ASE A Series - Quiz Questions with Answers

A1: Engine Repair

1.

Two technicians are discussing the engine cooling system. Technician A says *all* coolant contains ethylene glycol. Technician B says coolant color reflects the additives it contains.

Who is correct?

- **Neither A nor B**
- Technician A
- Both A and B
- Technician B

Correct answer: Neither A nor B

Neither technician is correct. Until the mid-1990s, ethylene-glycol-based engine coolant was standard. Since then, most automakers have switched to propylene-glycol-based coolant, which is less toxic and lasts longer. All coolant and additives start out transparent and nearly colorless. Coolant color, such as yellow, pink, red, blue, and others, is simply the result of dye added to differentiate one brand from another.

2.

Which two methods can be used to repair a crack in an aluminum cylinder head?

Both metal-stitching and Heliarc (TIG) welding

Metal-stitching and mig welding

Heliarc (TIG) welding and stick welding

Flux welding and MIG welding

Correct answer: Both metal-stitching and Heliarc (TIG) welding

Some cracks in aluminum heads can be repaired by metal-stitching, drilling, and tapping specialized bolts into the crack to seal it. Cracks in aluminum can also be repaired by TIG welding, also called Heliarc, developed specifically for use on aluminum.

3.

Technician A says a blocked cooling passage can cause a valve to burn. Technician B says a corroded head gasket can cause a valve to burn.

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. Excessive cylinder head temperatures can cause a valve to burn. These high temperatures can result from clogged cooling system passages or a corroded head gasket that is changing the coolant flow.

4.

During which stroke are both the intake and exhaust valves closed while the piston is moving upward?

Compression stroke

Intake stroke

Power stroke

Exhaust stroke

Correct answer: Compression stroke

Both the intake and exhaust valves are closed during the compression stroke. During this time, the piston is also moving upward in the cylinder, compressing the air/fuel mixture.

5.

Two technicians are discussing harmonic balancer installation. Technician A says some harmonic balancers are installed using a tube-type driver. Technician B says a hammer can be used to install a press-fit harmonic balancer.

Who is correct?

Technician A

Technician B

Both A and B

Neither A nor B

Correct answer: Technician A

Depending on the vehicle, the harmonic balancer is installed in one of three ways:

- *Pulling it in place with the attaching bolt*
- *Installing it with a special tool*
- *Using a tube-type driver*

Technician B is incorrect. Using a hammer to install a press-fit harmonic balancer can damage the balancer, crankshaft, or thrust bearing. Always use the proper tool to install the harmonic balancer.

6.

How much vacuum should a healthy engine produce at sea level?

17 to 22 in. Hg

15 to 20 in. Hg

12 to 17 in. Hg

20 to 24 in. Hg

Correct answer: 17 to 22 in. Hg

Manifold vacuum is developed by the pistons as they move up and down in the cylinder. Engine performance problems will affect vacuum readings. A healthy engine should produce 17 to 22 in. Hg vacuum at sea level.

7.

What grit size hone should be used on an engine that has chrome rings?

180 grit

200 grit

220 grit

240 grit

Correct answer: 180 grit

The surface finish should match the surface required for the type of piston rings to be used. In the case of chrome rings, 180 grit should be used.

8.

All of the following should be replaced during timing belt service **except**:

Harmonic balancer

Water pump

Crankshaft seal

Tensioner assembly

Correct answer: Harmonic balancer

Although the harmonic balancer must be removed to gain access to the timing belt, it does not need to be replaced unless it is damaged. The following items should be replaced during timing belt service as a preventative measure:

- *Tensioner assembly*
- *Idler pulley(s)*
- *Water pump (if driven by the timing belt)*
- *Camshaft seals*
- *Crankshaft seal*

9.

Variable valve timing is being discussed. Technician A says exhaust cam phasing mainly helps the engine produce more power. Technician B says intake cam phasing mainly helps reduce emissions.

Who is correct?

- **Neither A nor B**
- Technician A
- Technician B
- Both A and B

Correct answer: Neither A nor B

The variable valve timing (VVT) on most systems uses an electronically controlled cam phaser. This phaser can alter the relationship of the camshaft from 15 degrees retard to 25 degrees advance. Both technicians are incorrect: exhaust cam phasing mainly helps reduce exhaust emissions, and intake cam phasing mainly helps the engine produce more power.

10.

What kind of head gasket is **not** likely to be used on a modern engine with aluminum heads and a cast iron block?

Shim steel

Perforated metal core

Multilayer steel (MLS)

Graphite

Correct answer: Shim steel

Because aluminum and cast iron expand and contract at different rates, the differential would grind down a shim steel head gasket. This wasn't a problem with older cast iron cylinder heads mounted on cast iron blocks, which expanded at the same rate.

Multilayer steel, graphite, and perforated metal core head gaskets allow for some slip without wearing on gasket facings or creating head gasket leaks.

11.

What is valve spring installed height?

The distance between the spring seat and the underside of the valve spring retainer

The distance between the spring seat and the valve seat

The distance between the spring retainer and the rocker arm

The distance between the spring retainer and the valve stem

Correct answer: The distance between the spring seat and the underside of the valve spring retainer

Valve spring installed height is the distance between the spring seat and the underside of the valve spring retainer. This measurement is taken during cylinder head rebuilding because, after machining, the top of the valve projects farther than before.

12.

Considering a standard production four-stroke engine, how often does the power stroke occur on an 8-cylinder engine?

Every 1/4 rotation (90°)

Every 1/2 rotation (180°)

Every 1/8 rotation (45°)

Every 1/16 rotation (22.5°)

Correct answer: Every 1/4 rotation

The number of degrees that the crankshaft rotates between power strokes is expressed as an angle. Each cycle in a four-stroke engine requires two rotations of the crankshaft, or 720 degrees of rotation (360° x 2). To find the answer to this question, divide two rotations (720°) by the number of cylinders. For our V8 engine, 720° / 8 = 90°, or every 1/4 rotation.

13.

Two technicians are discussing hydraulic valve lifters. Technician A says some lifters must be bled prior to installation. Technician B says some lifters can be bled by operating the engine at fast idle.

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. Some lifters can be bled by running the engine at fast idle, but others must be bled prior to installation. Bench bleeding hydraulic lifters is accomplished by putting the lifter in a container of oil and using a tool to depress the oil passage check ball. Check the repair manual for procedures specific to the engine.

14.

After a new engine is installed, how soon should the engine oil be changed?

500 miles

100 miles

200 miles

1,000 miles

Correct answer: 500 miles

After a new engine is installed, the oil should be changed within 500 miles or 20 hours of operation.

15.

Two technicians are discussing valve seat width. Technician A says an excessively wide valve seat tends to develop deposits that can keep the valve from closing. Technician B says if the valve seat is too narrow, it can lead to valve burning.

Who is correct?

Both A and B

A only

B only

Neither A nor B

Correct answer: Both A and B

Valves with narrow valve seat widths do not transfer sufficient heat to the cooling jacket. Wider valve seats can develop deposits which may interfere with valve seating.

16.

A tapping noise is heard upon start-up that goes away when the engine is warm. The noise is most noticeable at idle.

Which of the following is the **most** likely cause?

Piston slap

A cracked flex plate

Excessive rod-bearing clearance

Main bearing noise

Correct answer: Piston slap

Piston slap is generally described as a tapping noise. The noise is most noticeable upon start-up and goes away as the engine warms up and the piston expands. In extreme cases, piston slap will only diminish as the engine warms.

Rod-bearing noise is usually described as a metallic rapping that is proportional to engine speed. A cracked flex plate typically makes a rattling noise that changes intensity when the gear selector is moved. Main bearing noise is usually described as a deep metallic knocking.

17.

Which of the following is **false** regarding high compression engines?

They require more advanced ignition timing to prevent spark knock

They can produce more power than lower compression engines

They can be difficult to crank, especially when hot

They can achieve better fuel economy than lower compression engines

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Correct answer: They require more advanced ignition timing to prevent spark knock

A high compression engine requires less ignition advance to prevent spark knock. High compression engines do produce more power, get better fuel economy, and are harder to crank.

In a lower compression engine, more ignition advance is possible without spark knock.

18.

Two technicians are discussing valve seating. Technician A says poor valve seating can be caused by hard carbon deposits. Technician B says insufficient valve clearance can lead to poor valve seating.

Who is correct?

- **Both A and B**
- Technician B
- Technician A
- Neither A nor B

Correct answer: Both A and B

Technician A is correct. Poor valve seating can be caused by hard carbon deposits. Technician B is also correct. Valve clearance decreases as the engine heats up. If valve clearance is insufficient, the valve may not fully seat when hot.

19.

What type of piston uses replaceable wrist pin clips?

Full floating

Press fit

Taper face

Positive twist

Correct answer: Full floating

Full floating pistons use wrist pins held in by clips.

Pressed fit wrist pins are held by interference with the connecting rod small end. Taper face and positive twist are piston ring types, not piston types.

20.

Which of the following is **false** regarding compression testing?

Compression readings that improve during a "wet" compression test indicate defective valves

The ignition system should be disabled prior to performing the test

A low reading on the initial puff indicates potentially weak piston rings

All cylinders should measure within 10% of each other

Correct answer: Compression readings that improve during a "wet" compression test indicate defective valves

Compression readings that improve during a "wet" compression test indicate defective piston rings, not defective valves.

The other options are all true: the ignition system should be disabled prior to performing the test, a low reading on the initial puff indicates potentially weak piston rings, and the difference between the highest reading and lowest reading should be within 10%.

21.

All of the following are ways of checking for a failed head gasket **except**:

Look for blue smoke coming from the tailpipe

Look for bubbles in the coolant

Use an exhaust gas analyzer

Perform a chemical test on the coolant

Correct answer: Look for blue smoke coming from the tailpipe

Blue smoke coming from the tailpipe indicates that the engine is burning oil. This is typically caused by problems such as worn rings, worn valve guides, or damaged cylinders.

A failed head gasket may be identified by white exhaust smoke, bubbles in the coolant, exhaust gas analyzer readings, or chemical test (combustion leak tester).

22.

All of the following valve stem-to-guide clearance measurements are within specification **except**:

Intake valve: 0.005"

Exhaust valve: 0.002"

Intake valve: 0.003"

Exhaust valve: 0.004"

Correct answer: Intake valve: 0.005"

General recommendations for valve stem-to-guide clearance is 0.001" to 0.003" for intake valves and 0.002" to 0.004" for exhaust valves.

23.

Technician A says exhaust back pressure can be tested with a vacuum-pressure gauge. Technician B says at idle, back pressure should be less than 1.5 PSI.

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. Exhaust back pressure can be tested with either a vacuum-pressure gauge or a pressure gauge. Back pressure should be less than 1.5 PSI at idle and 2.5 PSI at 2,500 rpm.

24.

Two technicians are discussing cylinder head installation. Technician A says torque-to-yield bolts can be reused. Technician B says torque-to-yield bolts are tightened to a specified torque, then turned an additional number of degrees.

Who is correct?

Technician B

Technician A

Both A and B

Neither A nor B

Correct answer: Technician B

Technician B is correct: torque-to-yield bolts are tightened to a specified torque, then turned an additional number of degrees, stretching them to achieve proper clamp force. Technician A, however, is incorrect: torque-to-yield bolts can break off or fail prematurely if reused.

Always check the repair manual for head bolt specifications.

25.

Generally, total camshaft runout should not exceed:

0.002"

0.001"

0.005"

0.006"

Correct answer: 0.002"

Runout is the distance the camshaft wobbles out of its axis of rotation. It is checked by placing the camshaft in V-blocks and measuring with a dial indicator. Camshaft runout over 0.002" is considered excessive, requiring replacement of the camshaft.

26.

Two technicians are discussing oil leaks. Technician A says a plugged PCV valve can cause gasket failure. Technician B says over-tightening can cause gasket failure.

Who is correct?

Both A and B

Technician A

Technician B

Neither A nor B

Correct answer: Both A and B

Over-tightening a valve cover can deform the gasket, leading to an oil leak. A plugged PCV valve can also cause gasket failure by increasing crankcase pressure.

27.

Technician A says a bent connecting rod can be repaired by straightening. Technician B says a cracked connecting rod can be repaired by welding.

Who is correct?

Technician A

Technician B

Both A and B

Neither A nor B

Correct answer: Technician A

While bent or twisted connecting rods may be salvageable (straightened and machined), a cracked or broken connecting rod must be replaced. Usually, twisted or deformed connecting rods are simply replaced.

28.

All of the following are true regarding valve train noise **except**:

Valve train noise is characterized by a deep knocking sound

Some manufacturers consider valve ticking right after startup normal

Valve train noise can be caused by aeration

Valve train noise can be caused by a worn camshaft lobe

Correct answer: Valve train noise is characterized by a deep knocking sound

Valve train noise is usually described as a ticking sound. A deep knocking sound would be consistent with a lower-engine bearing noise.

All of the other options are true. Some manufacturers consider valve ticking right after startup normal, especially if the noise goes away after 10 to 30 seconds. Valve train noise can be caused by aeration (air mixed with water) or a worn camshaft lobe.

29.

Generally, timing chain slack is considered excessive when it exceeds:

- **1/2"**
- 1/4"
- 1/8"
- 1/16"

Correct answer: 1/2"

Generally, a timing chain and sprockets are due for replacement when timing chain slack exceeds 1/2". However, it's a good idea to replace the chain and sprockets during an engine rebuild, regardless of the measurements.

30.

Two technicians are discussing repairs to a warped cylinder head from a V6 OHC engine. Technician A says removing too much material will increase compression. Technician B says removing too much material could lead to an intake gasket leak.

Who is correct?

Both A and B

Technician A

Technician B

Neither A nor B

Correct answer: Both A and B

Removing material from the cylinder head changes the relationship between the cylinder head and the engine block, as well as all moving and stationary components in and attached to them. The compression ratio and compression will increase because the pistons and valves are now closer together. Because the intake manifold attaches to both cylinder heads in a V6 engine, it may not seal properly because one head may be lower than the other.

Milling too much from the cylinder head or engine block can also lead to piston-to-valve interference, detonation from high compression, and retarded valve timing.

31.

Timing belts should be replaced at which of the following intervals?

- **60,000 to 100,000 miles**
- 60,000 to 90,000 miles
- 100,000 to 120,000 miles
- 90,000 to 120,000 miles

Correct answer: 60,000 to 100,000 miles

Timing belts have a limited service and should be replaced every 60,000 to 100,000 miles.

32.

A cylinder leak-down test is being performed. Generally, what percent leakage is considered "good", indicating a healthy engine?

10%

20%

30%

40%

Correct answer: 10%

Generally, cylinder leakage up to 10% indicates a good, healthy engine. Leakage over 20% indicates a problem in need of further diagnosis.

33.

All of the following are examples of combustion chamber designs **except**:

Radial

Wedge

Pent-roof

Hemispherical

Correct answer: Radial

Wedge, pent-roof, and hemispherical are all examples of combustion chamber designs. Radial is not a combustion chamber design, but a type of engine in which the cylinders radiate out from the crankcase.

34.

Technician A says a cylinder should have a maximum out-of-round measurement of no more than 0.003". Technician B says a cylinder should not have more than 0.005" of taper.

Who is correct?

Both A and B

Technician A

Technician B

Neither A nor B

Correct answer: Both A and B

A cylinder should be checked for out-of-round and taper to determine if it is serviceable. Both technicians are correct, because a cylinder should have a maximum out-of-round measurement of no more than 0.003" and it also should not have more than 0.005" of taper.

35.

Which of the following is the **least** likely cause of engine overheating?

Faulty intake air temperature sensor

Low oil level

Defective thermostat

Low coolant

Correct answer: Faulty intake air temperature sensor

A thermostat that is defective and stuck closed will not allow coolant to circulate through the system, which will cause the engine to overheat. If the coolant level is low, it will not be able to cool the engine, causing the engine to overheat.

A faulty intake air temperature sensor may cause drivability concerns, but it is not likely to cause engine overheating.

36.

Which of the following is **true** regarding main bearings?

Oil clearance is usually between 0.0005" and 0.0025"

The bearing caps are interchangeable and can be mounted in any order

Oil clearance can be reduced by 0.001" by using 0.0005" undersized bearing shells

Upper and lower bearings are all identical and can be installed in any order

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Correct answer: Oil clearance is usually between 0.0005" and 0.0025"

Typically, oil clearance is between 0.0005" and 0.0025".

None of the other options are true. Each of the bearing caps fits in only one location and they are not interchangeable. The upper bearing insert has an oil feed hole, but not all lower bearing inserts do. Oil clearance can be reduced by 0.001" by replacing both bearing shells with bearing shells that are 0.001" undersized.

37.

Depending on the engine configuration, the camshaft(s) can be driven by:

Any of these

Timing gears

Timing chains

Timing belts

Correct answer: Any of these

Depending on the type of engine, the camshaft(s) can be driven by a belt, chains, or gears.

38.

Two technicians are discussing resurfacing a warped cylinder head. To restore surface flatness, 0.020" of material was removed. When the head is reinstalled on the block, Technician A says the compression ratio will be higher than before and Technician B says valve timing will be affected.

Who is correct?

Both A and B

Technician B

Technician A

Neither A nor B

Correct answer: Both A and B

Resurfacing or milling the cylinder head or engine block changes the relationship between the two. Cylinder volume is reduced, increasing the compression ratio. The distance between the crankshaft and the camshaft is reduced, resulting in retarded valve timing.

39.

Two technicians are discussing an overheating engine. Technician A says this can lead to oil varnish deposits. Technician B says this can lead to oil sludge deposits.

Who is correct?

Technician A

Technician B

Both A and B

Neither A nor B

Correct answer: Technician A

Technician A is correct that varnish can be caused by an engine that is running too hot. This is the result of high temperatures burning off additives in the oil. Delaying oil change services can result in a similar condition.

Technician B is wrong because sludge is typically formed by engine operating temperatures that are too low. Excessive idling and short trips don't allow the engine to get up to operating temperature, leading to a similar condition.

40.

Generally, what is the maximum amount of connecting rod twist that is considered acceptable?

0.002"

0.006"

0.004"

0.000"

Correct answer: 0.002"

Connecting rod twist is the difference in parallelism between the hole at the small end and the hole at the big end. In most cases, the maximum acceptable amount of twist is 0.002".

41.

Which of the following is **true** about engine oil viscosity?

Thicker oil provides better high-temperature protection

Oil gets thinner as it cools

Thicker oil provides better fuel economy

Thinner oil makes cold starting more difficult

Correct answer: Thicker oil provides better high-temperature protection

Oil that is thicker provides better protection than thinner oil.

None of the other options are true: oil gets thicker as it cools, thinner oil provides better fuel economy, and thinner oil makes cold starting easier.

42.

An engine vacuum test is being performed. The needle on the vacuum gauge fluctuates rapidly at idle and steadies out as engine speed is increased.

Which of the following is the **most likely** cause?

Worn valve guides

Normal engine function

Choked catalytic converter

A burnt valve

Correct answer: Worn valve guides

A vacuum gauge that fluctuates rapidly at idle and steadies out as engine speed is increased indicates worn valve guides.

Normal engine function would produce a steady 17-21 in. Hg at idle. A leaking head gasket would cause the gauge to vibrate as it moves through a range from above to below normal. A burnt valve would be indicated by a gauge that drops 1 or 2 Hg from the normal reading.

43.

What is the pressure rating of most OEM radiator caps?

14 to 16 PSI

10 to 12 PSI

17 to 20 PSI

21 to 23 PSI

Correct answer: 14 to 16 PSI

Most OEM radiator caps are rated at a nominal pressure of between 14 and 16 PSI. This is usually written on the cap.

44.

Which type of valve stem seals are usually fitted to valves in modern engines?

Positive

O-ring

Umbrella-style

Lip

Correct answer: Positive

Positive valve stem seals allow very little oil to pass through to the valve guides, for lubrication. Pre-1990s valve stem seals, such as umbrella-style and deflector o-ring seals, have higher oil consumption and increased exhaust emissions. Lip seals are not used on valve stems.

45.

An oil pump is being checked for wear. Which of the following is a reasonable gear end play clearance measurement?

0.004 inches

0.0015 inches

.12 inches

0.010 inches

Correct answer: 0.004 inches

When checking an oil pump during an engine rebuild, the clearances in the pump should be measured. This includes the space between the gears and housing, the teeth of the two gears, and the space between the side of the gears and the front pump cover. Typical gear end play clearance is 0.004 inches.

46.

Two technicians are discussing valve replacement during an engine rebuild. This high-performance engine was originally equipped with titanium intake and exhaust valves.

Technician A says cheaper stainless steel valves won't make any difference to the driver. Technician B says heavier stainless steel valves will result in poor engine performance.

Who is correct?

Technician B only

Technician A only

Both A and B

Neither A nor B

Correct answer: Technician B only

Titanium valves are about half the weight of stainless steel valves, resulting in higher engine RPM operation. If the titanium valves are replaced with stainless steel, the engine will not be able to rev as high, which will reduce power output.

47.

The relief valve located in the oil pump is used to regulate what?

Pressure

Volume

Displacement

Flow

Correct answer: Pressure

The relief valve located in the oil pump is used to regulate pressure. This valve bleeds off excess oil pressure to the inlet side of the pump. Oil pumps are positive displacement pumps, which means the volume of oil is the same for every rotation of the pump.

48.

Two technicians are discussing resurfacing the engine block on an OHC engine. Technician A says removing too much material will cause the valve timing to be retarded. Technician B says removing too much material from an OHC engine will cause pre-ignition.

Who is correct?

- **Both A and B**
- Technician B
- Technician A
- Neither A nor B

Correct answer: Both A and B

Removing material from an OHC cylinder head reduces the distance between the camshaft and the crankshaft, causing valve timing to be retarded. The higher compression ratio can cause pre-ignition or detonation.

49.

In regard to engine blocks, what is a bedplate?

A structural member that supports the crankshaft

The top surface of the block

The component that ties the main bearing caps together

The part of the block where the crankshaft rides

Correct answer: A structural member that supports the crankshaft

The bedplate is a structural member that supports the crankshaft.

The top surface of the block is referred to as the block deck. A girdle ties all the main bearing caps together. The part of the block where the crankshaft rides is referred to as the bore.

50.

An oil pressure test is being performed. Technician A says that at 3500 RPM, the oil pressure should read about 25 PSI. Technician B says the oil pressure should read at least 45 PSI.

Who is correct?

Neither Technician A nor B

Technician A

Technician B

Both Technician A and B

Correct answer: Neither Technician A nor B

Both technicians are wrong. Most manufacturers recommend a minimum oil pressure of 10 PSI per 1000 RPM. Therefore, at 3500 RPM, the oil pressure should be about 35 PSI.

51.

The front-to-rear position of the crankshaft in the block is maintained by which of the following?

Thrust bearings

Main bearings

Rod bearings

Camshaft bearings

Correct answer: Thrust bearings

The thrust bearings help the crankshaft endure longitudinal loads from the transmission and maintain the front-to-rear (longitudinal) position of the crankshaft in the block.

Main bearings locate and support the crankshaft in the engine block radially, rod bearings are the bearings at the crankshaft end of the connecting rod, and camshaft bearings locate and support the camshaft.

52.

All of the following parts must be removed when disassembling an OHC engine, **except**:

Push rods

Camshaft(s)

Timing belt, chain, or gears

Harmonic balancer

Correct answer: Push rods

Push rods are not used in OHC engines, only in OHV engines. The other parts, such as camshaft, harmonic balancer, and timing components, are common to both engine types.

53.

Which of the following is **true** regarding piston rings?

A taper face ring contacts the cylinder wall at the lower edge of the piston ring

Too little ring gap will allow excessive blowby

Butt gap piston rings are used to reduce high pressure combustion gases

The piston ring gap blocks all leakage past the compression ring

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Correct answer: A taper face ring contacts the cylinder wall at the lower edge of the piston ring

A taper face ring does indeed contact the cylinder wall at the lower edge of the piston ring.

The other options are incorrect. Too much ring gap, not too little, will allow excessive blowby. Tapered or seal cut rings, not butt gap rings, are used to reduce high pressure combustion gases. Finally, the piston ring allows some leakage past the compression ring. This leakage helps provide pressure to the second ring to develop a sealing force.

54.

All of the following must be removed when disassembling an overhead cam (OHC) engine **except**:

Push rods

Camshaft

Timing belt

Valve springs

Correct answer: Push rods

Push rods are only found in overhead valve (OHV) engines. Push rods transfer the motion of the camshaft to rocker arms, which transfer that motion to the valves. All of the other components can be found in an OHV engine and must be removed during disassembly.

55.

All of the following may cause an engine to overheat **except**:

Stuck open thermostat

Seized water pump

Air in the cooling system

Cracked cylinder head

Correct answer: Stuck open thermostat

A thermostat that is stuck open will not allow the engine to reach operating temperature. As a result, the engine will not overheat, but run too cool.

A seized water pump, air in the cooling system, or a cracked cylinder head can cause engine overheating.

56.

Two technicians are discussing the performance benefits of a variable intake manifold. Technician A says short runners improve high RPM power output. Technician B says long runners improve low RPM torque output.

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. A variable intake system uses solenoid-controlled valves to provide short runners for high RPM power and long runners for low RPM torque.

57.

All of the following are true regarding crankshaft bearings **except**:

Bearing crush holds the bearing shell in the housing while the engine is assembled

They can be measured with Plastigage

Aluminum bearings work well in high load conditions

It is recommended that rod and main bearings be replaced at the same time

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Correct answer: Bearing crush holds the bearing shell in the housing while the engine is assembled

Bearing crush holds the bearing shell in place and keeps it in place while the engine runs. It's bearing spread that holds the bearing shell in the housing while the engine is assembled.

All of the other options are true. The characteristics of aluminum bearings work well in high load conditions, bearings can be measured with Plastigage, and it is recommended that rod and main bearings be replaced at the same time.

58.

Technician A says valve lift height depends on the camshaft opening ramp.
Technician B says valve lift height depends on the camshaft heel.

Who is correct?

Neither A nor B

A only

B only

Both A and B

Correct answer: Neither A nor B

Both technicians are incorrect. Valve lift height depends on camshaft lobe lift multiplied by rocker arm ratio (if any).

Camshaft opening ramp location, in crankshaft degrees, determines when the valve starts to open.

There is no valve lift when the lifter or rocker is on the camshaft heel or base circle.

59.

Technician A says engines with hydraulic lifters do not require valve lash adjustment. Technician B says engines with solid lifters require valve lash adjustment.

Who is correct?

Technician B

Technician A

Both A and B

Neither A nor B

Correct answer: Technician B

Technician B is correct. OHV engines with mechanical lifters have an adjustment screw on the rocker arm or an adjustment nut at the ball pivot. Valve clearance on some OHC engines is set by shims.

Technician A is incorrect because hydraulic lifters do require valve lash adjustment.

60.

Two technicians are discussing engine balance shafts. Technician A says some balance shafts turn at crankshaft speed but in the opposite direction. Technician B says some balance shafts turn at twice engine speed.

Who is correct?

- **Both A and B**
- Technician A
- Technician B
- Neither A nor B

Correct answer: Both A and B

Balance shafts are used in some engines to dampen normal engine vibrations. Some engines use a balance shaft turning at crankshaft speed in the opposite direction, and other engines use two shafts turning at double engine speed.

61.

Air is heard escaping from the oil fill cap during a cylinder leakdown test. This could be caused by which of the following?

Worn piston rings

A blown head gasket

A leaking intake valve

A leaking exhaust valve

Correct answer: Worn piston rings

Air heard escaping from the oil fill cap during a cylinder leakdown test indicates worn or broken rings.

If air is seen bubbling in the radiator, suspect a leaking head gasket or cracked head. Air heard coming from the throttle body or air intake indicates a leaking intake valve. Air heard coming from the exhaust pipe indicates a leaking exhaust valve.

62.

A typical four-cylinder engine crankshaft has how many main bearings?

Five

Six

Four

Three

Correct answer: Five

A four-cylinder engine uses a crankshaft with four throws on a single plane. There is typically a main bearing journal between each throw, which means the crankshaft uses five main bearings.

63.

Loctite®, or threadlocker, is used for what purpose?

Keep fasteners from vibrating loose

Fill gaps

Hold a gasket in place during assembly

Prevent corrosion

Correct answer: Keep fasteners from vibrating loose

Threadlocker is applied to threaded fasteners to prevent them from vibrating loose. It is applied whenever there is a crucial component that may have a tendency to come loose.

64.

A technician is checking for cracks in an aluminum block. Which of the following is the **best** method to use?

Dye penetrant testing

Magnetic crack detection

Vapor cleaning

Pyrolytic oven

Correct answer: Dye penetrant testing

Dye penetrant is used to detect cracks in parts made of non-magnetic materials, such as aluminum. Since aluminum is non-magnetic, magnetic crack detection will not work.

Vapor cleaning and the pyrolytic oven are cleaning methods, not methods for detecting cracks.

65.

An inline four-cylinder cylinder head is being checked for warpage using a straight edge and a feeler gauge. Generally, the overall clearance between the cylinder head and the straight edge should not vary by more than how much?

0.004"

0.010"

0.006"

0.008"

Correct answer: 0.004"

When checking a cylinder head for warpage, generally the clearance should not vary by more than 0.004" in any 6-inch length. Also, overall clearance should not vary by more than 0.001" per cylinder.

A2: Automatic Transmission/Transaxle

66.

All of the following are typical torque converter checks **except**:

Lateral runout

Stator end play

Seal wear

Damage to the pump drive tags/tangs

Correct answer: Lateral runout

Lateral runout is not a check typically performed on a torque converter. If a converter is to be reused, it should be checked for wetness that could indicate a seam leak, damage to the pump drive tags/tangs, wear to the seal and hub, stator one-way clutch operation, and stator end play.

67.

Technician A says multiple-plate clutches are a type of holding device. Technician B says bands are a type of holding device. 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. Apply devices, or holding devices, apply force to elements of a planetary gear set. Automatic transmissions typically use a combination of several holding devices, including multiple-plate clutches, one-way clutches, and bands.

68.

What is the resistance of most on-off shift solenoids?

10 to 15 ohms

1 to 5 ohms

50 to 100 ohms

150 to 200 ohms

Correct answer: 10 to 15 ohms

On-off shift solenoids are commanded on and off by the PCM or TCM. They can be either normally open or normally closed. The internal resistance of these solenoids should typically measure between 10 and 15 ohms. This can be tested with a digital multimeter.

69.

Technician A says all automatic transmission fluid (ATF) types are interchangeable and that "Mercon V", "Dexron VI", and "Type T-IV" are just manufacturer names for the same product. Technician B says all transmission fluids are not interchangeable and the manufacturer's specific fluid should be used.

Who is correct?

Technician B

Technician A

Both A and B

Neither A nor B

Correct answer: Technician B

Manufacturers use ATFs designed for compatibility with the specific materials used inside the transmissions they manufacture, such as friction clutches and oil seals. The ATF's specific additive package and thermal, lubricant, and viscosity qualities are additional considerations.

70.

A multiple-plate clutch contains all of the following **except**:

A servo

Plates

A piston

A snap ring

Correct answer: A servo

Servos are used to apply bands, and they are not found in a multiple-plate clutch assembly. The multiple-plate clutch is made up of several plates, a piston, a drum, and a snap ring.

71.

All of the following are true regarding ATF coolers **except**:

All are mounted inside the radiator

If the engine is overheating, the transmission could overheat too

Some manufacturers use a cooler bypass valve

Some vehicles use a valve to block fluid flow in low-temperature conditions

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Correct answer: All are mounted inside the radiator

Most transmission coolers are located inside the radiator as a separate section of the tank, but some vehicles use an external ATF-to-air radiator, either on its own or in addition to the internal ATF-to-coolant radiator.

All the other options are true: in the case of in-tank coolers, an overheating engine can overheat the transmission fluid instead of cooling it, some manufacturers use a cooler bypass valve to bypass the cooler if it is restricted, and some vehicles use a valve to block fluid flow in low-temperature conditions.

72.

The torque converter does all of the following **except**:

Disconnect the engine from the transmission, permitting the engine to run with the vehicle stopped

Multiply engine torque and transmit it to the transmission

Drive the automatic transmission pump

Allow slippage so the transmission can remain engaged with the vehicle stopped

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Correct answer: Disconnect the engine from the transmission, permitting the engine to run with the vehicle stopped

The clutch in a manual transmission is what disconnects the engine from the transmission to permit the engine to remain running with the vehicle stopped.

The torque converter in an automatic transmission allows slippage so the transmission can remain engaged with the vehicle stopped. The torque converter multiplies engine torque and transmits it to the transmission and also drives the automatic transmission pump.

73.

Which of the following is the reaction member of the torque converter that redirects fluid flow?

Stator

Turbine

Impeller

Flex plate

Correct answer: Stator

The stator is the reaction member of the torque converter. It redirects fluid flow to improve efficiency and multiply torque.

The impeller is the driving member and the turbine is the driven member. The flex plate is not part of the torque converter; the torque converter bolts to the flex plate.

74.

Two technicians are discussing planetary gears inside an automatic transmission. Technician A says the planetary gears disengage to change ratios. Technician B says most planetary gears use only one pinion gear.

Who is correct?

Neither A nor B

Technician A

Technician B

Both A and B

Correct answer: Neither A nor B

Both technicians are incorrect. The planetary gears never disengage to change ratios; torque is redirected based on clutch engagement of ring, sun, or carrier. Most transmission gear sets use three, four, or five planetary pinion gears.

75.

Generally, at least how many quarts of ATF flow through the transmission cooler every 20 seconds?

1 quart

2 quarts

3 quarts

4 quarts

Correct answer: 1 quart

If the transmission cooler is working properly, a least 1 quart of ATF should flow through every 20 seconds. If fluid flow is less than this, suspect a restriction in the cooler or lines.

76.

Technician A says the torque converter should be bolted to the flex plate prior to transmission installation. Technician B says the flex plate should be bolted to the back of the engine prior to transmission installation.

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 flex plate should be bolted to the back of the engine prior to transmission installation. Once the transmission is installed, the flex plate can be rotated to line up the bolt holes on the torque converter. The converter can then be secured to the flex plate.

77.

The fluid level on an automatic transmission registers at the "add" mark. Generally, this indicates the fluid is down by how much?

0.5 quarts

0.25 quarts

0.75 quarts

1 quart

Correct answer: 0.5 quarts

Generally, if the automatic transmission fluid level is to the "add" mark on the dipstick, it is about 0.5 quarts low.

78.

Limp mode generally places the transmission in which gear?

- **2nd or 3rd gear**
- 1st or 2nd gear
- 3rd or 4th gear
- 4th or 5th gear

Correct answer: 2nd or 3rd gear

Default, or limp, mode is used if there is a failure in the transmission electronics. This mode places the transmission in 2nd or 3rd gear to prevent damage to the system.

79.

All of the following are true regarding spool valves **except**:

Fluid flow is permitted by the lands

They were named after a spool of thread

The larger-diameter portion of the valve is called the land

The smaller-diameter portion of the valve is called a valley or groove

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Correct answer: Fluid flow is permitted by the lands

Fluid flow is blocked by the lands. All of the other options are true: spool valves were named after a spool of thread, the larger-diameter portions of the valves are called lands, and the smaller-diameter portions of the valves are called valleys or grooves.

80.

All of the following are components of a planetary gear set **except**:

Valve body

Sun gear

Pinion gears

Ring gear

Correct answer: Valve body

The valve body is used to direct fluid flow in an automatic transmission. It is not part of the planetary gear set. A simple planetary gear set contains three main components: sun gear, planetary or pinion gears and carrier, and ring gear.

81.

All of the following are true regarding TCC operation **except**:

Slow TCC engagement is usually caused by an open solenoid circuit

TCC failure can lead to transmission overheating

There should be a drop of about 150 to 250 rpm during TCC disengagement

Transmission fluid temperature that is too low can prevent TCC lockup

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Correct answer: Slow TCC engagement is usually caused by an open solenoid circuit

Slow torque converter clutch (TCC) engagement is usually caused by worn clutches. If the TCC solenoid circuit were open, the TCC would not function at all.

All the other options are true:

- *TCC failure can lead to transmission overheating*
- *There should be a drop of about 150 to 250 rpm during TCC disengagement*
- *Transmission fluid temperature that is too low can prevent TCC lockup*

82.

Which valve connects to the shift lever in the transmission?

Manual valve

Switching valve

Pressure control valve

One-way check valve

Correct answer: Manual valve

The manual valve, controlled manually by the driver, is the main flow-directing valve in an automatic transmission. The valve connects to the shift lever in the transmission, and the driver controls the valve through the gear selector and linkage. In this way, the manual valve distributes pressure to the hydraulic circuits uncovered by the valve lands.

83.

Two technicians are inspecting clutch components during an automatic transmission rebuild. Technician A says all of the clutch steel discs should be replaced if any of them show heat discoloration. Technician B says if a friction disc shows signs of glazing, the entire set should be replaced.

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 any of the clutch pack steel or friction discs show signs of excessive wear, such as heat discoloration or glazing, the entire set should be replaced.

84.

A customer complains of an engine vibration. The technician unbolts the torque converter from the flex plate and starts the engine. The vibration is gone.

Which of the following is the **most** likely cause?

Faulty front pump

Broken motor mount

Defective crankshaft dampener

Faulty balance shaft

Correct answer: Faulty front pump

One method of pinning down the cause of a vibration is to unbolt the torque converter from the flex plate and run the engine. If the vibration disappears, the problem is in the torque converter, front pump, or other transmission component that is constantly turning with the engine running. If the vibration remains, the cause is due to an engine or accessory problem.

85.

During which torque converter phase is the turbine traveling at nearly the same speed as the impeller while rotary flow is much greater than vortex flow?

Coupling

Multiplication

Stall

Overdrive

Correct answer: Coupling

During the coupling phase of torque converter operation, the turbine is traveling at nearly the same speed as the impeller, rotary flow is much greater than vortex flow, and torque multiplication stops. It is important to note that the impeller, or converter pump, is driven by the engine, forcing ATF through the turbine, which is connected to the automatic transmission input shaft.

86.

A spring-loaded ball check valve is an example of what?

One-way valve

Flow-directing valve

Manual valve

Switching valve

Correct answer: One-way valve

A spring-loaded ball check valve is an example of a one-way valve. One-way valves are found in the valve body and are designed to allow fluid to flow in only one direction. To accomplish this, a spring holds the ball against its seat until fluid pressure overcomes spring force and the ball moves. In other words, fluid flows through the valve as long as hydraulic pressure exceeds the force of the spring.

87.

Dual clutch transmissions (DCTs) are being discussed. Technician A says one clutch drives the odd-numbered gears and the other clutch drives the even-numbered gears. Technician B says a DCT is shifted with a shift lever just like a manual transmission.

Who is correct?

Technician A

Technician B

Both A and B

Neither A nor B

Correct answer: Technician A

In a DCT, the general shifting scheme is sequentially shifting one gear up or down. By arranging the clutches on even-gear and odd-gear shafts, switching from 2nd to 3rd or from 3rd to 4th is nearly instantaneous, because the transmission controller has only to switch clutch engagement to effect the shift.

Technician B is incorrect because DCTs are controlled electronically and hydraulically.

88.

The resistance of most linear shift solenoids is:

4 to 6 ohms

1 to 2 ohms

60 to 80 ohms

Over 10K ohms

Correct answer: 4 to 6 ohms

Linear solenoids are pulse-width modulated for precise fluid control. The internal resistance of these solenoids is generally between 4 and 6 ohms.

89.

All of the following are inputs to the TCM **except**:

Shift solenoids

Transmission range sensor

Crankshaft position sensor

Mass air flow sensor

Correct answer: Shift solenoids

The TCM takes inputs from various sensors, such as the transmission range sensor, crankshaft position sensor, and mass airflow sensor. Using information from these sensors, the TCM controls transmission actuators, such as the shift solenoids.

90.

A technician is using a scan tool to check shift solenoid operation. While monitoring the live data, it is noted that the TCM commands the solenoid on but nothing happens.

Which of the following is the **least** likely cause?

Faulty TCM

Worn band

Faulty solenoid

Problem in the solenoid wiring

Correct answer: Faulty TCM

The TCM is unlikely to be the problem, since it can be observed commanding the solenoid on. The lack of response from the solenoid and corresponding hydraulics indicates a problem with the hydraulics (clutch, band, etc.), the solenoid, or the solenoid wiring.

91.

Technician A says a one-way roller clutch consists of a hub, rollers, and springs that fit inside a drum. Technician B says a one-way roller clutch uses sprags to lock and unlock the clutch.

Who is correct?

Technician A

Technician B

Both A and B

Neither A nor B

Correct answer: Technician A

Only technician A is correct; a one-way roller clutch consists of a hub, rollers, and springs that fit inside a drum. In this design, the rollers wedge themselves against the cams in response to the rotation of the hub, locking the clutch in one direction.

Technician B is incorrect because it is a one-way sprag clutch, not a one-way roller clutch, that uses sprags to lock and unlock the clutch.

92.

Technician A says if the vehicle does not move in drive or reverse, the problem is **likely** electrical or hydraulic. Technician B says if the vehicle moves but does not shift correctly, the problem is **likely** mechanical.

Who is correct?

Neither A nor B

Technician A

Technician B

Both A and B

Correct answer: Neither A nor B

Both technicians are incorrect. If the vehicle does not move in drive or reverse, the problem is likely mechanical. If the vehicle moves but does not shift properly, the problem is likely electrical or hydraulic. If the vehicle is able to move backward and forward, most major mechanical components are functioning. Of course, further diagnosis would be needed to determine the actual fault.

93.

Two technicians are discussing the use of the parking brake in an automatic-transmission vehicle. Technician A says applying the parking brake can prevent transmission wear. Technician B says using the emergency brake can make it easier to shift the transmission out of the park position.

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. Applying the parking brake before placing the gear selector in park can prevent transmission wear by keeping weight off the parking pawl. This also makes it easier to get the transmission out of park, especially when on a hill.

94.

Driving down a long grade with a five-speed automatic transmission, which gear selection should be used to maintain vehicle speed?

First gear, "L"

Third gear, "3"

Overdrive Off, "O/D Off"

Drive, "D"

Correct answer: First gear, "L"

First or second gear, "L" or "2", can be used to maintain vehicle speed on long descending grades. The transmission drives the engine, and vehicle speed is controlled by engine braking instead of the service brakes. "O/D Off" and "3" provide slight engine braking and "D" does not provide any engine braking at all.

The drive position (D) enables all forward gears with the ability to turn overdrive (O/D) off. Third gear (3) allows the transmission to up-shift normally but prevents it from going into direct drive or overdrive. Clicking the "O/D Off" button locks out overdrive.

95.

Two technicians are discussing how torque converter design affects stall speed. Technician A says the angle of the stator and impeller blades affects stall speed. Technician B says the overall diameter of the torque converter affects stall speed.

Who is correct?

Both A and B

Technician B

Technician A

Neither A nor B

Correct answer: Both A and B

The outside diameter of the torque converter and the angle of the stator blades determine the stall speed. Steeper blade angles or larger torque converter diameter will decrease stall speed.

96.

Two technicians are discussing special tools used to disassemble an automatic transmission. Technician A says a puller is needed to remove the transmission pump. Technician B says a puller is needed to remove the torque converter.

Who is correct?

Technician A

Technician B

Both A and B

Neither A nor B

Correct answer: Technician A

Only technician A is correct. Typically, a special pulling tool or slide hammer is used to remove the transmission front pump. The torque converter slips into place by hand and does not require any special tools for removal or installation.

97.

Which of the following is used to determine shift points and control line pressure?

All of these

Crankshaft position sensor

Vehicle speed sensor

Manifold absolute pressure sensor

Correct answer: All of these

All of the options listed are used to determine shift points and control line pressure. The crankshaft position sensor measures engine speed, the manifold absolute pressure sensor measures engine load, and the vehicle speed sensor measures vehicle speed.

98.

Two technicians are discussing transmission controls. Technician A says throttle valves are used in modern electronically controlled transmissions. Technician B says vacuum modulators are used in modern electronically controlled transmissions.

Who is correct?

Neither A nor B

Technician A

Technician B

Both A and B

Correct answer: Neither A nor B

Both technicians are incorrect. Valves such as the throttle valve, vacuum modulator valve, governor valve, and shift valve are used in hydraulically controlled transmissions. Modern electronically controlled transmissions use sensors and solenoids in place of these valves.

99.

Typically, fluid pressure at idle in park should be:

54-60 PSI

100-105 PSI

84-87 PSI

20-45 PSI

Correct answer: 54-60 PSI

Pressure testing is done by connecting a gauge to the fittings on the outside of the transmission. Typical pressure at idle in park is 54-60 PSI. At idle, pressure in reverse should be 100-105 PSI, neutral should be 54-60 PSI, drive should be 54-87 PSI, and low should be 84-87 PSI.

100.

Two technicians are discussing an automatic transaxle. Technician A says the transaxle includes the final drive unit. Technician B says the transaxle is usually mounted longitudinally.

Who is correct?

- **Technician A**
- Technician B
- Both A and B
- Neither A nor B

Correct answer: Technician A

Technician A is correct; a transaxle includes a differential assembly known as a final drive unit. Technician B is incorrect because most transaxles are mounted transversely.