D. A short to ground on the signal wire inside the sensor body — with the sensor disconnected and the signal wire measuring 4.8V at the harness, the pull-up resistor in the PCM is now floating the signal line near 5V. The previous 0.1V reading with the sensor connected confirms the sensor itself was pulling the signal to ground internally — classic internal sensor short to ground pattern

21. A vehicle has a P0442. The technician performs an EVAP system pressure decay test using nitrogen at 14 inches of water column. Pressure stabilizes at 13.2 inches and holds there with no further decay for 15 minutes. The MOST likely explanation is:

A. Normal pressure decay from system volume equalization — a 0.8-inch drop followed by complete stabilization indicates initial test gas equalization within the system volume, not a leak. A true leak produces continuous decay, not stabilization

B. A small leak that has sealed itself from nitrogen pressure expanding the leak slightly and then sealing

C. A P0442-sized leak that the nitrogen test is not sensitive enough to detect accurately

D. A failed fuel tank pressure sensor producing a false pressure reading during the nitrogen test

22. A vehicle has a P0442. All EVAP system components test within specification. The fuel cap passes a pressure test and the O-ring appears normal. A smoke test reveals no leaks. The vehicle was recently serviced — the fuel filter was replaced on a model where the filter is under the vehicle near the fuel tank. The MOST likely cause is:

A. The fuel filter replacement disturbed an EVAP line near the fuel tank — a disconnected, cracked, or pinched EVAP hose at the connection point near the fuel filter service area is the most common cause of P0442 appearing shortly after underbody fuel system service

B. A PCM calibration issue causing false P0442 storage after fuel system service

C. Contaminated fuel from the filter replacement allowing fuel vapors to enter the EVAP system

D. The fuel filter replacement pressurized the EVAP system and caused a weak hose to develop a microcrack

23. A vehicle has a P0455 — Large EVAP Leak. A smoke test reveals no leaks from any accessible EVAP component. The fuel cap seals correctly. The vent solenoid and purge solenoid test within specification. The technician should NEXT:

A. Inspect the fuel tank itself for cracks, seam separation, or damage — a large unrestricted leak that cannot be found at accessible components must be located in an inaccessible area. The fuel tank body, tank seams, tank straps that may be crushing the tank, and sending unit access port are large-volume components that can develop significant leaks invisible from above

B. Replace the EVAP canister — large canister failures always cause P0455 without visible smoke leaks

C. Replace the fuel tank pressure sensor — the FTP sensor is the most common cause of P0455

D. Perform a fuel flow rate test — a large EVAP leak can be confirmed by monitoring fuel flow restriction

24. A vehicle has a P0441 — EVAP Incorrect Purge Flow. The technician monitors the O2 sensor response during a commanded purge test. The O2 sensor shows a rich spike followed immediately by a lean spike, then returns to normal. This pattern repeats with each purge command. The MOST likely cause is:

A. A purge solenoid that is partially restricted — partial restriction causes alternating rich and lean O2 excursions

B. An O2 sensor with a slow response time — a slow O2 sensor produces alternating rich and lean voltage swings in response to any transient

C. A purge solenoid that is operating correctly — a normal rich excursion followed by a lean correction then return to normal closed-loop operation is the expected O2 sensor response to a correctly functioning purge event

D. A canister that is partially saturated — partial saturation causes inconsistent vapor delivery producing alternating O2 responses

25. A vehicle has been flagged for an EVAP system leak by an enhanced I/M program (remote sensing or loaded-mode test). No PCM DTCs are stored. The MOST likely explanation is:

A. A PCM software fault preventing EVAP DTC storage despite genuine leaks being present

B. A very small EVAP leak below the 0.020-inch OBD II threshold that the I/M remote sensing equipment can detect but the OBD II monitor is not required to detect — real-world remote sensing equipment can identify fuel vapor emissions below the OBD II threshold, explaining a failed emissions test without a stored EVAP DTC

C. An EVAP monitor that has not yet completed — an incomplete monitor prevents DTC storage regardless of leak size

D. A fuel cap that is loose at the time of I/M testing but tightens during normal driving — loose cap at the test creates vapor emissions without setting a DTC

26. A vehicle has a P0442. The technician locates a small crack in an EVAP vacuum hose near the intake manifold. The hose is between the purge solenoid and the intake manifold. The hose is replaced. After repair, fuel trims are checked — both banks are now +18% at idle. The MOST appropriate next step is:

A. The P0442 repair is confirmed — the positive fuel trims are from a purge solenoid fault

B. Investigate the lean fuel trim condition — a cracked EVAP hose between the purge solenoid and the intake manifold is on the intake manifold side of the purge solenoid. The crack was allowing unmetered air into the intake manifold, causing the lean condition. If fuel trims are still +18% after the hose is replaced, either the hose repair is incomplete or a second vacuum leak still exists — the fuel trims must return to normal before the repair is considered complete

C. Replace the EVAP purge solenoid — positive fuel trims after EVAP hose replacement always indicate a purge solenoid fault

D. Clear the LTFT and monitor — the +18% trims are legacy trim that will self-correct without further investigation

27. A vehicle has an ORVR (Onboard Refueling Vapor Recovery) system. During refueling, the customer reports a strong fuel odor near the filler neck. No DTCs are stored. The MOST likely cause is:

A. Normal ORVR operation — strong fuel odor during refueling is expected as vapors displace from the tank

B. A saturated or restricted EVAP canister that cannot absorb refueling vapors — when the canister is saturated or its flow is restricted, vapors that should be routed through the canister to be absorbed are instead displaced back up the filler neck, creating fuel odor during refueling without necessarily setting a DTC if the canister fault is not severe enough to fail the EVAP monitor

C. A fuel cap that is venting early due to a failed pressure check valve

D. A fuel tank overfill condition causing vapor displacement from the tank vent system

28. A vehicle has a P0452 — FTP Sensor Low Voltage. The technician disconnects the sensor and measures resistance between the sensor ground terminal and chassis ground = 14.8 ohms. Specification is less than 1 ohm. The MOST likely cause and repair is:

A. A failed FTP sensor — internal sensor resistance causes the ground circuit to read 14.8 ohms

B. An open sensor ground — 14.8 ohms is within acceptable range for a sensor ground circuit

C. An open or high-resistance ground circuit for the FTP sensor — 14.8 ohms versus less than 1 ohm specification confirms high resistance in the sensor ground circuit, which pulls the sensor signal voltage toward ground as a reference error (false low signal). Repairing the ground circuit — cleaning the ground connection, repairing a broken ground wire, or cleaning a corroded ground splice — is the correct repair before replacing the sensor

D. A PCM ground fault affecting the FTP sensor reference only — a PCM ground fault would affect all sensors sharing that ground reference

29. A vehicle has a P0442. During diagnosis the technician finds that the EVAP system monitor enables and tests but the decay rate recorded by the PCM is borderline — just barely failing the monitor threshold. All physical components and hoses test acceptable. The fuel cap passes and has a new O-ring. The MOST likely cause is:

A. The EVAP system has multiple very small leaks that individually are below detection threshold but collectively fail the monitor

B. A PCM calibration fault causing oversensitive monitor threshold settings

C. A fuel tank that has expanded from age and temperature cycles, increasing internal volume and causing borderline pressure decay rates during the fixed-time monitor test — an expanded fuel tank does not indicate a leak but creates more volume for the test gas to fill, producing a slower pressure rise and faster apparent decay that can borderline-fail the EVAP monitor without any actual leak

D. A fuel filler neck that is slightly loose at the tank connection — a loose filler neck is always the cause of borderline P0442 failures

30. A vehicle has a P0441 — Incorrect Purge Flow. The technician monitors the FTP sensor PID during a commanded purge test. When purge is commanded on, the FTP sensor shows increasing negative pressure (vacuum building in the fuel tank). After 60 seconds of purge, tank pressure = -8 inches of water column. The vent solenoid is confirmed closed during this test. The MOST likely conclusion is:

A. The purge solenoid is stuck open — a correctly functioning purge system would not draw vacuum in the fuel tank

B. The vent solenoid has failed open — an open vent allows atmospheric pressure to equalize the fuel tank during purge, preventing vacuum from building

C. The EVAP system is functioning correctly for a vacuum-based EVAP monitor — drawing tank vacuum during purge with the vent closed confirms purge flow is occurring (the intake manifold is drawing vapor from the canister and through the tank), and the FTP sensor is correctly detecting the resulting vacuum — this is how some EVAP monitor strategies confirm purge flow using FTP sensor feedback

D. The fuel tank pressure sensor is producing a false low-pressure reading due to a stuck-closed vent solenoid amplifying pressure differential

31. A vehicle has a P0442. A smoke test reveals smoke seeping from the junction where the EVAP vapor line connects to the charcoal canister. The connection uses a push-lock quick-connect fitting. The MOST appropriate repair is:

A. Apply EVAP system sealant around the outside of the fitting to seal the vapor leak

B. Replace the EVAP vapor line and canister — push-lock fitting leakage always indicates internal canister damage

C. Inspect the quick-connect fitting for a missing or damaged O-ring, a broken locking tab, or a deformed line end — quick-connect fittings that are not fully seated, have damaged O-rings, or have cracked locking clips are a common source of EVAP system leaks. The fitting components must be inspected before the canister or line is replaced

D. Cut and splice the vapor line using a rubber hose and clamp at the canister connection point

32. A vehicle has a P0496 — EVAP High Purge Flow (purge detected when solenoid should be closed). The technician commands the purge solenoid closed with a scan tool. Fuel trims remain at -14% (rich). The technician disconnects the purge solenoid electrical connector — fuel trims shift to +2% within 45 seconds. The MOST likely conclusion is:

A. The PCM was commanding the purge solenoid open despite the scan tool bidirectional command — the scan tool override was not functioning correctly

B. A stuck-open purge solenoid that cannot be commanded closed by the PCM or the scan tool — when the solenoid connector is disconnected (removing all power from the solenoid), the rich condition resolves. When connected and commanded closed, it remains rich. This confirms the solenoid is mechanically stuck open and cannot close regardless of command

C. The EVAP canister was the source of the rich condition — disconnecting the solenoid isolated the canister

D. A short to voltage in the solenoid circuit was holding the solenoid open despite the PCM command to close

33. A vehicle has a P0442 that was set during an I/M emissions test drive cycle. The customer states the vehicle has been operating normally with no fuel odors. The only recent event was filling the fuel tank at a station with a malfunctioning pump that overfilled the tank to the point of fuel overflowing from the filler neck. The MOST likely cause of P0442 is:

A. The overfill contaminated the O2 sensor with fuel causing false EVAP monitor results

B. A damaged fuel filler neck seal from the pressure of overfilling — fuel overflow under pressure damages the filler neck seal creating a P0442-sized leak

C. Liquid fuel from the overfill flooding the EVAP charcoal canister — liquid fuel saturates the activated charcoal and can also reach and damage the canister vent path, preventing the EVAP monitor from sealing correctly and causing monitor failure with an apparent small leak

D. A failed fuel cap pressure relief valve — overfilling activates the pressure relief valve and damages it permanently

34. A vehicle has a P0442. All EVAP system smoke test results are negative — no leaks found anywhere accessible. Fuel cap passes testing. FTP sensor signal is within specification. The technician checks enabling criteria for the EVAP monitor — fuel level = 48% (within 15–85% window). Engine run time = 22 minutes (sufficient). Ambient temperature = 38°F (3°C). The MOST likely cause of the recurring P0442 is:

A. An intermittent small leak that is not present during the current smoke test — temperature changes, vibration, and pressure variation between monitor-run conditions and smoke-test conditions can produce intermittent leaks that seal during static testing

B. A cold ambient temperature inhibiting the EVAP monitor from running correctly — 38°F is within the temperature enabling window for the EVAP monitor on most platforms

C. A fuel level too close to the upper limit of the enabling window — 48% is well within the 15–85% window

D. The engine run time is insufficient for the EVAP monitor enabling criteria

35. A vehicle has a P0456 — EVAP System Very Small Leak. P0456 is defined as a leak smaller than the P0442 threshold. The MOST common diagnostic approach for a P0456 is:

A. Replace the fuel cap first — a very small leak almost always originates from a degraded fuel cap O-ring that cannot be confirmed with standard pressure testing

B. Use an ultrasonic leak detector or nitrogen-based pressure decay test — a very small leak (smaller than 0.020 inches) may not produce visible smoke from a standard smoke machine at normal test pressures. An ultrasonic detector can identify the high-frequency hiss from a very small leak, or a sensitive nitrogen pressure decay test with a calibrated flow meter can detect the very slight pressure decay from a sub-P0442 leak

C. Replace the EVAP canister — very small leaks always originate from canister body microporosity

D. Replace the purge and vent solenoids simultaneously — P0456 is always caused by solenoid seating leakage

36. A vehicle has a P0441. The purge solenoid is confirmed functioning electrically. A commanded purge produces a confirmed rich O2 excursion. The EVAP monitor is running but sets P0441 during the flow rate evaluation portion of the test. The FTP sensor shows the tank does not go negative during purge (remains at 0 inches water column). The vent solenoid is commanded closed during this test. The MOST likely cause is:

A. A failed FTP sensor — a failed sensor always reads 0 inches during the purge test

B. A stuck-open vent solenoid — if the vent solenoid is commanded closed but remains open, atmospheric pressure equalizes the fuel tank during purge, preventing the expected vacuum from building in the tank. The FTP sensor correctly reads 0 (atmospheric) because the open vent is allowing air into the tank — the monitor interprets this as no purge flow reaching the tank and sets P0441

C. A blocked purge line — a blocked purge line prevents the rich excursion, which has been confirmed

D. A clogged canister — clogged canister prevents vapor flow but the confirmed rich excursion indicates vapor is flowing

37. A vehicle has a P0442. A smoke test reveals a very fine mist of smoke seeping from a fuel tank seam. The technician confirms this is the source by monitoring for DTC return after the repair. Which repair is MOST appropriate for a leaking plastic fuel tank seam?

A. Apply two-part epoxy over the fuel tank seam leak from the outside

B. Apply EVAP sealer compound to the outside of the fuel tank seam at the leak point

C. Replace the fuel tank — plastic fuel tank seam leaks cannot be permanently repaired with external sealants or adhesives due to fuel vapor permeability, temperature cycling, and fuel exposure that degrades any external repair compound. Tank replacement is the only permanent repair

D. Weld the plastic fuel tank seam using a plastic welding kit

38. A vehicle has a P0441. The purge solenoid is confirmed open when commanded. The EVAP canister is new (replaced during a previous repair). FTP sensor signal is correct. The EVAP monitor uses a pressure-rise test after purge: the purge solenoid and vent solenoid are both closed after purge, and the PCM monitors for fuel tank pressure rise from fuel vapor generation. The test fails — no pressure rise is detected. The MOST likely cause is:

A. The purge solenoid is not fully closing after the purge phase — a purge solenoid stuck slightly open after purge prevents pressure from building in the isolated tank

B. A fuel tank that is not generating sufficient vapor — an extremely cold fuel temperature or very low fuel volatility can reduce vapor generation enough to fail the pressure-rise portion of the EVAP monitor

C. A clogged EVAP canister preventing vapor from reaching the tank — a new canister was just installed

D. A failed FTP sensor — a failed sensor would not correctly detect pressure rises during the sealed tank test

39. A vehicle has a P0442. During diagnosis the technician finds that the EVAP canister is physically located under the vehicle near the rear axle. A visual inspection reveals the canister has an impact dent on the bottom face. The dent is approximately 1 inch deep. The MOST likely cause of P0442 is:

A. The dent is cosmetic and does not affect EVAP function — EVAP canisters are structurally robust

B. A broken vapor line connection from the impact that caused the canister dent

C. The canister dent has cracked the canister body or damaged the internal activated charcoal bed — an impact severe enough to dent the canister body 1 inch deep can crack the plastic housing or fracture the internal charcoal medium, creating a leak path. The canister requires replacement and the mounting area should be inspected for additional damage

D. The impact dent has crushed the canister vent tube reducing airflow and causing a flow restriction, not a leak

40. A vehicle has a P0446 — EVAP Vent Control Circuit. The technician commands the vent solenoid closed with a scan tool and monitors the FTP sensor — the FTP sensor shows no vacuum build during a commanded purge test (normally the tank should go slightly negative). The vent solenoid is inspected — it is confirmed energized (12V removed, solenoid clicks). The MOST likely cause is:

A. A mechanically stuck-open vent solenoid — the solenoid energizes and clicks but the internal valve is not seating, allowing atmospheric air to continuously enter the canister vent path and preventing vacuum from building in the tank during purge — confirming the solenoid cannot fully close mechanically despite electrical function

B. A restricted canister vent line preventing vacuum from reaching the FTP sensor

C. A failed FTP sensor showing false atmospheric reading during the purge test

D. A purge solenoid that is not fully opening — low purge flow cannot draw sufficient vacuum to register on the FTP sensor

41. A vehicle has a P0442 and P0171 — System Lean stored simultaneously. The EVAP vacuum hose from the canister to the purge solenoid is inspected — it is cracked with a split approximately 1/2 inch long midway along the hose. The MOST likely explanation for BOTH codes from this single fault is:

A. A cracked EVAP hose can cause both a lean condition and an EVAP leak code — a cracked hose on the INTAKE MANIFOLD SIDE of the purge solenoid introduces unmetered air into the intake manifold causing lean fuel trims. If the same hose also communicates with the EVAP canister side, it creates an EVAP leak path. However, a hose between the canister and the purge solenoid is entirely on the EVAP side and would cause only P0442 (EVAP leak) — not lean trims because this hose is upstream of the solenoid and sealed from intake manifold vacuum when the solenoid is closed

B. The cracked hose between the canister and the purge solenoid is an EVAP leak (P0442) but is not the direct cause of the lean condition — a separate intake manifold leak must be causing P0171

C. The cracked hose creates an unmetered air path directly into the intake manifold causing P0171, and simultaneously creates an EVAP leak causing P0442 — both from the single cracked hose

D. P0171 is a false code generated by the PCM EVAP monitor strategy when P0442 is stored

42. A vehicle has a P0455 — Large EVAP Leak. A smoke test is performed — smoke pours from a disconnected large-diameter vent hose at the top of the fuel tank. The hose connects the fuel tank vapor space to the EVAP canister. The hose is reconnected and secured. The DTC is cleared. The technician confirms no smoke leaks on a post-repair test. The MOST appropriate final verification step is:

A. Monitor fuel trims for 20 minutes at idle to confirm no vapor-related enrichment

B. Perform a fuel tank pressure sensor voltage test to confirm the repair did not damage the FTP sensor

C. Run the EVAP monitor to completion and confirm the monitor passes before releasing the vehicle — repairing an EVAP leak and confirming with smoke is necessary but not sufficient. The EVAP monitor must run and pass to confirm the repair meets OBD II leak detection criteria and to set monitor readiness status required for I/M testing

D. Perform a nitrogen pressure decay test at 14 inches water column to quantify that the vent hose connection is sealed to specification

43. A vehicle has a P0442. The technician suspects the purge solenoid is the leak source. To test the purge solenoid for internal leakage when commanded closed, the MOST appropriate method is:

A. Apply 12V directly to the solenoid and listen for a click — an audible click confirms seating

B. Measure solenoid resistance — normal resistance confirms the solenoid is sealing correctly when closed

C. Pressurize the EVAP system with smoke or nitrogen with the purge solenoid commanded closed and monitor for pressure decay at the solenoid outlet — if pressure decays through the solenoid when it is commanded closed, the solenoid is not sealing and is the leak source. Additionally, smoke exiting at the solenoid outlet or intake manifold side when the solenoid is closed confirms internal leakage

D. Monitor fuel trims with the solenoid commanded closed at idle — fuel trim enrichment with the solenoid commanded closed confirms purge leakage

44. A vehicle has a P0442. During smoke testing, the technician notices smoke faintly seeping from around the fuel sending unit access cover on top of the fuel tank. The cover is secured by a locking ring. The MOST appropriate repair is:

A. Replace the fuel tank — sending unit seal leakage always requires tank replacement

B. Replace the fuel tank pressure sensor — the FTP sensor is located at the sending unit and its O-ring has failed

C. Inspect and replace the sending unit access cover gasket or O-ring — the sealing gasket between the sending unit cover and the fuel tank flange compresses and takes a set over time, losing its ability to seal the vapor space. This is a common cause of EVAP leaks on vehicles with top-access fuel sending units, and the gasket or O-ring is the correct replacement component

D. Apply EVAP system sealant to the sending unit cover seam to seal the vapor path

45. A vehicle has a P0441 — EVAP Incorrect Purge Flow. All EVAP component tests are normal. The technician reviews the EVAP monitor enabling criteria list: fuel level 15–85%, coolant temperature above 70°F, IAT above 40°F, no other powertrain DTCs active, vehicle speed between 45–65 mph for at least 5 minutes. The technician notes the vehicle has a P0102 — MAF Sensor Low — stored as a pending code. The MOST likely explanation for P0441 is:

A. The MAF sensor fault is causing incorrect airflow calculations that affect EVAP purge flow measurement

B. An active P0102 pending code may be preventing the EVAP monitor from completing correctly — many EVAP monitor strategies require no active powertrain fault codes to be present before the monitor will enable. A pending P0102 can inhibit the EVAP monitor, causing it to run but fail the flow evaluation due to incorrect MAF-based calculations. Repairing the P0102 first may resolve the P0441 without any EVAP system repair

C. The P0441 and P0102 are independent faults that must be diagnosed separately

D. A low MAF sensor reading causes the PCM to underestimate airflow and reduce purge solenoid duty cycle below the minimum threshold — generating P0441 from insufficient duty cycle rather than from an EVAP component fault

46. A vehicle has a P0455 — Large EVAP Leak. The technician locates the fuel filler tube and inspects it — a 3/4-inch crack is visible on the lower section of the filler tube where it connects to the fuel tank. Fuel staining is present around the crack. The MOST appropriate repair is:

A. Apply fuel-resistant epoxy to the cracked filler tube section

B. Wrap the cracked section with fuel-resistant tape and clamp both sides

C. Replace the fuel filler tube assembly — a cracked filler tube is a fuel vapor and potential liquid fuel leak source. The crack creates both a P0455-sized EVAP leak and a fire hazard. Temporary sealing methods with tape or epoxy are not permanent or safe repairs for a fuel system component. Full filler tube assembly replacement is the correct repair

D. Replace only the lower section of the filler tube using a rubber splice hose and clamps

47. A vehicle has a P0442 that sets consistently in cold weather below 32°F but not in warm weather. Smoke tests in warm weather show no leaks. All EVAP components test within specification at ambient temperature. The MOST likely cause is:

A. The EVAP monitor enabling criteria require warmer temperatures — the monitor is not running in cold weather and the P0442 is from a previous warm-weather fault

B. A plastic EVAP component (hose, canister body, or vapor tube) that develops a small crack when cold — plastic materials contract at low temperatures and a component with a developing fatigue crack may only open when contracted in cold weather, creating a P0442-sized leak in cold weather that closes when the plastic expands at warmer temperatures. This is an intermittent cold-weather fatigue failure pattern

C. Water condensation in the EVAP system at cold temperatures creating a false pressure signal

D. The fuel cap seal contracts at cold temperatures — a seal with marginal sealing force may not adequately compress against the filler neck when cold, creating a small leak at temperatures below 32°F

48. A vehicle has a P0452 — FTP Sensor Low Input. The technician checks the FTP sensor signal PID on the scan tool — the signal reads -14 inches of water column (extreme vacuum) on a vehicle sitting at rest with the engine off and a 1/2 tank of fuel. The MOST likely cause is:

A. The fuel tank is under genuine extreme vacuum from a completely blocked vent solenoid

B. A stuck-closed vent solenoid that has allowed the purge cycle to draw extreme vacuum in the tank before engine shutoff — a vent solenoid stuck closed during the previous drive cycle allows the purge system to draw and maintain excessive tank vacuum. When the engine shuts off, the extreme vacuum remains in the sealed tank and is read by the FTP sensor

C. A failed FTP sensor producing a false extreme-vacuum reading — a sensor producing extreme readings at rest with engine off and no active EVAP events is most likely producing a false signal, especially if the tank is at 1/2 full with no reason for extreme vacuum

D. A collapsed fuel tank from a failed rollover valve preventing atmospheric equalization

49. A vehicle has P0442. The EVAP monitor has been running on numerous drive cycles but the monitor status shows INCOMPLETE. No EVAP DTCs other than P0442 are stored. The technician reviews enabling criteria — all conditions appear to be met during typical driving. The MOST likely cause of the monitor remaining incomplete despite conditions being met is:

A. A PCM software fault preventing the monitor from completing despite correct conditions

B. A fuel level that is frequently outside the 15–85% enabling window — a vehicle that is routinely filled to above 85% or driven to below 15% fuel has limited windows for the EVAP monitor to run. If the driver consistently fills the tank full and drives it down very low, the monitor may have only brief opportunities to run within the correct fuel level window, especially if other enabling conditions are not simultaneously met during those windows

C. The P0442 itself is preventing the EVAP monitor from running — a stored P0442 never prevents the monitor from running; it runs and confirms the fault each cycle

D. An ambient temperature that is too cold for the EVAP monitor — the monitor requires minimum ambient temperature to enable

50. A vehicle has a P0442 that returns consistently after every repair attempt. The technician has replaced the fuel cap, purge solenoid, vent solenoid, and EVAP canister. Each time, the smoke test before replacement showed no visible leaks. The P0442 continues to return. The technician reviews scan data — the EVAP monitor always fails during the pressure decay phase of the test, not during the component function tests. The MOST likely cause is:

A. A PCM calibration fault — the EVAP monitor threshold is set too sensitive and is flagging normal pressure decay as a leak

B. A very small leak in a location not detectable by standard smoke machine pressure — smoke testing at standard machine pressure (typically 0.5 psi) may not reveal a very small leak that only becomes apparent under the lower test pressures used by the OBD II monitor. A more sensitive test method such as an ultrasonic leak detector, a higher-sensitivity smoke machine, or a calibrated nitrogen pressure decay test with a precision flow meter may be required to locate the sub-threshold leak

C. All previously replaced components were defective simultaneously

D. The fuel tank has an internal baffle crack that is only detectable by fuel tank replacement and inspection

BONUS SECTION 6: ANSWER KEY AND EXPLANATIONS

1. B — 0.020-Inch OBD II Small Leak Threshold — The EPA mandates that OBD II EVAP monitors must detect leaks equivalent to or larger than a 0.020-inch diameter orifice. This standardized threshold applies to all OBD II compliant vehicles produced from 1996 onward. P0442 is set when the EVAP monitor detects a pressure decay rate during its test cycle that exceeds what would result from a 0.020-inch leak, confirming the system cannot maintain the required vapor integrity.

2. B — Missing or Loose Fuel Filler Cap — A completely missing or improperly seated fuel cap creates the largest possible EVAP system opening at the most accessible point — the fuel filler neck. When a smoke machine pressurizes the system, smoke exits immediately at the open cap rather than traveling through the rest of the system to visible components. If the cap is missing, smoke may exhaust at the fill neck so rapidly that it does not form a visible plume in still air. Always verify cap presence and seating before performing a smoke test.

3. A — Locate the Confirmed Leak — A pressure decay from 14 to 11 inches of water column in 10 minutes confirms a real leak exists in the EVAP system. The nitrogen test has already accomplished its goal — confirming a leak is present. The next step is identifying the physical leak location using a detection method suited to the confirmed leak size. Electronic ultrasonic detectors listen for the high-frequency hiss of gas escaping through a small orifice, and smoke testing complements this by making the leak visually identifiable.

4. C — P0446 EVAP Vent Control Circuit — P0446 is a control circuit fault code indicating the PCM cannot verify correct vent solenoid operation. The most common causes are an open circuit in the vent solenoid wiring, a short to ground or voltage in the solenoid circuit, a failed solenoid that does not respond to PCM commands, or a PCM driver fault. The code name refers to a circuit malfunction — the inability to control the solenoid — not necessarily a stuck physical position of the solenoid itself.

5. B — Diagnose Both Simultaneously — A P0442 EVAP leak on the intake manifold side of the purge solenoid (between the purge solenoid outlet and the intake manifold port) creates an unmetered air path directly into the intake manifold. This unmetered air causes lean fuel trims and P0171 simultaneously with the P0442. Both codes can have the same single root cause — a cracked EVAP hose between the purge solenoid and the manifold. Diagnosing both simultaneously is the most efficient approach.

6. C — Disconnected or Blocked Purge Flow Path — A commanded purge with no O2 rich response confirms no fuel vapor is reaching the intake manifold despite the purge solenoid being commanded open. If the solenoid is electrically functioning, the fault is in the vapor flow path —

either no connection between the canister and the solenoid (disconnected or blocked canister-to-solenoid line) or no connection between the solenoid outlet and the intake manifold (disconnected or blocked solenoid-to-manifold line). The vapor cannot travel to the intake manifold regardless of solenoid operation.

7. D — Clogged Intake Manifold Purge Port — The solenoid is confirmed audibly clicking (mechanical function confirmed). The fault is not in the solenoid itself. Low vacuum at the solenoid outlet (2 inches vs. 8 inches required) means the manifold is not providing adequate vacuum through the port that feeds the purge solenoid. A clogged intake manifold purge port — carbon buildup, a manufacturing blockage, or a collapsed internal passage — prevents manifold vacuum from reaching the purge solenoid, making it unable to draw vapor even when mechanically open.

8. C — Stuck-Open or Leaking Purge Solenoid — The commanded-off test is one of the most definitive EVAP purge solenoid diagnostic procedures. When the purge solenoid is commanded off and fuel trims immediately shift toward zero (from -18% to -2%), the solenoid was the active rich source. A solenoid that does not fully close when commanded off allows continuous vapor flow from the canister into the intake manifold at idle — producing persistent negative fuel trims. The solenoid requires replacement.

9. A — Stuck-Closed EVAP Vent Solenoid — The first phase of the test confirms vapor flow (purge solenoid functioning, O2 confirms vapor delivery). The second phase — vent solenoid function evaluation — fails. On platforms where P0441 includes evaluation of the vent solenoid's ability to open for the vent phase (allowing atmospheric air into the canister after purge completion), a stuck-closed vent solenoid that cannot open for venting causes the overall EVAP flow monitor to fail with P0441 even though the purge side is functional.

10. D — Missing Fuel Cap — A completely missing fuel cap provides a completely unrestricted large-diameter opening in the EVAP system. When the EVAP monitor runs its test sequence, it first tests for large leaks and then for small leaks. A missing cap is large enough to fail both threshold tests on the same monitor run — generating both P0455 (large leak threshold exceeded) and P0442 (small leak threshold exceeded) simultaneously from the single large-diameter opening at the fuel fill neck.

11. A — Short to Ground on FTP Signal Wire — With a confirmed 5V supply and confirmed normal ground, the signal wire measuring 0.1V at the sensor connector is being pulled toward ground by an external fault. Either the signal wire has a short to ground somewhere between the sensor and the PCM, or the sensor's internal signal output circuit has failed in a manner that shorts the signal output pin to the sensor's ground side — both pulling the signal below its normal atmospheric-condition range of 1.5–2.0V.

12. B — Short to 5V Reference or Internal Sensor High Failure — Measuring 4.9V at both the sensor connector and the PCM harness connector eliminates any fault between the two connectors (no wiring fault between connectors). With the 5V reference present, a signal wire shorted to the 5V reference circuit pulls the signal to near 5V regardless of actual pressure. Alternatively, an internal sensor failure in the signal conditioning circuit can cause the output to default to near the supply voltage. Either condition produces P0453.

13. C — EVAP Monitor Cannot Run or Complete — P0440 is the non-specific EVAP system fault code that indicates the EVAP monitor has detected a problem that cannot be classified into a more specific code, OR that a condition exists that prevents the monitor from running properly. Common causes include enabling criteria not consistently met (the monitor starts but cannot complete), a component fault that prevents monitor initiation, or a platform where P0440 is the parent code that sets before more specific codes differentiate the exact fault.

14. D — Smoke Test After Cap Is Ruled Out — The fuel cap pressure test confirms the cap's internal check valve holds pressure to specification — this rules out a cap with a failed internal valve. However, the smoke test is the appropriate next step after ruling out the cap because it will locate an EVAP leak anywhere else in the system. While inspecting the O-ring is useful, the smoke test is more comprehensive and will find leaks at any location including hoses, solenoids, canister, and tank connections simultaneously.

15. B — Clear DTC and Release — A confirmed canister crack repaired by canister replacement, confirmed with a smoke test showing no leaks, followed by the EVAP monitor running and passing on the first post-repair drive cycle is a complete and successful repair verification. The monitor passing confirms the repair resolved the leak to below the OBD II detection threshold. The vehicle can be released to the customer. Additional monitor passes provide reassurance but are not required when all evidence confirms a complete repair.

16. A — Failed PCM Driver — All circuit inputs to the solenoid are confirmed: resistance within specification, supply voltage present, ground within specification, and mechanical operation confirmed by external 12V application. The solenoid clicks when powered externally but does not operate during PCM commands despite all circuit inputs being correct. This pattern — confirmed functional solenoid, confirmed correct external circuit, no response to PCM command — points to a failed PCM driver that cannot produce the command output needed to actuate the solenoid.

17. B — Stuck-Open or Leaking Purge Solenoid — P0496 specifically indicates the PCM detected fuel vapor purging when the purge solenoid should be fully closed. A purge solenoid that does not seal completely when commanded off allows continuous uncontrolled vapor flow from the EVAP canister into the intake manifold. The PCM detects this uncommanded enrichment through fuel trim monitoring (negative trims develop when purge should be zero) and sets P0496 to indicate the solenoid is delivering vapor without a command.

18. A — Verify EVAP Monitor Runs and Passes — A confirmed physical repair (new gasket) and a confirmed post-repair smoke test (no leaks) address the physical fault, but OBD II readiness requires the EVAP monitor to run and pass to set the monitor status to COMPLETE. This is particularly important before emissions testing where EVAP monitor readiness is evaluated. Releasing the vehicle without confirming monitor completion risks the customer failing an emissions test due to an incomplete monitor status.

19. B — Loose Cap Tightened Before Test — A P0442 from a fuel cap that was loose during a previous drive cycle but was fully tightened before the smoke test is one of the most common explanations for a negative smoke test after a confirmed P0442. The EVAP monitor detected the leak when the cap was loose and stored the DTC. By the time the technician smoke-tests the system, the cap has been properly seated and no leak is present. Always verify cap seating history with the customer before smoke testing.

20. D — Sensor Pulling Signal to Ground Internally — When a sensor is disconnected and the signal wire floats to near the 5V reference (4.8V), this is normal behavior — the PCM's internal pull-up resistor biases the unloaded signal wire toward the reference voltage. The previous 0.1V reading with the sensor connected confirms the sensor's internal output circuit was sinking the signal toward ground. Disconnecting the sensor removed the ground path and the signal floated to 4.8V — confirming an internal sensor short to ground.

21. A — Normal System Volume Equalization — A 0.8-inch pressure drop that immediately stabilizes and holds with zero further decay for 15 minutes is not a leak — it is normal behavior from the pressurized gas distributing evenly throughout the system volume during initial test gas introduction. A true leak produces continuous decay throughout the test period. Stabilization after a small initial drop confirms the system is sealed. The P0442 may have been from an intermittent source not present during testing.

22. A — Disturbed EVAP Line from Underbody Service — A P0442 appearing shortly after underbody fuel system service where EVAP lines are in the same vicinity is most likely caused by a disturbed EVAP connection. During fuel filter replacement on underbody-mounted filters, EVAP vapor lines that run alongside the fuel lines can be inadvertently disconnected, cracked from being stepped on, or pinched by a incorrectly reinstalled heat shield. A targeted inspection of all EVAP connections in the fuel filter service area is the first step.

23. A — Inspect Fuel Tank for Cracks or Seam Separation — After ruling out all accessible external EVAP components with a negative smoke test, the fault must be in an inaccessible location. The fuel tank is the largest component in the EVAP system and has the greatest potential for large-volume leaks at seams, tank body stress cracks, tank damage from road debris, or at the sending unit access port. Tank inspection requires the vehicle to be raised on a lift and the tank inspected from all angles, including the bottom and all seam locations.

24. C — Normal Purge O2 Response Pattern — A commanded purge that produces a rich O2 excursion (vapor entering from canister) followed immediately by a lean correction (PCM reduces fuel delivery in response) then returns to normal closed-loop operation is the expected, correct O2 sensor response to a functioning EVAP purge event. The PCM interprets the initial rich spike, corrects fuel delivery, and stabilizes — this is how the purge confirmation test works. This does not indicate P0441; it confirms correct purge system function.

25. B — Sub-Threshold Leak Below OBD II Detection Minimum — OBD II EVAP monitors are calibrated to the 0.020-inch threshold mandated by EPA regulations. Real-world remote sensing equipment (roadside infrared hydrocarbon detection) and loaded-mode I/M tailpipe analysis equipment can identify fuel vapor emissions from leaks smaller than 0.020 inches — below the OBD II mandate. A vehicle with a genuine but very small EVAP leak can fail enhanced emissions screening without storing any EVAP DTC.

26. B — Investigate Remaining Lean Trim — A cracked EVAP hose between the purge solenoid outlet and the intake manifold creates an unmetered air path into the intake manifold — causing lean fuel trims (P0171) AND an EVAP leak (P0442). If after replacing the hose the lean trims are still +18%, either the hose repair is incomplete (the new hose is also not sealing at the manifold or solenoid connection), or a second vacuum leak exists that was not the EVAP hose. Fuel trims must return to near zero before the repair is considered complete.

27. B — Saturated or Restricted EVAP Canister — During ORVR refueling, fuel vapors displaced from the tank are routed through the EVAP system to the charcoal canister rather than being released into the atmosphere. If the canister is saturated with previously absorbed hydrocarbons (from a stuck-open purge solenoid preventing canister regeneration) or if the canister vent path is restricted, the incoming refueling vapors cannot be absorbed and take the path of least resistance — back up the filler neck as fuel odor.

28. C — High-Resistance FTP Sensor Ground Circuit — A measured resistance of 14.8 ohms between the FTP sensor ground terminal and chassis ground versus a specification of less than 1 ohm confirms significant resistance in the ground circuit. The FTP sensor's signal output is referenced against its ground circuit. A high-resistance ground shifts the apparent zero reference point of the signal circuit, causing the signal voltage to read lower than actual — producing a false P0452 low-voltage reading. The ground circuit must be repaired before the sensor is condemned.

29. C — Expanded Fuel Tank Volume — An EVAP monitor pressure decay test applies a fixed test pressure and monitors the decay rate over a fixed time period. The decay rate is compared to a threshold that represents the 0.020-inch leak standard. A fuel tank that has expanded from plastic creep over years of thermal cycling and pressure variations has a larger internal volume than its original specification. This larger volume causes the test gas to distribute over more space, producing a slightly faster apparent pressure decay even with no actual leak — a borderline EVAP monitor failure without any physical leak.

30. C — Normal Vacuum-Based EVAP Monitor Operation — Some OBD II EVAP monitor strategies use the fuel tank pressure sensor to confirm purge flow by monitoring for vacuum development in the fuel tank when the vent solenoid is closed and the purge solenoid is open. If the purge solenoid is drawing vapor from the canister, and the canister is drawing vapor from the fuel tank, and the vent solenoid is closed, the fuel tank pressure will go negative (vacuum). An FTP reading of -8 inches during this test confirms the purge pathway from tank through canister to intake is functioning correctly.

31. C — Inspect Quick-Connect Fitting Components — Quick-connect push-lock fittings are used throughout EVAP systems for their ease of assembly and disassembly. Leakage at a quick-connect fitting is most commonly caused by an O-ring that has degraded or rolled out of its groove, a locking tab or clip that is cracked or missing allowing the fitting to partially unseat, or a deformed line end that cannot seat against the fitting O-ring correctly. These components must be inspected and replaced individually before the canister or vapor line is condemned.

32. B — Stuck-Open Purge Solenoid — The definitive diagnostic sequence: commanded closed by scan tool while rich trims persist confirms the PCM command is not closing the solenoid. Disconnecting the solenoid connector removes all electrical power and the spring-return mechanism should close the solenoid — but if the solenoid is mechanically stuck open, even with power removed the valve does not close. The fuel trim shift to near-zero when disconnected confirms that disconnecting the solenoid — removing its ability to allow flow — resolved the condition, confirming the solenoid body is mechanically stuck open.

33. C — Liquid Fuel Flooding EVAP Canister from Overfill — ORVR and EVAP systems include rollover valves and liquid-vapor separators designed to prevent liquid fuel from entering the canister during normal filling. However, severe overfilling that causes fuel to overflow from the filler neck has pushed liquid fuel through the vapor lines and into the activated charcoal canister. Liquid fuel in the charcoal bed saturates and degrades the charcoal's vapor-absorbing capacity, prevents the vent from sealing correctly during EVAP monitor testing, and can damage the canister.

34. A — Intermittent Leak Not Present During Smoke Test — A P0442 that cannot be located by smoke test, cap test, and component testing is most commonly an intermittent leak. Intermittent leaks may only be present under specific conditions: thermal expansion or contraction of plastic components, vibration-dependent contact faults in push-connect fittings, pressure differences between the OBD II monitor test and the smoke test, or moisture-related seal behavior. The leak exists when the monitor runs but seals when the vehicle is static and cool for the smoke test.

35. B — Ultrasonic Detector or Sensitive Nitrogen Decay Test — A P0456 very small leak is below the P0442 threshold (smaller than 0.020 inches). Standard smoke machine test pressure and smoke particle size may not be adequate to push visible smoke through such a small orifice. An ultrasonic leak detector can identify the supersonic frequency hiss from gas escaping through a micro-orifice that is inaudible to human hearing. A precision nitrogen pressure decay test with a calibrated flow meter can quantify very small pressure losses that standard smoke testing cannot reveal.

36. B — Stuck-Open Vent Solenoid — The vent solenoid is commanded closed but the FTP sensor shows no vacuum development in the tank during purge (remains at atmospheric). The purge side is confirmed functional (rich O2 excursion confirmed). If the vent solenoid is commanded closed but cannot close mechanically, atmospheric air continuously enters the canister through the open vent path — equalizing tank pressure as fast as the purge system draws vacuum. The FTP sensor correctly reads atmospheric because the tank is being continuously vented despite the closed command.

37. C — Replace Fuel Tank — Plastic fuel tanks are manufactured from multilayer co-extruded plastic (typically HDPE) that provides fuel vapor impermeability. A seam leak on a plastic fuel tank cannot be permanently repaired with external epoxy, sealant, or adhesive because fuel vapor permeates through and around any surface repair material, temperature cycling breaks adhesion, and the repair material degrades from fuel contact. Tank replacement is the only durable, safe, and long-term repair for a leaking plastic tank seam.

38. A — Purge Solenoid Not Fully Closing After Purge Phase — The EVAP monitor's pressure-rise test requires both the purge solenoid and vent solenoid to be fully closed after purge, creating a sealed tank. If the purge solenoid does not fully seat when commanded closed after the purge phase, the intake manifold vacuum path remains open — preventing any pressure rise from fuel vapor generation because the vapor is continuously drawn out through the partially open purge solenoid. A pressure-rise test failure with a new canister and correct FTP sensor points to the purge solenoid not fully closing.

39. C — Canister Body Cracked or Charcoal Damaged from Impact — An EVAP charcoal canister with a 1-inch deep impact dent has sustained significant mechanical force. Plastic canister bodies are not designed to absorb impact deformation — the force required to dent the body 1 inch will fracture the housing or fracture the activated charcoal medium inside. A fractured canister housing is a direct EVAP leak path. The canister must be replaced and the mounting area, mounting straps, and nearby EVAP lines should be inspected for collateral damage from the same impact event.

40. A — Mechanically Stuck-Open Vent Solenoid — The solenoid is confirmed electrically: it energizes (12V removed when commanded, click heard) confirming the electrical circuit is functioning and the solenoid coil is energizing. However, the FTP sensor showing no vacuum build during purge with the vent commanded closed confirms the vent path is still open to atmosphere despite the electrical command. The solenoid coil energizes but the internal poppet valve is stuck open mechanically — the valve does not seat when the coil pulls it despite the coil creating magnetic force. The solenoid requires replacement.

41. B — EVAP Hose Between Canister and Purge Solenoid is Upstream — This question tests knowledge of EVAP system architecture. The hose between the EVAP canister and the purge solenoid inlet is on the EVAP vapor side — it is upstream of the purge solenoid and is completely isolated from the intake manifold vacuum when the purge solenoid is closed. A crack in this hose creates an EVAP system leak (P0442) because vapor can escape from the canister side. However, because the purge solenoid blocks this hose from connecting to the intake manifold when closed, unmetered air cannot enter the intake manifold through this hose — it does not cause P0171. A separate leak source must be causing the lean condition.

42. C — Run EVAP Monitor to Confirm Passing — Smoke test confirmation proves the physical leak is sealed, but the OBD II EVAP monitor must run and pass to set monitor readiness status to COMPLETE. This is the required final step for EVAP system repairs because it confirms the repair meets the 0.020-inch detection threshold, not just visual smoke sealing. Monitor completion is also required for I/M readiness status and confirms the PCM's leak detection algorithm is satisfied with the repair result.

43. C — Pressurize System and Monitor for Decay/Smoke at Solenoid Outlet — Testing a purge solenoid for internal leakage when commanded closed requires isolating the solenoid as the potential leak point while the system is under test pressure. With the solenoid commanded closed, pressurizing the canister side of the system with smoke or nitrogen and then monitoring the solenoid outlet (manifold side) for pressure decay, smoke emergence, or nitrogen flow confirms whether the solenoid is sealing. Flow or smoke at the solenoid outlet with it commanded closed confirms internal leakage.

44. C — Replace Sending Unit Access Cover Gasket or O-Ring — The fuel sending unit access cover seals the fuel tank vapor space against the atmosphere. The large-diameter flat gasket or O-ring between the access cover and the tank flange is a known wear item — it compresses over years of use and temperature cycling and eventually loses its ability to maintain EVAP system seal integrity. Replacement of this gasket is a straightforward, inexpensive repair that directly addresses the identified smoke leak location at the sending unit cover perimeter.

45. B — Pending P0102 Inhibiting EVAP Monitor Completion — Many EVAP monitor strategies in the PCM include a prerequisite check that no other active or pending powertrain fault codes are present before the EVAP monitor will enable or complete. A pending P0102 (MAF Sensor Low) indicates an active fault condition even though the MIL is not yet illuminated. This pending code can prevent the EVAP monitor from entering its flow evaluation phase or can corrupt the flow calculation by providing incorrect MAF-based airflow data during the monitor test.

46. C — Replace Fuel Filler Tube Assembly — A 3/4-inch crack in a fuel filler tube is a significant structural failure of a fuel system component. The filler tube carries both liquid fuel during refueling and fuel vapors continuously. A crack this size is a large EVAP leak, a potential liquid fuel leak, and a fire hazard. No temporary repair — tape, epoxy, splice hose — is appropriate for a fuel system component with a structural crack and liquid fuel staining. The complete filler tube assembly must be replaced to ensure structural integrity and vapor sealing.

47. B — Plastic Component Fatigue Crack Opening in Cold Weather — Plastic polymers used in EVAP components (HDPE hoses, ABS canister bodies, nylon vapor tubes) contract at low temperatures. A component that has developed a fatigue crack from age and flexing may have crack faces that are in contact at warm temperatures but separate when the material contracts in cold weather — opening a P0442-sized gap. When the vehicle warms, the plastic expands and the crack faces close again, sealing the leak and making warm-weather smoke testing negative.

48. C — Failed FTP Sensor Producing False Extreme Reading — A fuel tank at 1/2 capacity with the engine off and no active EVAP events does not generate -14 inches of water column vacuum. Normal tank vacuum at rest is near atmospheric (0 inches) or slightly negative from cooldown after a recent purge cycle. An FTP sensor reading -14 inches at rest with no operational reason for extreme vacuum is producing a false signal. The sensor has an internal fault causing it to output an out-of-range vacuum signal — replacement is indicated after confirming supply voltage and ground circuit integrity.

49. B — Fuel Level Frequently Outside Enabling Window — The EVAP monitor requires fuel level between 15% and 85% to enable. A driver who consistently fills to a completely full tank (100%, above 85% window) and drives until the fuel low warning activates (below 15%) creates a driving pattern where the fuel level is outside the enabling window for the majority of the vehicle's operation. The monitor can only run during the brief transition period through the 15–85% window, and if other enabling criteria are not simultaneously met during that window, the monitor never completes.

50. B — Sub-Threshold Leak Requiring More Sensitive Detection Method — When a P0442 returns consistently after multiple component replacements with negative smoke tests and the monitor specifically fails during the pressure decay phase, a very small leak exists that standard smoke machine test pressure cannot reveal. OBD II EVAP monitors operate at very low test pressures (approximately 7–14 inches of water column) that can detect smaller leaks than a smoke machine generates at its working pressure. An ultrasonic leak detector, a higher-sensitivity smoke machine operating at lower pressure, or a precision calibrated nitrogen pressure decay test can locate leaks below the smoke machine's detection capability.