

Name: _____ Date: _____
Instructor: _____ Period: _____



Cooling System Fundamentals



Objective: After studying this chapter, you will be able to describe the operation of a modern automotive cooling system.

1. List the functions of a typical **cooling system**:

- A. _____
- B. _____
- C. _____
- D. _____

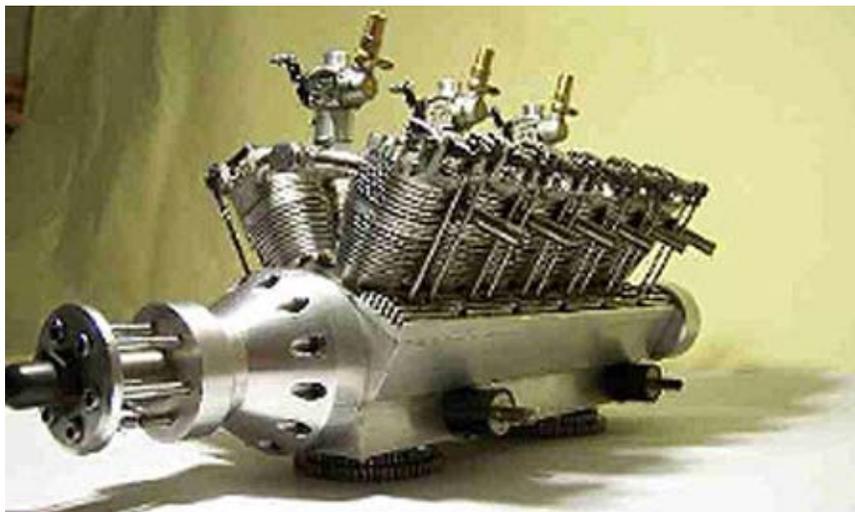
Cooling System Functions

2. What are the advantages of rapid engine warm-up? _____

3. What are the advantages of maintaining proper operating temperature? _____

4. A typical automobile engine operates from _____ to _____ degrees Fahrenheit.
5. What is the biggest disadvantage of **not** removing excess heat from the engine? _____

6. What is the typical combustion flame temperature? _____
7. What cooling system components are missing from this **air-cooled** engine?
_____ and _____



8. What would be used to direct air-flow onto and around the cylinder fins of the engine shown in #7? _____,

9. List and describe **four (4)** advantages of a **liquid cooled** engine over air cooled:

- A. _____
- B. _____
- C. _____
- D. _____

10. When is **reverse cooling** more advantageous than conventional liquid cooling:

Basic Cooling System

11. Explain the purpose of the following cooling system components:

Radiator _____

Radiator Hose _____

Fan _____

Thermostat _____

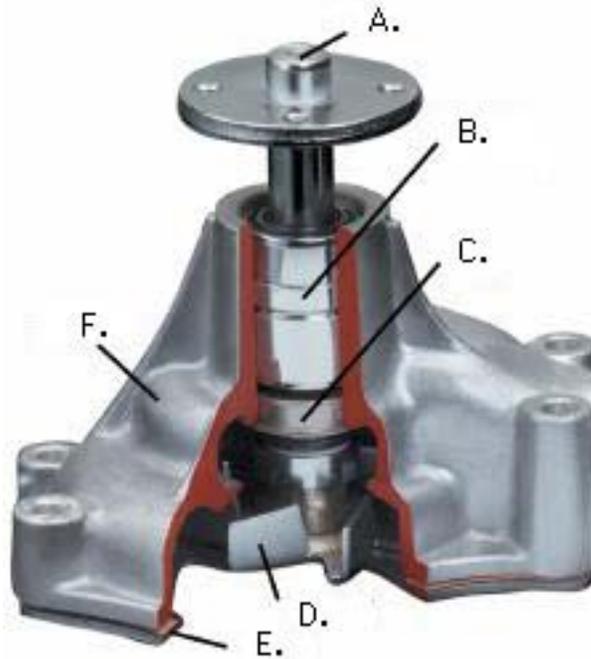
Water Pump _____

12. Water pumps use centrifugal force to move fluid throughout an engine. What shape of the pump impeller blades uses the least power? _____

13. Identify the parts of the automotive water pump:

A. _____ B. _____ C. _____

D. _____ E. _____ F. _____



14. The tanks on a **vertical** flow radiator are on the _____ and _____, while the tanks on a **cross flow** radiator are on both _____.

15. Why are transmission fluid coolers built into the radiators of automobiles equipped with automatic transmissions? _____

Match the correct water pump parts to the correct description:

- 16. ___ Fits between the water pump and the engine to prevent leakage.
- 17. ___ Steel shaft that transmits the turning force from the hub to the impeller.
- 18. ___ Provides a mounting place for the belt, pulley, and fan.
- 19. ___ Iron or aluminum casting that forms the main body of the pump.
- 20. ___ Disk with fan-like blades, the impeller spins and produces pressure and flow.
- 21. ___ Prevents coolant leakage between pump shaft and pump housing.
- 22. ___ Plain or ball-bearings that allow the pump shaft to spin freely in housing.

- A. Water pump shaft
- B. Water pump bearing
- C. Water pump housing
- D. Water pump impeller
- E. Water pump gasket
- F. Water pump seal
- G. Water pump hub

Match the correct term to definition:

- 23. ___ Hold the radiator hoses and heater hoses onto their fittings.
- 24. ___ Frequently used in the lower radiator hose to prevent the hose from collapsing.
- 25. ___ Carry coolant between the engine water jackets and the radiator.
- 26. ___ Has an accordion shape and can be bent to different angles.
- 27. ___ Uses a worm gear that engages slots in the clamp strap to allow tightening around the hose.
- 28. ___ Small-diameter hoses that carry coolant to the heater core.
- 29. ___ Manufactured in a special shape, with bends to clear the cooling fan and other parts.

- A. Radiator hoses
- B. Molded hose
- C. Flexible hose
- D. Hose spring
- E. Heater hoses
- F. Hose clamps
- G. Worm-drive hose clamps

30. List four functions performed by the **radiator cap**:

- A. _____
- B. _____
- C. _____
- D. _____

31. Modern radiator caps are equipped with a **vacuum valve**. What would occur in the cooling system without this valve? _____

Closed and Open Cooling Systems

32. A **closed cooling system** uses an _____ and an _____ tube which is routed into reservoir tank, while an open cooling system allows excess coolant to leak onto the _____.

Match the following terms:

- | | |
|--|------------------------------|
| 33. ___ Provide cooling action with an electric motor and a thermostatic switch. | A) Fluid coupling fan clutch |
| 34. ___ Filled with silicone-based oil Slips at higher rpm | B) Thermostatic fan clutch |
| 35. ___ Bolts to the water pump hub and pulley. | C) Flex fan |
| 36. ___ A small direct-current motor. | D) Engine powered fan |
| 37. ___ Has a temperature-sensitive, Bi-metal spring that controls clutching action. | E) Electric cooling fans |
| 38. ___ High rpm cause blades to flex, reducing blowing action. | F) Fan Motor |

39. In vehicles with a **PCM-Controlled Fan**, when cold, the _____ does not energize fan relays.

40. How does the **radiator fan shroud** help engine cooling? _____

41. Why do modern automobiles use higher coolant temperatures? _____

42. The thermostat is _____ when the engine is cold, and no coolant flows in the radiator.

43. A _____ valve allows partial coolant flow in the engine when the thermostat is closed.

44. A thermostat _____ valve helps eliminate trapped air in the housing.

45. How does a **temperature warning light** work? _____

46. List two (2) benefits of adding **Antifreeze** to a cooling system? _____

47. The most common **water to Antifreeze** mixture is _____

48. The boiling point of a 50/50 mixture of anti-freeze and water is _____°F and the freezing point of the same is _____°F.