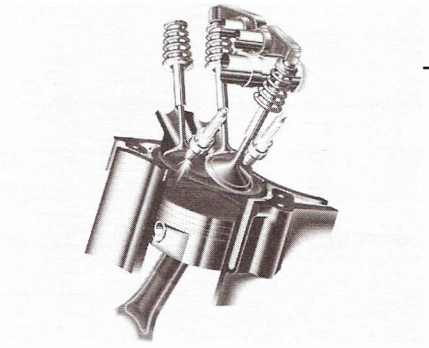


Chapter 12

Engine Design Classifications

Name: _____ Date: _____

Instructor: _____ Score: _____ Textbook pages 158–175

Objective: After studying this chapter, you will be able to describe and explain basic automotive engine designs and classifications.

Cylinder Arrangement

1. Define *cylinder arrangement.* _____

2. Name the four basic cylinder arrangements. _____

3. The cylinders of a(n) _____ engine are lined up in a single row. 3. _____

4. A(n) _____ engine has only one bank of cylinders. 4. _____

5. Cylinders of a(n) _____ engine lie flat on either side of the crankshaft. 5. _____

Number of Cylinders

6. Normally, car and truck engines have either _____ cylinders. 6. _____
   (A) 4, 5, or 6
   (B) 2, 4, or 6
   (C) 4, 6, or 8
   (D) 6, 10, or 12

7. A greater number of cylinders generally _____ (increases/decreases) engine smoothness and power. 7. _____

8. A(n) _____ cylinder engine produces twice as many power strokes per crank revolution as a(n) _____ cylinder engine. 8. _____
   (A) 3, 8
   (B) 8, 4
   (C) 6, 10
   (D) None of the above.

20. Gasoline engines use _____ ignition. 20. _____

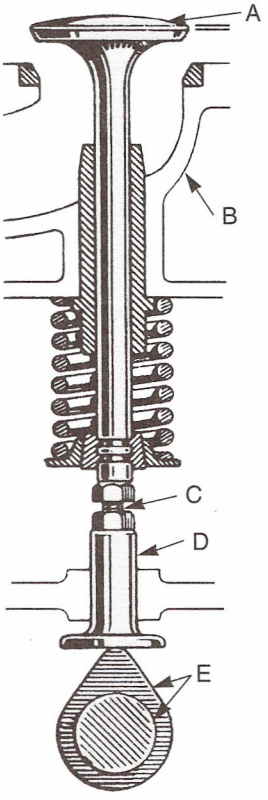
21. A diesel engine is a(n) _____ ignition engine. 21. _____

Valve Location

22. A(n) _____ engine has both the intake and exhaust valves in the block. 22. _____

23. A(n) _____ engine has both valves in the cylinder head. 23. _____

24. Identify the parts of the valve-in-block arrangement illustrated below.



(A) _____

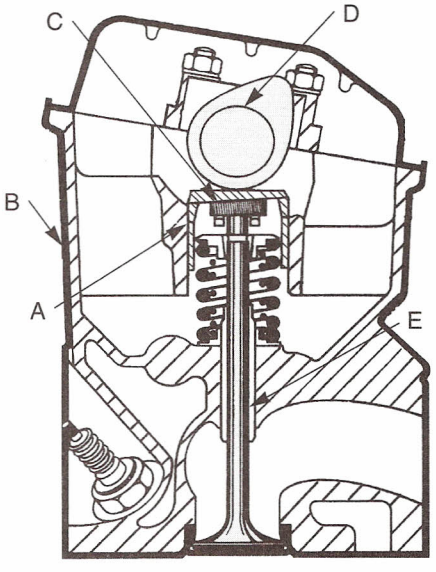
(B) _____

(C) _____

(D) _____

(E) _____

25. What type of valve-camshaft arrangement is illustrated below? Label the parts as indicated.



_____

(A) _____

(B) _____

(C) _____

(D) _____

(E) _____

Cylinder Numbering and Firing Order

9. Why do engine manufacturers number each engine cylinder? _____

10. Cylinder numbers are normally stamped on an engine's _____ rods or they are sometimes cast into the _____. 10. _____

11. Define *firing order.* _____

12. When is it important to know an engine's firing order? _____

Cooling System Type

13. Explain how a *liquid cooling system* operates. _____

14. _____ cooled engines are seldom used in passenger cars. 14. _____

15. An air cooling system circulates air over _____ on the cylinders to prevent overheating. 15. _____

Fuel Type

16. An engine can be classified by the type of _____ it burns. 16. _____

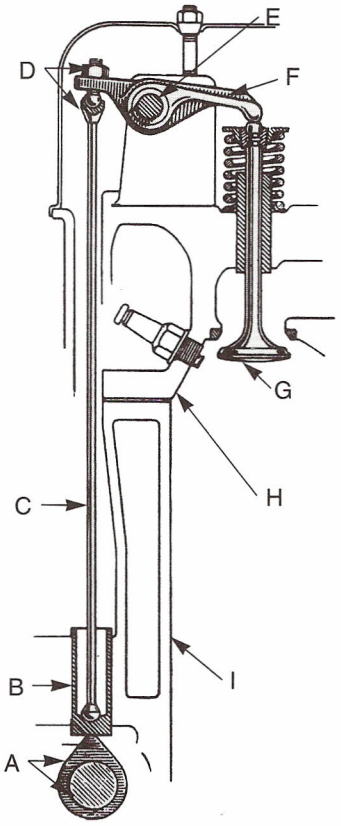
17. Name at least three types of fuels used in automotive engines. 17. _____

18. What are the two most common types of fuel for vehicles? 18. _____

Ignition Type

19. Explain the difference between a *spark* ignition engine and a *compression* ignition engine.

26. What type of valve-camshaft arrangement is illustrated below? Label the parts as indicated.



(A) _____

(B) _____

(C) _____

(D) _____

(E) _____

(F) _____

(G) _____

(H) _____

(I) _____

Camshaft Location

27. Name the two basic locations for the engine camshaft. _____

_____

_____

_____

28. A(n) _____ engine uses pushrods to transfer motion to the rocker arms and valves and a(n) _____ engine has the camshaft in the cylinder head. 28. _____

_____

29. A(n) _____ engine has only one camshaft per cylinder head. 29. _____

30. The _____ arrangement is frequently used in engines equipped with four-valve combustion chambers. 30. _____

Combustion Chamber Shape

31. List the three types of combustion chamber designs. _____

_____

_____

32. The _____ combustion chamber has valve heads that are almost parallel to the top of the piston. 32. _____

33. In a(n) _____ combustion chamber, the spark plug is located near the center. 33. _____

Combustion Chamber Types

34. A(n) _____ combustion chamber is designed to cause the air-fuel mixture to swirl, or spin, as it enters from the _____ port. 34. _____

35. The extra valves in a(n) _____ combustion chamber increase flow in and out of the chamber. 35. _____

36. A three-valve combustion chamber has ____ intake valve(s) and ____ exhaust valve(s). 36. _____
    (A) 1, 2
    (B) 2, 1
    (C) 3, 3
    (D) None of the above.

37. Briefly describe the operation of a *stratified charge combustion chamber.* _____

38. A(n) _____ combustion chamber has a single chamber fitted with an extra air valve. 38. _____

Alternative Engines

Fill in the blanks of the statements on the left with the correct term from the list on the right.

39. A(n) _____ engine uses a triangular rotor instead of conventional pistons. 39. _____

40. A steam engine is a(n) _____ combustion engine. 40. _____

41. A(n) _____ only requires one revolution of the crankshaft for a complete power-producing cycle. 41. _____

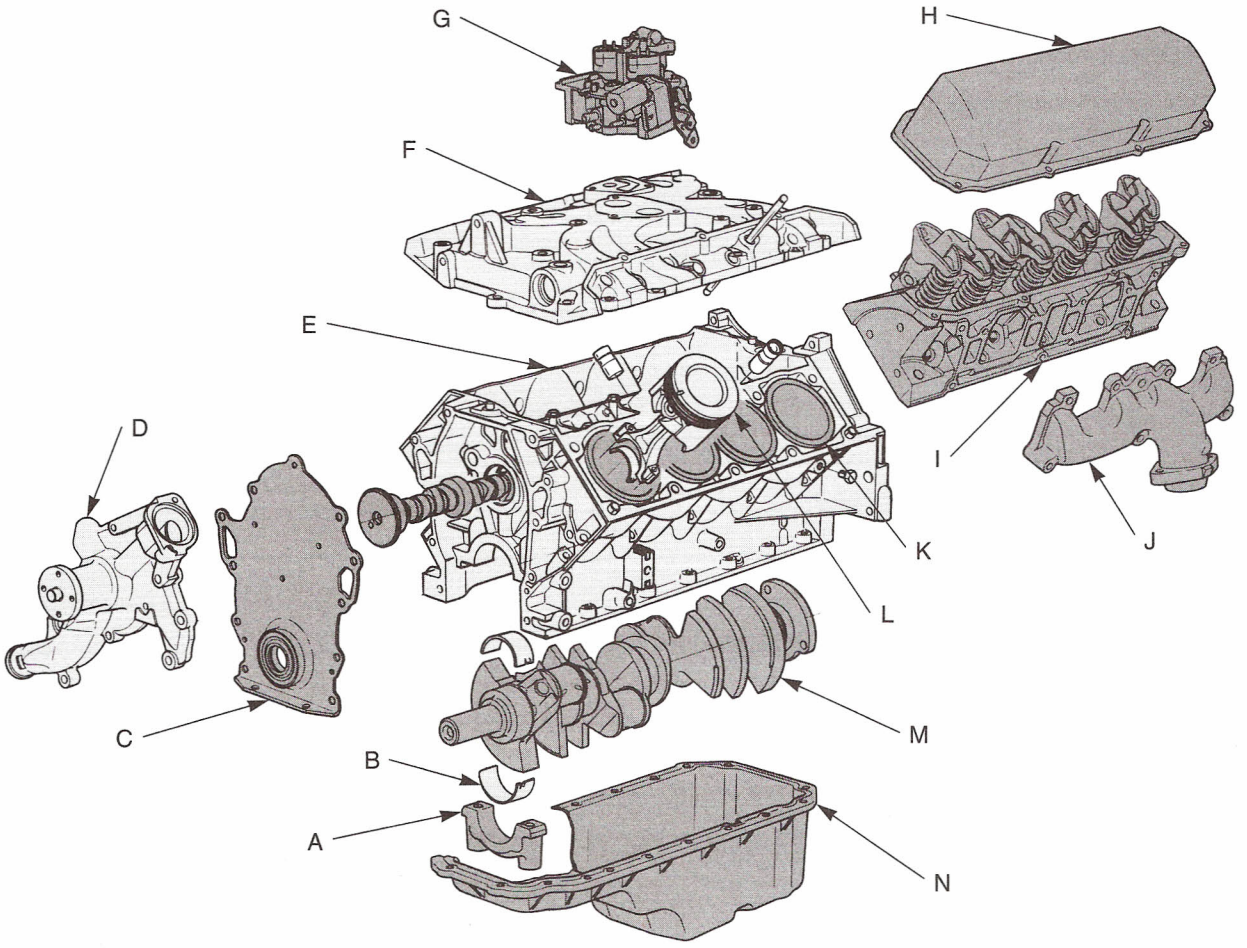
42. A(n) _____ uses a mixture of fuel and oil. 42. _____

43. A(n) _____ is designed with a short compression stroke and a long power stroke to increase efficiency. 43. _____

(A) two-stroke engine
(B) two-stroke-cycle engine
(C) external
(D) Miller-cycle
(E) rotary

Typical Automotive Engines

44. Label the parts of the fuel-injected V-8 engine illustrated below. Indicate the type(s) of metal used in each part's construction.



(A) _____

(B) _____

(C) _____

(D) _____

(E) _____

(F) _____

(G) _____

(H) _____

(I) _____

(J) _____

(K) _____

(L) _____

(M) _____

(N) _____