




# LAB - Cooling System Inspection



Students: 1. \_\_\_\_\_  
 2. \_\_\_\_\_  
 3. \_\_\_\_\_

Fill in each box with the appropriate information.  
 Be sure to have the Instructor's initials before moving on to the next step. These are there to ensure everything is SAFE and CORRECT. Each team member must be able to answer questions from your instructor to receive credit for this lab.

VEHICLE IDENTIFICATION			
Year:		Make:	
Model:		Mileage:	
VIN Number:			
BEFORE YOU BEGIN			
<p style="text-align: center;"><b>You will need the following special tools:</b></p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p style="font-size: small;">Cooling System Pressure Tester</p> <p><b>Cooling system pressure tester</b></p> </div> <div style="text-align: center;">  <p><b>Antifreeze</b></p> </div> </div>		<div style="border: 2px solid red; padding: 10px; margin-bottom: 10px;"> <p><i>CAUTION!</i></p> </div> <p><b>Engine Coolant can be hot!</b>  <b>Be very careful not to burn yourself!</b></p>	
VISUAL INSPECTION			
RADIATOR HOSES			
<b>1</b>	<p>Hoses should be firm, yet pliable. They need to flex to allow for engine vibration. Over time under-hood heat makes them hard and crunchy. Oil leaks onto them make them rot. Radiator hoses and heater hoses should be replaced every <b>FOUR YEARS</b>.</p> <p>Visually inspect, feel, and squeeze, all the hoses.</p> <div style="border: 1px solid black; padding: 10px; margin-top: 20px; width: fit-content;"> <p>What did you find?</p> </div>		

# WATER PUMP

2

Water pumps are replaced when they fail. They may fail by leaking (there is usually a drain hole somewhere behind the pulley so coolant can leak away from the fan and belts)), or by mechanical fault (the impellor comes off internally – a lack of cooling will result).



Inspect the water pump by either looking or feeling around the casting looking for coolant escaping. Wiggle the pulley around to see if the bearings are allowing any play.

What did you find?

It is good practice to replace the water pump whenever replacing a timing belt, or timing chain. I mean, hey – you're in there anyway....

# RADIATOR

3

Radiators usually last about 10 years. They are replaced when they are failing. A replacement can cost around \$200. Sometimes your old radiator can be "re-cored" where they remove the old tanks, and attach them to a new core. This costs around \$200. I would not re-core a plastic tank radiator – plastic just doesn't last that long.



Visually inspect for any visual signs of leakage – usually a green "mold-looking" scum, especially around the tank attachment, and the hose attachments.

Visually inspect the fins for any damage or plugging. Fins can usually be cleaned out and straightened. If the fins DISINTEGRATE beneath your touch, the rad is garbage and needs to be replaced.

What did you find?

# HEAD GASKETS

4

Headgaskets may fail due to corrosion or overheating. This is typically evidenced in a few ways:

- **Green scum** oozing down from cylinder head gasket location (head gasket is leaking externally)
- **Inside of radiator coated with oil** (motor oil will get into the coolant, looks like an oil spill, since oil floats – you will need to carefully remove the rad cap to have a look)
- **Motor oil looks like heavily creamed coffee** (coolant will get into the oil – you will need to pull the dipstick and have a look)
- **Zillions of tiny bubbles like champagne** floating through the cooling system (combustion gasses getting into the cooling system – ain't no rad in the world going to keep that motor cool. You will need to remove the rad cap while the engine is running to see this)



Replacing head gaskets can be pretty major. If the engine has been overheated, it will never really be the same again without a full rebuild. Try not to ever let your engine overheat – take good care of the system!!

What did you find?

# OVERFLOW TANK

5

The overflow tank is usually connected by a hose to just under the radiator cap. You should always keep this filled up to the proper fill line. If it is empty – MAKE SURE the radiator is not low too – top the rad up completely, then fill the overflow tank to the correct level.

Check for leaks in the container, and cracks in the hose.



What did you find?

## FROST PLUGS

6

Frost plugs are more correctly called "core plugs" – their only purpose is in the original casting of the engine block – it holds the pattern that creates the water jacket around the cylinders.

Over time, they may begin to rust and create leaks. If unchecked, you may lose coolant and ruin your motor.

Most iron blocks have core plugs, most aluminum blocks do not. See if you can find and inspect all of yours.



What did you find?

It is always a good idea to run Antifreeze in your engine, even if you live in California. Antifreeze also prevents rust, lubricates the water pump, and increases the boiling point!

## BELTS

7

V-belts and Serpentine belts should be replaced every FOUR YEARS. Over time, they become hard, cracked, and eventually disintegrate. Twist the belt in your fingers, and look at the inside (the grooved, or pulley side). A few cracks are reasonably normal, but it's often best to replace it when the cracks become excessive.



What did you find?

**STOP!**

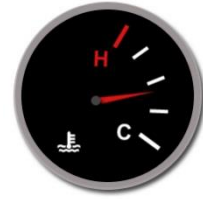
**INSTRUCTOR'S INITIALS:**

# COOLANT TESTING

8

Engine should be at OPERATING TEMPERATURE, but OFF

Cover the radiator cap with a rag (to protect yourself from potential burns), and SLOWLY release the rad cap. Some may leak out, that's fine (clean it up ASAP). A geyser is not fine.



Coolant should be flush with the top of the filler neck with an overflow tank (1" below, if not)

Good antifreeze coolant should be a light yellow-ish/green colour. Over time it tends to get dull coloured or murky.

What did you find?

Using a light, see if you can see the inside tubes of the radiator. Over time, they start to get corroded and begin to plug up. This is made worse if the rad was filled with tap water (ALWAYS USE DISTILLED WATER – THERE ARE NO MINERALS IN IT!)



What did you find?

Insert the Antifreeze tester into the radiator, keep it upright (there is a level in it), and draw coolant up exactly to the fill line. A large pointer should float indicating the freezing temperature of the coolant. We want to see about -35°



What did you find?

Engine coolant should be replaced every two years. There is "long life" coolant which can be replaced every five years. GM's DEXCOOL cannot be mixed with other coolants – it turns to jello, which doesn't cool very well.

**STOP!**

**INSTRUCTOR'S INITIALS:**

# PRESSURE TESTING

9

Radiator caps are rated by their pressure. It may be in pounds per square inch (psi), or in Barometers (Bar).

Eg:

13 lbs    14psi    1.1    1.1bar

1 bar is 14.7psi (atmospheric pressure on earth).



What pressure is the cap rated at?

If you know your friend doesn't read instructions, YOU need to take control at this point and SAVE THE ENGINE

## ***PAY ATTENTION NOW!***

***DO NOT BE THE NEXT KID TO  
DAMAGE SOMETHING BY OVER PRESSURE!!***

Attach the pressure tester to the radiator filler next, and pressurize the system to **NO MORE THAN** the rad cap rating. We want to FIND leaks, NOT CREATE THEM!!!

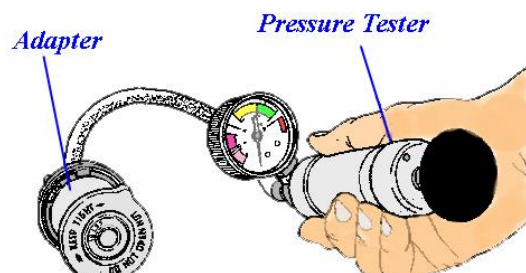


The system should hold pressure. If the pressure starts to drop, you have a leak – find it!

What did you find?

Next, use the rad cap adapter and pressure test the rad cap. It should release at its rated pressure.

Most caps I have tested do not pass. Radiator caps are usually \$15 or so.



What did you find?

***STOP!***

***INSTRUCTOR'S INITIALS:***

# SKILL TESTING QUESTIONS

10

Assume that the cooling system is not working adequately. What would cause the following situations?

1. Overheating while sitting in traffic?
2. Overheating only while pulling a long hill? (assume it's fine everywhere else)
3. Never heating up at all?

**STOP!**

**INSTRUCTOR'S INITIALS:**