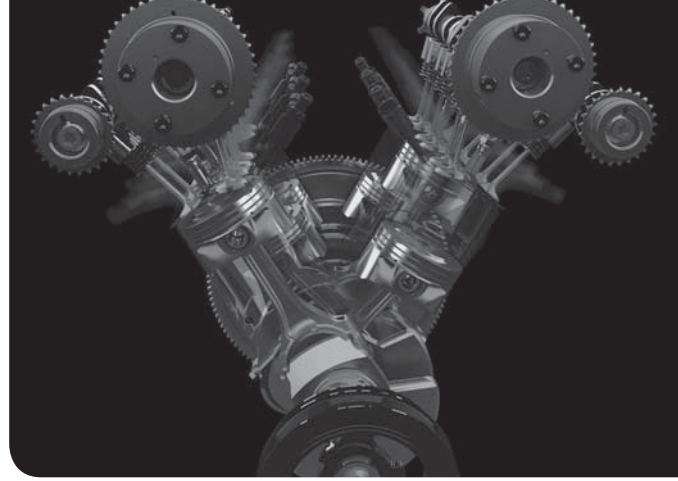


Chapter 12

Engine Design Classifications



Name _____

Date _____

Instructor _____

Score _____

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.

4. The _____ consists of two cylinder banks that form a "V" but the cylinders in each bank are offset, forming a second, very narrow "V."

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

Number of Cylinders

- _____ 6. Normally, car and truck engines have either _____ cylinders.

- (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.

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

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 _____.

Cooling System Type

11. Explain how a liquid cooling system operates.

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

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

Fuel Type

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

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

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

Name _____

Ignition Type

17. Explain the difference between a spark ignition engine and a compression ignition engine.

18. Gasoline engines use ____ ignition.

19. A diesel engine is a(n) ____ ignition engine.

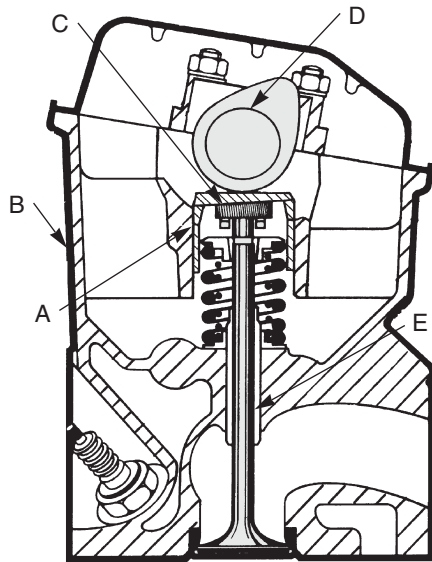
Valve Location

20. A(n) ____ engine has both the intake and exhaust valves in the block.

21. A(n) ____ engine has both valves in the cylinder head.

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

Type: _____



(A) _____

(B) _____

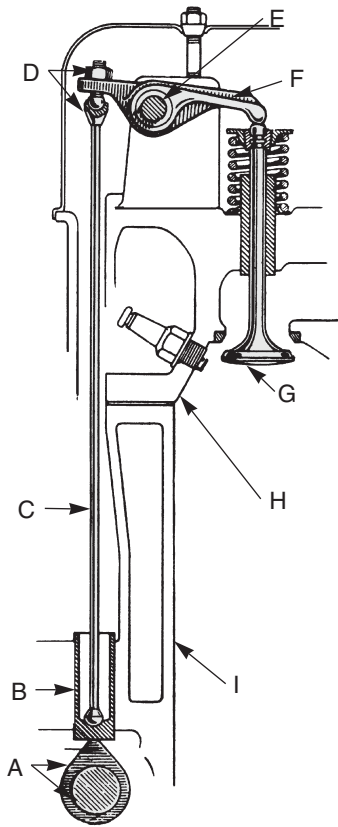
(C) _____

(D) _____

(E) _____

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

Type: _____



- (A) _____
- (B) _____
- (C) _____
- (D) _____
- (E) _____
- (F) _____
- (G) _____
- (H) _____
- (I) _____

Camshaft Location

24. Name the two basic locations for the engine camshaft.

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

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

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

Combustion Chamber Shape

28. List the four types of combustion chamber designs.

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

Name _____

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

Combustion Chamber Types

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

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

- _____ 33. A three-valve combustion chamber has _____ intake valve(s) and _____ exhaust valve(s).
 (A) 1, 2
 (B) 2, 1
 (C) 3, 3
 (D) None of the above.

34. Briefly describe the operation of a stratified charge combustion chamber.

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

Alternative Engines

Complete the following statements using the correct term from the list on the right.

- | | |
|--|----------------------------------|
| _____ 36. A(n) _____ engine uses a triangular rotor instead of conventional pistons. | (A) two-stroke-cycle engine |
| _____ 37. A(n) _____ uses a mixture of fuel and oil. | (B) Miller-cycle engine |
| _____ 38. A(n) _____ is designed with a short compression stroke and a long power stroke to increase efficiency. | (C) rotary engine |
| _____ 39. A(n) _____ can alter valve opening and closing independent of crankshaft rotation. | (D) variable displacement engine |
| _____ 40. A(n) _____ can deactivate cylinders so the engine conserves fuel and reduces emissions. | (E) variable valve timing engine |