

ASE L1 - Quiz Questions with Answers

A. General Powertrain Diagnosis

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1.

A small amount of ring leakage occurs during a cylinder leakage test. Which of the following is the MOST likely cause?

Normal operation

Leaking intake valve

Worn piston rings

Blown head gasket

Correct answer: A leaking intake valve

A leakdown test is performed to determine the cause of low compression in a cylinder. This is done by filling the cylinder with shop air. It's normal to notice a small amount of ring leakage during the test because rings seal better with the engine running.

If air is heard coming from the throttle body area during the test, an intake valve leak might be the culprit.

2.

Technician A says the vacuum will be lower than normal at idle but remain steady if there's a leaking EGR valve. Technician B says a wide-open EGR valve will prevent the engine from starting.

Who is correct?

Both A and B

Technician A

Technician B

Neither A nor B

Correct answer: Both A and B

Both technicians are correct. When an EGR valve is leaking, the vacuum is going to be lower than normal at idle. However, the gauge needle will remain steady.

If the EGR valve is stuck wide open, it will prevent the engine from starting.

3.

Technician A states a substantial increase in HC (hydrocarbon) during a power balance test indicates a defective injector. Technician B states if a power balance test shows no increase in HC, there could be a problem with the valvetrain.

Who is correct?

Technician B

Technician A

Both A and B

Neither A nor B

Correct answer: Technician B

Technician B is correct. If there's no increase in hydrocarbons during a power balance test, there's likely a malfunctioning injector or valvetrain problem.

Technician A is incorrect. During a power balance test, HC should increase substantially if the injector is delivering the right amount of fuel.

4.

A technician is checking for a restricted exhaust using a vacuum gauge. A reading is recorded once at 1,000 rpm with the engine at normal operating temperature and once again at 2,500 rpm.

If the exhaust is restricted, at 2,500 rpm the reading will do which of the following?

Decrease gradually

Stay the same

Increase gradually

Fluctuate rapidly

Correct answer: Decrease gradually

If the reading gradually drops by more than 3 in. Hg during the test, the exhaust system is restricted. The most likely cause of a restricted exhaust is a clogged catalytic converter, but a collapsed pipe or blocked muffler is also possible.

5.

Which of the following is the LEAST likely cause of valves not sealing properly?

Worn camshaft lobe

Carbon deposits

Overtightened adjusters

Broken valve spring

Correct answer: Worn camshaft lobe

A worn camshaft lobe doesn't affect the sealing of the valve. Instead, it prevents the valve from opening properly.

Carbon deposits, overtightened adjusters, and a broken valve spring can all cause problems with valve sealing.

6.

Which of the following is the MOST likely cause of a low, steady vacuum reading at idle?

A leaking EGR valve

A broken valve spring

Worn piston rings

A sticking valve

Correct answer: A leaking EGR valve

A leaking exhaust gas recirculation (EGR) valve will cause a low but steady vacuum reading at idle. This is because EGR raises manifold pressure, thereby lowering vacuum (the two are inversely proportional).

A broken valve spring and sticking valve cause the vacuum to drop sharply every time the valve attempts to close. Worn piston rings need to be checked with a snap throttle test.

7.

Technician A says a MAP sensor measures pressure. Technician B says a MAP sensor measures vacuum.

Who is correct?

Technician A

Both A and B

Technician B

Neither A nor B

Correct answer: Technician A

Technician A is correct. The MAP sensor measures pressure.

Technician B is incorrect. The MAP sensor doesn't measure vacuum.

8.

A technician is testing the cam actuator solenoid resistance on the composite vehicle. What should the readings be?

12 +/- 2 ohms

10 +/- 2 ohms

8 +/- 2 ohms

6 +/- 2 ohms

Correct answer: 12 +/- 2 ohms

The composite vehicle is equipped with variable valve timing (VVT). This system uses ECM-controlled solenoids to supply oil pressure to the cam actuators. Solenoid resistance should be 12 +/- 2 ohms.

9.

Cylinder #1 has low compression, but all the other cylinders are okay. What is the next diagnostic step to take?

Perform a wet compression test

Perform a cylinder leakage test

Check valvetrain components for wear

Inspect timing belt

Correct answer: Perform a wet compression test

With one cylinder revealing low compression, the next diagnostic step is to perform a wet compression test.

If that produces the same results as the dry compression test, it's recommended to move on to a leakage test. When both of these tests come back normal, the valvetrain components should be checked for wear. A defective timing belt could cause low compression, but it would be in all cylinders, so there's no reason to examine the component.

10.

In a cylinder leakdown test, where should the piston be?

Top dead center of the compression stroke

Top dead center of the intake stroke

Top dead center of the power stroke

Top dead center of the exhaust stroke

Correct answer: Top dead center of the compression stroke.

Before a cylinder leakdown test, the engine must be brought to the top dead center on the compression stroke. This is done to ensure the valves are in the closed position to prevent false readings.

11.

Technician A says variable valve timing (VVT) actuators run by the ECM increase valve lift and duration with an increase in engine speed. Technician B says many VVT actuators use engine oil for hydraulic operation.

Who is correct?

Both A and B

Technician A

Technician B

Neither A nor B

Correct answer: Both A and B

Both technicians are correct. When the VVT actuators are run by the ECM, valve lift and duration increase with engine speed.

Actuators often use engine oil for hydraulic operation, but some use motors instead.

12.

Technician A says a restricted exhaust causes combustion gases to exit through an open intake valve. Technician B says a restricted exhaust causes manifold vacuum to rise significantly.

Who is correct?

Technician A

Technician B

Neither A nor B

Both A and B

Correct answer: Technician A

Only technician A is correct. With a restricted exhaust, the combustion gases get trapped in the cylinder before exiting the path of least resistance, which is through the open intake valve instead of the exhaust valve.

Technician B is wrong because a restricted exhaust is going to lead to a significant manifold vacuum drop.

13.

Technician A says the EGR valve raises manifold pressure. Technician B says the EGR valve raises the vacuum.

Who is correct?

Technician A

Technician B

Both A and B

Neither A nor B

Correct answer: Technician A

Only technician A is correct. The EGR valve raises manifold pressure but lowers the vacuum. Therefore, a leaking EGR valve causes a low and steady vacuum reading with a closed throttle.

14.

To check for a restricted exhaust system, the first vacuum reading should be taken with the car running at what rpm?

1000

2500

1500

2000

Correct answer: 1000

To check for a restricted exhaust system, the vacuum gauge is first read at 1000 rpm with the engine at normal operating temperature. Once that reading is recorded, engine speed should be slowly increased to 2500 rpm.

If the reading drops more than 3 in. Hg from the initial value, the exhaust system may be restricted.

15.

Which of the following is LEAST likely to cause intermittent vacuum fluctuations of 3 to 4 in. Hg?

Sticking valves

Restricted exhaust system

Improper spark plug gap

Bad ignition coil

Correct answer: Sticking valves

Sticking valves cause an intermittent fluctuation of the gauge needle from 3 to 4 in. Hg. Improper spark plug gap, a bad ignition coil, and other ignition problems can lead to a fluctuation between 1 and 2 in. Hg.

A restricted exhaust system would lead to a steady drop in vacuum with rpm increasing.

16.

During a snap throttle test, how much higher can the vacuum increase with piston rings that are sealing correctly?

Up to 5 in. Hg

Up to 3 in. Hg

Up to 7 in. Hg

No rise

Correct answer: Up to 5 in. Hg

With piston rings sealing correctly, the vacuum can rise by up to 5 in. Hg during a snap throttle test. If it doesn't, the reading could indicate bad piston rings.

17.

While testing the composite vehicle's variable valve lift motors, what should the scan tool value read under normal conditions?

0.5 to 4.5 V

0.0 to 3.5 V

0.5 to 5.5 V

0.0 to 6.5 V

Correct answer: 0.5 to 4.5 V

During a test of the variable valve lift motors on the composite vehicle, the scan tool value reading should be between 0.5 V (0%) and 4.5 V (100%).

0.5 volts is measured at minimum lift with 4.5 volts reading at full valve lift.

18.

What should the manifold absolute pressure (MAP) reading be under Key On, Engine Off (KOEO) conditions?

29.5 in. Hg

11.5 in. Hg

22.5 in. Hg

18.5 in. Hg

Correct answer: 29.5 in. Hg

Under KOEO conditions, the MAP value should be close to 29.5 in. Hg. This reading is the equivalent of sea level atmospheric pressure.

When the engine is idling, the reading should drop to 11.5 in. Hg. This value measures the pressure inside the intake manifold.

19.

Technician A says the manifold vacuum should read 18-20 in. Hg with the engine at idle. Technician B says when connected to a ported vacuum source at closed throttle, the vacuum gauge should read near 0 in. Hg.

Who is correct?

Both A and B

Technician A

Technician B

Neither A nor B

Correct answer: Both A and B

Both technicians are correct. When reading a manifold vacuum with an engine in good running order, the gauge should remain between 18-20 in. Hg while at idle.

Using a vacuum gauge connected to a ported vacuum source with the engine at closed throttle should always produce a reading of near 0 in. Hg.

20.

Which of the following is the LEAST likely cause of a restricted exhaust system?

Cracked exhaust manifold

Clogged converter

Collapsed pipe

Blocked muffler

Correct answer: Cracked exhaust manifold

A cracked exhaust manifold typically leads to a leaking exhaust system. The most common cause of a restricted exhaust is a clogged converter. There's also the possibility of a collapsed pipe or blocked muffler.

21.

At no-load idle, a healthy engine should have an approximate vacuum reading of which of the following?

18-20 in. Hg

15-18 in. Hg

14-19 in. Hg

13-18 in. Hg

Correct answer: 18-20 in. Hg

A healthy engine should produce 18-20 in. Hg at idle. As engine speed increases, the vacuum decreases.

Engine vacuum can be determined by subtracting the running MAP reading from the Key On Engine Off (KOEO) value.

22.

A power balance test is being performed. When cylinder #3 is canceled, HC levels do not increase on the exhaust gas analyzer. Technician A says this means the cylinder is contributing properly. Technician B says there may be a leaking intake manifold.

Who is correct?

Neither A nor B

Technician A

Technician B

Both A and B

Correct answer: Neither A nor B

Both technicians are wrong. A cylinder power balance test is used to determine if each cylinder is contributing equally to the engine's overall power output. When a cylinder is canceled during the test, HC levels should increase. If HC levels do not increase, the cylinder may have a failed injector or a problem in the valvetrain.

While the power balance test won't give a specific diagnosis, it should point to the area needing attention.

B. Computerized Powertrain Controls Diagnosis

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23.

All the following readiness statuses of non-continuous systems on the composite vehicle can be read on the scan tool EXCEPT:

Fuel control

Catalytic converter

Oxygen sensor heaters

EGR system

Correct answer: Fuel control

Fuel control is considered a continuous system, with the OBD II monitor running all the time.

The remaining answers (catalytic converter, oxygen sensor heaters, and EGR system) are non-continuous systems. The readiness status of these systems can be read by the scan tool.

24.

How many freeze frame records do the ECM and TCM of the composite vehicle store?

One

Two

Four

Ten

Correct answer: One

Freeze frame data is a snapshot that's automatically stored in the memory of the ECM or TCM when a DTC sets. The composite vehicle's EMC and TCM only store one frame of data.

If another DTC sets at a later time, the old frame is replaced with a newer one.

25.

A technician measures a resistance of 120 ohms between pin 6 and pin 14 on a 16-pin OBD connector. What does this indicate?

An open terminating resistor

Normal resistance

A shorted CAN bus

An open CAN bus

Correct answer: An open terminating resistor

A terminating resistor is found at each end of the CAN bus. The terminating resistors can be checked by measuring the resistance between pin 6 and pin 14 of the OBD connector.

Normal resistance is 60 ohms. A reading of 120 ohms indicates an open or missing resistor.

26.

Technician A says terminating resistors on a CAN bus system create resistance to slow communication speeds, so scan tools can talk to the network. Technician B says terminating resistors are used to absorb electrical interference.

Who is correct?

Technician B

Technician A

Both technicians

Neither technicians

Correct answer: Technician B

Technician B is correct. Terminating resistors serve to absorb signal bounce and interference.

Technician A is incorrect. Terminating resistors do nothing to slow the signal.

27.

Technician A says a monitor status of "INCOMPLETE" indicates the monitor has failed. Technician B says a monitor status of "NO" indicates the monitor has failed.

Who is correct?

Neither A nor B

Technician A

Technician B

Both A and B

Correct answer: Neither A nor B

Both technicians are wrong. A monitor status of "NOT READY," "NO," or "INCOMPLETE" does not mean the monitor has failed. It means the monitors have not been operated so as to display the requested criteria.

28.

Technician A says OBD II connectors were standardized into a 16-pin design.
Technician B says pin 16 on the OBD II connector is ground, and 4 is B+.

Who is correct?

Technician A

Both A and B

Technician B

Neither A nor B

Correct answer: Technician A

Technician A is correct. All OBD II connectors contain a 16-pin design.

Technician B is incorrect. On the OBD II connector, pin 4 is the ground, and 16 is B+.

29.

Technician A says when the scan tool voltage of a resistive sensor is near or at 0 volts, it means that the circuit to the ECM is open. Technician B says the OBD-II Inspection Maintenance (IM) Readiness shows whether all of the monitors have been completed.

Who is correct?

Technician B

Technician A

Both A and B

Neither A nor B

Correct answer: Technician B

Only technician B is correct. The OBD-II IM Readiness reveals whether the monitors have been completed. It's good to check if a monitor has passed once a repair is complete to verify the fix.

Technician A is incorrect. If the resistive sensor voltage reads near or at 0 volts, it means that the circuit to the ECM is probably grounded. A reading near the 5.0-volt reference indicates an open circuit.

30.

The composite vehicle exhibits a crank, no-start condition. Which of the following could be the cause?

A blown fuse #4

An opening at ECM terminal 14

A short to ground at ECM terminal 122

A short to ground at FPCM terminal 660

Correct answer: A blown fuse #4

A blown fuse #4 will prevent power from getting to any of the injectors or coils, resulting in a crank, no-start condition.

A short to ground at ECM terminal 122 will affect fuel injector #3, while an opening at ECM terminal 14 will affect ignition coil #1. Both can lead to performance issues, but neither should prevent the vehicle from starting. A short to ground at FPCM terminal 660 remains grounded, and there should be no change.

31.

With an emissions-related fault, how many consecutive trips are needed by the composite vehicle before the ECM will store a DTC and illuminate the MIL?

Two

One

Three

Four

Correct answer: Two

After two consecutive trips with an emissions-related fault, the ECM will store a DTC. The MIL also illuminates to indicate the fault.

Freeze frame data from the first failure is stored.

32.

An engine coolant temperature sensor reads 0.46 volts. What is the corresponding temperature?

212 degrees Fahrenheit

100 degrees Fahrenheit

-40 degrees Fahrenheit

248 degrees Fahrenheit

Correct answer: 212 degrees Fahrenheit

The engine coolant temperature sensor reads 0.46 volts at 212 degrees Fahrenheit (100 degrees Celsius). The sensor measures temperatures between -40 and 248 degrees Fahrenheit.

33.

Referring to the composite vehicle, which modules contain the terminating resistors for the data bus?

ECM and ICM

ECM and TCM

ECM and FPCM

ECM and BCM

Correct answer: ECM and ICM

The data bus in the composite vehicle is equipped with two terminating resistors, one in the engine control module (ECM) and one in the instrument cluster module (ICM).

The data bus fails when both terminating resistors aren't connected to the network. If only one fails, the data bus can remain operational.

34.

All of the following are continuous monitors EXCEPT:

Oxygen sensor

Comprehensive components

Fuel control

Misfire detection

Correct answer: Oxygen sensor

Misfire detection, comprehensive components, and fuel control are continuously run monitors. The oxygen sensor is considered a non-continuous monitor since it only runs after certain criteria have been met. Other non-continuous monitors include catalyst efficiency, positive crankcase ventilation (PCV), O₂ heater, A/C refrigerant, evaporative emissions (EVAP), exhaust gas recirculation (EGR), heated catalyst, secondary air, and thermostat.

35.

Technician A says engine RPM is used to determine fuel control. Technician B says without the tach signal, the EMC cannot tell if the car engine is running.

Who is correct?

Both A and B

Technician A

Technician B

Neither A nor B

Correct answer: Both A and B

Both technicians are correct. Engine RPM is one of the most important inputs to the ECM. The ECM uses this information to determine the operation of the fuel system, ignition system, emissions equipment, and transmission.

The tach signal (engine RPM) is needed for the ECM to know that the engine is running.

36.

How much can valve lift increase in the composite vehicle?

4 mm

2 mm

6 mm

3.5 mm

Correct answer: 4 mm

The composite vehicle is equipped with variable valve lift (VVL). This system allows lift to increase by as much as 4 mm at high speeds.

At high lift (100% command), the VVL position sensors should read 4.50 V.

37.

Which of the following is required for the composite vehicle to complete a drive cycle?

Accelerate to 40-55 mph at 25% throttle and maintain that speed for 5 minutes

Keep fuel tank level between 1/4 and full

Perform engine cold start below 75 degrees

Warm up until coolant reaches at least 140 degrees

Correct answer: Accelerate to 40-55 mph at 25% throttle and maintain that speed for 5 minutes

For all the monitors to run on the composite vehicle, the following criteria must be met: fuel tank between 1/4 and 3/4 full, engine cold start below 86 degrees, engine warm-up until coolant reaches at least 160 degrees, and acceleration to 40-55 mph at 25% throttle plus maintaining that speed for 5 minutes.

Other requirements include rules for deceleration, restarting the engine, idling, cycling the key, and accelerating.

38.

On the composite vehicle, an AFRS reading of 3.3 volts indicates what?

A lean mixture

A rich mixture

A perfect air/fuel mixture

A failed catalytic converter

Correct answer: A lean mixture

The AFRS is used to measure the air/fuel ratio of the exhaust stream. This information is used by the ECM for fuel control.

A sensor reading of 3.3 volts indicates a lean mixture. A reading below 2.5 volts indicates a rich mixture.

39.

The composite vehicle cranks but doesn't start. Which of the following could be the cause?

An open at ECM terminal 252

A short to ground at ECM terminal 204

An open at ECM terminal 201

A blown fuse #31

Correct answer: An open at ECM terminal 252

An open at ECM terminal 252 would prevent the crank sensor from working, resulting in a crank, no-start condition. A short to ground at terminal 204 would keep the cam position actuator on continuously, but would not cause a no-start condition. An open at ECM terminal 201 or a blown fuse #31 would result in a no-crank, no-start condition.

40.

The composite vehicle is stuck in fifth gear, and the torque converter clutch has been disabled. Technician A says a faulty transmission range switch could be the cause. Technician B says a faulty transmission fluid temperature sensor could be the cause.

Who is correct?

Technician A

Technician B

Both A and B

Neither A nor B

Correct answer: Technician A

Only technician A is correct. When the transmission control module (TCM) defaults to fail-safe mode, it keeps the transmission in fifth gear and disables the torque converter clutch. The TCM will enter fail-safe mode if it detects a problem with any of the following: transmission range switch, electronic pressure control, shift solenoids, turbine shaft speed sensor, or vehicle speed sensor.

Technician B is incorrect. A faulty transmission fluid temperature sensor doesn't signal the transmission control module (TCM) to go into fail-safe mode on the composite vehicle.

41.

The composite vehicle is producing excessive hydrocarbons. Technician A says a blown #4 fuse could be the cause. Technician B says an open CKP sensor could be the cause.

Who is correct?

Neither A nor B

Technician A

Technician B

Both A and B

Correct answer: Neither A nor B

Both technicians are wrong. An open crankshaft position (CKP) sensor would prevent the engine from starting.

Fuse #4 of the composite vehicle sends power to all six coils, preventing the vehicle from running if it is blown.

42.

For proper operation, the ECM must receive a regulated voltage between what values?

12 and 14 volts

8 and 10 volts

10 and 12 volts

14 and 16 volts

Correct answer: 12 and 14 volts.

The charging system must provide a regulated 12 to 14 volts to the ECM for it to operate properly. Without the proper voltage, many strange symptoms can occur.

43.

CAN Low (L) has a dormant voltage of which of the following?

11 volts

0.65 volts

0.25 volts

4.65 volts

Correct answer: 11 volts

CAN Low (L) has a dormant voltage of 11 volts that decreases to 4.65 volts when communicating.

CAN High (H) has a dormant voltage of 0.25 volts that increases to 0.65 volts when communicating.

44.

The composite vehicle is being discussed. Technician A says the crankshaft position sensor should produce a square waveform pattern. Technician B says the camshaft position sensor should produce a sawtooth waveform pattern.

Who is correct?

Neither A nor B

Technician A

Technician B

Both A and B

Correct answer: Neither A nor B

Looking at the information for the composite vehicle, the camshaft sensors are Hall-effect sensors, which produce a square waveform pattern. The crankshaft sensor is a permanent magnet sensor, which produces a sawtooth waveform pattern.

45.

Technician A states that pins 4 and 16 provide power to the OBD II scan tool. Technician B states eight diagnostic link connector (DLC) cavities are common across all vehicles, with the other eight remaining manufacturer-specific.

Who is correct?

Technician A

Technician B

Both A and B

Neither A nor B

Correct answer: Technician A

Technician A is correct. Pin 4 on the OBD II connector is ground, and 16 is B+, supplying power to the scan tool, so an external power supply isn't needed.

Technician B is incorrect. Seven of the DLC cavities are common, with the other nine remaining manufacturer-specific.

46.

Based on the composite vehicle, what does the engine temperature need to reach to complete a warm-up cycle?

160 degrees Fahrenheit

220 degrees Fahrenheit

180 degrees Fahrenheit

200 degrees Fahrenheit

Correct answer: 160 degrees Fahrenheit

For the composite vehicle to complete a warm-up cycle, the engine temperature must reach 160 degrees Fahrenheit. There must also be a 40-degree increase.

The ECM and TCM use the warm-up cycle to clear the freeze frame data and DTCs automatically.

47.

Technician A says an ohmmeter is the best way to evaluate an electrical circuit's condition. Technician B says a circuit is best tested for excessive energy loss using an ammeter.

Who is correct?

Neither A nor B

Technician A

Technician B

Both A and B

Correct answer: Neither A nor B

Both technicians are wrong. The best way to check for excessive circuit energy loss (voltage loss) is by performing a voltage drop test using a voltmeter.

Technicians commonly use an ohmmeter mistakenly to check the condition of an electrical circuit. An ohm reading can come back normal from a cable with just one strand of wire intact because the ohmmeter sends just a few milliamps of current through the circuit for testing.

48.

Technicians are discussing the composite vehicle. Technician A says if the “valid key” message doesn't get to the ECM within two seconds of engine startup, the fuel injectors will be automatically disabled. Technician B says the immobilizer control module cannot prevent starter motor operation for anti-theft purposes.

Who is correct?

Both A and B

Technician A

Technician B

Neither A nor B

Correct answer: Both A and B

Both technicians are correct. When a valid key isn't used or the message doesn't get to the ECM within two seconds of the engine starting, power is cut off to the fuel injectors and the engine will stall.

The immobilizer control module, ECM, and TCM cannot prevent the starter from operating in order to stop theft.

49.

Technicians are discussing the composite vehicle. Technician A states that fail-safe mode causes the transmission to default in second gear. Technician B states that fail-safe mode disables the torque converter clutch.

Who is correct?

Technician B

Technician A

Both A and B

Neither A nor B

Correct answer: Technician B

Technician B is correct. If a fault causes the TCM to enter a fail-safe mode, the torque converter clutch disables.

Technician A is incorrect. During fail-safe mode, the transmission defaults into fifth gear.

50.

Two technicians are discussing the composite vehicle. Technician A states circuit failure of either TPS will set a DTC. Technician B states a circuit failure in one TPS limits the maximum throttle opening to 35%.

Who is correct?

Both A and B

Technician A

Technician B

Neither A nor B

Correct answer: Both A and B

Both technicians are correct. If one or both of the throttle position sensors (TPS) experience a circuit failure, a DTC will be set.

One only TPS needs to have a circuit failure for the maximum throttle opening to be limited to 35%.

51.

Based on the composite vehicle, what is the normal sensor signal circuit of the knock sensor with the sensor connected?

2.50 volts

0.50 volts

4.50 volts

6.50 volts

Correct answer: 2.50 volts

Knock sensors are two-wire piezoelectric sensors that generate voltage spikes in relation to engine vibrations. In the composite vehicle, the knock sensors are located on each bank of the engine block.

Normally, the sensor signal circuit measures 2.50 volts with the sensor connected.

52.

For a MIL to turn off after a serious emission-related fault, the vehicle must have three trips without trouble, occurring in the same conditions that caused the initial fault.

These similar conditions include all EXCEPT which of the following?

Exhaust gas temperature equal to the freeze frame data

Engine speed within 375 rpm of initial freeze frame data

Engine load within 10% of the initial freeze frame data

Engine temperature equal to the freeze frame data

Correct answer: Exhaust gas temperature equal to the freeze frame data

For the MIL to turn off after a serious emission-related fault, the exhaust gas temperature doesn't need to be equal to the freeze frame data.

Three similar conditions do need to exist, including engine speed within 375 rpm, engine load within 10%, and engine temperature equal to the freeze frame data.

53.

For the composite vehicle, what should the voltage reading be at ignition switch pin B/ECM pin 222 with the ignition in the ACC position?

0 volts

12 volts

5 volts

14 volts

Correct answer: 0 volts

Referring to the ignition switch position table, there should be 0 volts at ignition switch pin B with the ignition in ACC position.

If the ignition switch was in the OFF, RUN, or START position, 12 volts would be supplied.

54.

Based on the composite vehicle, how many warm-up cycles are required for a DTC to be erased once the MIL goes off?

40

3

15

25

Correct answer: 40

Diagnostic trouble codes (DTCs) will be erased once the composite vehicle has completed 40 warm-up cycles after the malfunction indicator lamp (MIL) turns off.

After three consecutive passing trips, the MIL turns off, but the DTC and freeze frame data remain in memory.

55.

All the following can cause a hard starting condition EXCEPT:

Bad fuel pump relay

A faulty camshaft position sensor

A weak fuel pump

Fouled spark plug

Correct answer: Bad fuel pump relay

A bad fuel pump relay would prevent the engine from starting and cause a no-start condition. All the other options could result in hard starting.

56.

Which pin on an OBD II 16-pin connector supplies ground to a connected scan tool?

4

6

10

16

Correct answer: 4

Early on, manufacturers were free to use their own on-board diagnostics OBD connector design. The introduction of OBD II in 1996 brought about a standardized 16-pin design. Pin 16 is B+ (power), and pin 4 is ground. This eliminates the need for a separate power source when connecting a scan tool.

57.

Technicians are discussing the composite vehicle. Technician A says the manifold absolute pressure is 70.8 kPA when the voltage reads 3.00. Technician B says manifold absolute pressure sensor output should read 4.50 volts at KOEO (key on engine off) at sea level.

Who is correct?

Both A and B

Technician A

Technician B

Neither A nor B

Correct answer: Both A and B

Both technicians are correct. According to the MAP sensor for the composite vehicle, a voltage reading of 3.00 would indicate a manifold absolute pressure of 70.8 kPA

At sea level, the sensor output should be 4.50 volts with KOEO.

58.

The composite vehicle is being discussed. Technician A says high resistance at TCM terminal 337 could affect TCC operation. Technician B says an opening at TCM terminal 310 could affect TCC operation.

Who is correct?

Technicians A and B

Technician B

Technician A

Neither A nor B

Correct answer: Technicians A and B

Both technicians are correct. High resistance at transmission control module (TCM) terminal 337 could cause problems with the vehicle speed sensor (VSS) input to the TCM. The VSS signal is one of the main inputs to the TCM for torque converter clutch (TCC) control.

Technician B is correct because an opening at TCM terminal 310 would affect shift solenoid D performance, which would put the transmission into fail-safe mode. In fail-safe mode, the TCC is disabled.

59.

If the first numerical digit of a DTC is one, what is true about the code?

It is an OEM code

It is a generic code

It is a powertrain code

It is a vehicle system code

Correct answer: It is an OEM code

The first numerical digit of a DTC indicates whether the code is OEM or generic. If the code is generic, this digit will be a zero. If the code is OEM, this digit will be a one.

Vehicle area codes are specified by the first letter in the DTC. B indicates Body, C indicates Chassis, P indicates Powertrain, and U indicates Network. The vehicle system codes are found in the second numerical digit of the DTC.

60.

Technician A says OBD I systems have a malfunction indicator light (MIL) that goes out after the problem disappears. Technician B says the MIL in OBD II systems remains on until the vehicle runs three consecutive trips without a repeated failure.

Who is correct?

Both A and B

Technician B

Technician A

Neither A nor B

Correct answer: Both A and B

Both technicians are correct. With the OBD I system, the MIL only remains on while the fault is current. If the problem is resolved, the MIL disappears.

With an OBD II system, the vehicle must run three consecutive trips without the fault reoccurring for the light to turn off on its own.

61.

What is the maximum allowable voltage drop across a computer ground?

0.10 volts

0.30 volts

0.20 volts

0.40 volts

Correct answer: 0.10 volts

With the engine running, the maximum allowable voltage drop across a computer ground is 0.10 volts. If the voltage is higher, high resistance is indicated.

62.

Clear flood mode on the composite vehicle is initiated by the PCM during cranking when what happens?

The accelerator pedal is depressed 80% or greater with engine speed below 400 rpm

The accelerator pedal is depressed 60% or greater with engine speed below 500 rpm

The accelerator pedal is depressed 75% or greater with engine speed below 300 rpm

The accelerator pedal is depressed 90% or greater with engine speed below 600 rpm

Correct answer: The accelerator pedal is depressed 80% or greater with engine speed below 400 rpm

In the composite vehicle, the powertrain control module (PCM) will force the engine control system to enter "clear flood" mode when the accelerator pedal is depressed 80% or greater and the engine speed is below 400 rpm. This is done to prevent flooding.

With the clear flood mode activated, the ECM shuts off the fuel injectors.

63.

What is the cause of a resistance reading of 120 ohms between pin 6 and pin 14 on the OBD II diagnostic connector?

One missing or open terminating resistor

Normal operation

Short to ground

Bad diagnostic connector terminal

Correct answer: One missing or open terminating resistor

In terms of the resistance between pins 6 and 14 on the OBD II diagnostic connector, a value of 120 ohms indicates either a missing or open terminating resistor.

Normal operation shows a resistance of 60 ohms.

64.

All the following modules on the composite vehicle support communication with a scan tool and allow output control of components EXCEPT:

BCM

ECM

TCM

Instrument cluster

Correct answer: BCM

On the composite vehicle, the engine control module (ECM), transmission control module (TCM), and instrument cluster have software that supports functional testing.

The scan tool can be used for output control of components. This can be done using a scan tool connected to the OBD port.

65.

All the following are symbols or words used for the malfunction indicator light, EXCEPT:

Wrench symbol

Check engine soon

Service engine soon

ISO engine symbol

Correct answer: Wrench symbol

Depending on the manufacturer and vehicle, the MIL could be the "check engine soon," "service engine soon," or ISO engine symbol.

Some manufacturers use the wrench symbol to indicate when it's time for maintenance.

66.

On the composite vehicle, how many warmup cycles without the fault reoccurring is the freeze frame automatically cleared?

40

3

20

12

Correct answer: 40

If the vehicle completes 40 warmup cycles without the same fault recurring, the DTC and freeze frame are automatically cleared from the ECM/TCM memory.

After three consecutive passing trips, the MIL will turn off, but the DTC and freeze frame data will remain.

67.

The A/C compressor clutch will not engage on the composite vehicle. Which of the following is the MOST likely cause?

An open circuit at ECM pin 40

An open circuit at ECM pin 10

A blown fuse #2

A short to ground at ECM pin 9

Correct answer: An open circuit at ECM pin 40

Engine control module (ECM) pin 40 is the A/C pressure sensor input pin to the ECM. An open circuit here would cause the ECM to read a false high-voltage signal and assume the A/C pressure is above 450 psi. As a result, the ECM would disable A/C compressor operation.

An open circuit at ECM pin 10 is going to keep the fan from running, while a blown fuse #2 affects the keep-alive memory. A short to ground at ECM pin 9 keeps the A/C clutch relay on at all times.

68.

Technicians are discussing the composite vehicle. Technician A states when the electronic throttle control system enters limp-in operation, idle speed ranges from 1400 to 1500 rpm. Technician B states after the electronic throttle control system component replacement, an idle relearn procedure is necessary.

Who is correct?

Technician A

Technician B

Both A and B

Neither A nor B

Correct answer: Technician A

Only technician A is correct. When the electronic throttle control system goes into limp-in mode, the idle speed will range from 1400 to 1500 rpm. The spring-loaded throttle plate will also return to the default position of 15% opening, and the corresponding TAC value indicates 15% on a scan tool.

Technician B is incorrect. There's no idle relearn procedure needed after replacing a component of the electronic throttle control system.

69.

What is the dormant voltage of CAN High (H)?

0.25 volts

0.65 volts

4.65 volts

11 volts

Correct answer: 0.25 volts

Dormant CAN H has a voltage of 0.25 that rises to 0.65 volts when communication is occurring.

Dormant CAN Low (L) has a dormant voltage reading of 11 that drops to 4.65 volts when it's active.

70.

All the following are true regarding the ECM of the composite vehicle EXCEPT:

Receives power from the alternator

Provides a 5-volt supply to most of the engine sensors

Contains 120 Ω terminating resistor for the data bus

Control features include a vehicle anti-theft immobilizer system

Correct answer: Receives power from the alternator

The ECM of the composite vehicle does not receive power from the alternator. Power comes from the battery and ignition switch. Then, the ECM sends a 5-volt supply of power out to most of the engine sensors.

The ECM does contain a 120 Ω terminating resistor for the data bus and control features, such as the vehicle anti-theft immobilizer system.

71.

The composite vehicle is being discussed. If the vehicle is producing excessive NO_x, what could be the EGR position sensor voltage reading?

0.50 volts

2.50 volts

3.50 volts

4.50 volts

Correct answer: 0.50 volts

The EGR valve position sensor output varies between 0.50 volts when the valve is completely closed and 4.50 volts when the valve is completely open. When the EGR valve is stuck closed, combustion temperature increases, as does NO_x output.

A voltage reading of 4.50 indicates that the EGR valve is fully open.

72.

Technician A says when a faulty module is removed from the network, the other modules can communicate normally. Technician B says if one module fails to send needed information over the network, the other modules will set a communication failure for it.

Who is correct?

Both A and B

Technician A

Technician B

Neither A nor B

Correct answer: Both A and B

Both technicians are correct. If one module fails to send needed information over the network, the other modules will set a communication failure for it. To pinpoint the failing module, remove each module one at a time until communication resumes.

Communication should occur normally once the defective module is removed from the network.

73.

On the composite vehicle, the heated O₂ sensor output varies between which of the following?

0.0 to 1.0 volts

0 to 5 volts

1 to 2 volts

0 to 12 volts

Correct answer: 0.0 to 1.0 volts

O₂ output varies from 0.0 - 1.0 volts, depending on the conditions. They are mounted after the front catalytic converters on each bank in the exhaust pipe. These sensors are used for catalytic converter efficiency and OBD monitoring.

74.

All the following conditions cause the electronic throttle control system on the composite vehicle to be disabled EXCEPT:

Faulty idle air control valve (IAC)

Failure of both APP sensors

Correlation error

Failure of both TP sensors

Correct answer: Faulty idle air control valve (IAC)

The composite vehicle doesn't contain an IAC, throttle cable, or cruise control actuator. Instead, it uses input from two accelerator pedal position sensors to determine control of the throttle actuator.

If both of the sensors or the TP sensors fail, the throttle position will be limited to 15%, and the vehicle will be stuck in limp-in mode. The electronic throttle control system will also be disabled if there's a correlation issue.

75.

Two technicians are discussing a communications issue with the composite vehicle. Technician A states that a powertrain communications failure prevents the ECM from controlling the ignition system. Technician B states one 120-ohm terminating resistor is located in the ECM, and the other is in the instrument cluster.

Who is correct?

Technician B

Technician A

Both technicians

Neither technician A nor B

Correct answer: Technician B

Technician A is incorrect. A powertrain communications failure doesn't prevent the ECM from providing control of the vehicle's ignition system.

Technician B is correct. The powertrain communications network contains two 120-ohm terminating resistors. One is found in the ECM, and the other is in the instrument cluster.

76.

In an OBD II DLC, how many of the 16 cavities are common to all vehicles?

7 cavities

2 cavities

10 cavities

12 cavities

Correct answer: 7 cavities

According to OBD II regulations, seven cavities of the DLC are common to all vehicles. The other nine are manufacturer-specific.

77.

In the open loop, the composite vehicle determines fuel injector pulse width on which two signals?

MAF and ECT

MAP and ECT

CKP and ECT

TP and ECT

Correct answer: MAF and ECT

In the open loop, the composite vehicle determines injector pulse width based on input from the MAF (mass air flow) and ECT (engine coolant temperature). The system remains in an open loop until 10 seconds have passed since the engine start-up and the throttle position is lower than 80%.

Once in a closed loop, it bases injector pulse width on signals from the air/fuel ratio sensors.

78.

A technician is checking the air/fuel ratio sensor 1 (AFRS 1/1) performance on the composite vehicle. What does a reading of 4.3 volts indicate?

Lean air/fuel mixture of 20:1

Rich air/fuel mixture of 12:1

Lambda 0.75

Perfectly balanced air/fuel mixture of 14:7:1

Correct answer: Lean air/fuel mixture of 20:1

When the air/fuel ratio sensors on the composite vehicle read 4.3 volts, that indicates a lean air/fuel mixture of 20:1 (Lambda 1.36). When the sensors read 1.3 volts, that indicates a rich air/fuel mixture of 11:1 (Lambda 0.75).

A perfectly balanced air/fuel mixture would be 14:7:1, or 2.5 volts.

79.

Voltage drop tests should be run in which of the following conditions?

KOER (Key On Engine Running)

KOEO (Key On Engine Off)

Without the key in the ignition

Any condition

Correct answer: KOER (Key On Engine Running)

A voltage drop test measures the difference in voltage between two points in a live circuit.

Voltage drop tests should always be run with the key in the ignition and the engine running. If not, excessive voltage drop may not be noticed.

80.

What gear is the composite vehicle in when SS A, SS B, SS C, and SS D are all on?

Second

First

Third

Fourth

Correct answer: Second

The transmission application chart shows that when SS A, SS B, SS C, and SS D are applied, the vehicle is in second gear.

The first and fourth gears show SS A and SS C on with SS B and SS D off. The third gear shows SS A and SS B on with SS C and SS D off.

81.

Technician A says voltage drop cannot be measured by connecting a voltmeter directly across a circuit load. Technician B says voltage drop can be measured by connecting a voltmeter between the ground at the circuit load and the source of the ground, and then doing the same to the positive (from the positive at the load to the source of the positive).

Who is correct?

Technician B

Technician A

Both A and B

Neither A nor B

Correct answer: Technician B

Technician B is correct. Voltage drop can be measured one of two ways: by connecting a voltmeter directly across a circuit load or by connecting a voltmeter between the ground and the positive side of the circuit load, then to the negative side, and subtracting the second reading from the first.

82.

Technician A says the composite vehicle will store a network DTC if the bus is shorted to ground. Technician B says the data bus in the composite vehicle will be shut down if one of the two modules containing a terminating resistor is not connected to the network.

Who is correct?

Technician A

Technician B

Both A and B

Neither A nor B

Correct answer: Technician A

Only technician A is correct. The composite vehicle will store a DTC if either data line is shorted to power or ground, one data line is shorted to the other data line, or there is an open in either data line to a module.

Technician B is wrong because the data bus remains operational when one of the two modules containing a terminating resistor is not connected to the network. The data bus will fail when both terminating resistors are not connected to the network.

83.

The composite vehicle is being discussed. Technician A says an open circuit at ground 560 would prevent the instrument cluster from working. Technician B says a blown fuse #43 would prevent the instrument cluster from working.

Who is correct?

Both A and B

Technician A

Technician B

Neither A nor B

Correct answer: Both A and B

Both technicians are correct. Fuse #43 provides power to the instrument cluster and the immobilizer module. With a blown fuse, the instrument panel would be unable to operate.

560 is the ground for the instrument cluster. If there was an opening in this circuit, the instrument panel wouldn't operate.

84.

On OBD 1 systems, ECM driver damage may occur when the current draw exceeds which of the following?

750 milliamps

1500 milliamps

250 milliamps

100 milliamps

Correct answer: 750 milliamps

Shorted electrical components, such as a relay or solenoid, can damage sensitive engine control module (ECM) driver circuits. This typically happens with an OBD I system when the current draw exceeds 750 milliamps. A current draw test can be performed to diagnose such a condition.

C. Ignition System Diagnosis

C. Ignition System Diagnosis

85.

Two technicians are discussing the composite vehicle. Technician A says when the ignition switch is in the ACC position, the pin a/ECM pin 221 reads 12 volts. Technician B says when the ignition switch is in the OFF position, pin d/ECM pin 224 reads 12 volts.

Who is correct?

Both A and B

Technician A

Technician B

Neither A nor B

Correct answer: Both A and B

Both technicians are correct. With the ignition switch in the ACC position, pins a, c, and d all receive 12 volts of power, while pin b receives 0. When the ignition switch is in the OFF position, pins b, c, and d all receive 12 volts of power, while pin a receives 0.

86.

A technician connects a test light between a coil pack connector B+ terminal and the ground. Which of the following should be seen when the engine is cranked?

The test light should stay steadily illuminated.

The test light should flicker.

The test light should remain off.

The test light should shine momentarily and then go off.

Correct answer: The test light should stay steadily illuminated.

Most coil packs are ground-controlled, which means the engine control module (ECM) switches the ground side of the circuit on and off. Battery voltage is applied to the coil at all times, which means the test light should stay illuminated.

The absence of primary switching or battery voltage may cause a hard start or no-start condition.

87.

An ignition module fails repeatedly. Which of the following is the LEAST likely cause?

Open ground to module

Engine overheating

A missing heat shield

Shorted ignition primary windings

Correct answer: Open ground to module

An open ground to module would prevent the module from working but would not cause it to fail repeatedly. Anything that increases the temperature of an ignition module can cause it to fail prematurely. Engine overheating or a missing heat shield would increase temperatures where the module is located. A shorted ignition primary winding would cause excessive current draw and increase heat.

88.

On the composite vehicle, coil primary resistance in the distributorless ignition system should measure within approximately what range?

0.5 to 1.5 ohms

0.3 to 5 ohms

0.5 to 15 ohms

0.7 to 10 ohms

Correct answer: 0.5 to 1.5 ohms

On the composite vehicle, ignition primary resistance in the distributorless ignition system should measure between 0.5 and 1.5 ohms, while ignition secondary resistance should measure between 8,000 and 12,000 ohms.

89.

All the following are true regarding the composite vehicle's ignition system EXCEPT:

The ignition module controls ignition timing.

Ignition timing is not adjustable.

The crankshaft sensor input is used for base timing calculation.

The system is distributorless.

Correct answer: The ignition module controls ignition timing.

The composite vehicle does not use an ignition control module. Instead, ignition timing is directly controlled by the engine control module (ECM).

The ignition timing is not adjustable, and the crankshaft sensor input is used for the base timing calculation. This system is distributorless, using a coil-on plug configuration.

90.

The ignition system secondary voltage is measured in which of the following units?

Kilovolts

Millivolts

Volts

Megavolts

Correct answer: Kilovolts

The secondary side of the ignition system is the high-voltage side, which is measured in kilovolts. The primary side of the ignition system is measured in volts.

91.

Which component is NOT part of the primary portion of the ignition system?

Spark plugs

Battery

Primary coil winding

Triggering mechanism

Correct answer: Spark plugs

The battery, triggering mechanism, and primary coil windings are all part of the primary portion of the ignition system. The primary system also contains the ignition switch,

The secondary system contains the spark plugs and secondary coil windings.

92.

All the following are part of the secondary ignition circuit EXCEPT:

Triggering mechanism

Secondary coil windings

Spark plugs

Spark plug wires

Correct answer: Triggering mechanism

The primary portion of the ignition system consists of the low voltage components, including the battery, ignition switch, primary coil windings and triggering mechanism (crankshaft position sensor), and switching device.

The secondary portion of the ignition system consists of the high-voltage components, including the secondary coil windings, spark plug wires, and spark plugs.

93.

Technician A says in a waste spark system, the ignition components from two companion cylinders form a series circuit. Technician B says in a waste spark system, the cylinder that is on the compression stroke is referred to as the "waste" cylinder.

Who is correct?

Technician A

Neither A nor B

Technician B

Both A and B

Correct answer: Technician

Technician A is correct. In a waste spark system, the ignition components from two companion cylinders form a series circuit, not a parallel circuit.

Technician B is incorrect. The cylinder that is on the compression stroke is referred to as the "event" cylinder, whereas the cylinder that is on the exhaust stroke is referred to as the "waste" cylinder.

94.

The composite vehicle is being discussed. Technician A says the firing order is 1-2-3-4-5-6. Technician B says the ignition coil drivers are in the ECM.

Who is correct?

Both A and B

Technician A

Technician B

Neither A nor B

Correct answer: Both A and B

Both technicians are correct. The firing order for the composite vehicle is 1-2-3-4-5-6. Cylinders 1, 3, and 5 are on bank 1 and cylinders 2, 4, and 6 are on bank 2.

On the composite vehicle, the ignition coil drivers are built into the ECM. The ECM is responsible for ignition timing.

95.

Typically, the difference in firing kV between the lowest and highest cylinders in an ignition waveform pattern should not exceed what percent?

20%

10%

30%

40%

Correct answer: 20%

Typically, the difference in firing kV between the lowest and highest cylinders in an ignition waveform pattern should not exceed 20%. Any greater discrepancy indicates a problem with that particular cylinder.

The only time that a 20% difference is considered normal is with a waste spark ignition system.

96.

The dwell section of an ignition waveform pattern begins when what happens?

The coil energy has been completely exhausted.

The spark plug fires.

The primary circuit current is interrupted.

The switching transistor turns off.

Correct answer: The coil energy has been completely exhausted.

The dwell section of an ignition waveform pattern begins when the coil energy has been completely exhausted. A downward spike indicates the switching transistor has turned on, and several oscillations follow as a result of inductive reactance.

97.

Technician A says "direct ignition" is a term for ignition systems that use a distributor. Technician B says direct ignition systems are designed to minimize secondary resistance.

Who is correct?

Technician B

Technician A

Both A and B

Neither A nor B

Correct answer: Technician B

Technician B is correct. Direct ignition systems are designed to minimize secondary resistance by eliminating the plug wires.

Technician A is incorrect. The term "direct ignition" is used to describe ignition systems that use individual coils for each cylinder.

98.

Which type of crank sensor produces an AC voltage signal?

Permanent magnet

Hall-effect

Reed switch

Photo-optical

Correct answer: Permanent magnet

A permanent magnet crankshaft sensor produces its own AC voltage when a reluctor wheel passes by. The AC voltage created is in direct relation to the engine speed.

The other types of sensors all produce a DC voltage signal.

99.

The composite vehicle is being discussed. Technician A says the coils are controlled by drivers inside the ECM. Technician B says the ECM supplies power to the coils.

Who is correct?

Technician A

Technician B

Both A and B

Neither A nor B

Correct answer: Technician A

Only technician A is correct. The coils are controlled by drivers inside the engine control module (ECM) that switch the path to ground on and off. The ECM also controls the ignition timing.

Technician B is incorrect because the power source comes from fuse #4. The ECM is only responsible for grounding the coils.

100.

The ignition waveform pattern for a vehicle shows the sparklines for all cylinders sloping upward. Which of the following is the MOST likely cause?

Excessive EGR

A bad spark plug wire

A worn spark plug

A bad fuel injector

Correct answer: Excessive EGR

The sparkline will slope upward as a result of high resistance from a lean air/fuel mixture or excessive exhaust gas recirculation (EGR). If all the cylinders show sparklines that slope upward, the cause is something common to all cylinders.

The other issues should only affect certain cylinders, not all of them.
