

# Chapter

# 34

## Ignition System Technology



Name \_\_\_\_\_ Date \_\_\_\_\_

Instructor \_\_\_\_\_ Score \_\_\_\_\_

**Objective:** After studying this chapter, you will be able to explain the operating principles of modern ignition systems.

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### Ignition System Fundamentals

1. In your own words, explain the basic purpose of automotive ignition systems.

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2. Explain the seven major parts of an ignition system.

*Crankshaft position sensor:* \_\_\_\_\_

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*Primary wires:* \_\_\_\_\_

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*Ignition control module:* \_\_\_\_\_

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*Ignition coil:* \_\_\_\_\_

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*Spark plugs:* \_\_\_\_\_

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Secondary wires: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Ignition switch: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

- 3. The ignition system supply voltage is fed to the ignition system by the battery or \_\_\_\_\_. \_\_\_\_\_
- 4. \_\_\_\_\_ makes the engine start, and the driver or ECM can cut power to the starting motor. \_\_\_\_\_
- 5. The (primary/secondary) \_\_\_\_\_ circuit consists of all the components and wires that operate on low 12-volt dc. \_\_\_\_\_
- 6. The (primary/secondary) \_\_\_\_\_ circuit includes all the parts that carry high-voltage current. \_\_\_\_\_
- 7. The secondary operating voltage of the ignition system ranges from \_\_\_\_\_–\_\_\_\_\_ volts, depending on the system design. \_\_\_\_\_
- 8. What feeds the ignition system supply voltage to the ignition system?  
\_\_\_\_\_
- 9. \_\_\_\_\_ carry the high-voltage current produced by the ignition coils. \_\_\_\_\_
- 10. What are resistance wires made of?  
\_\_\_\_\_

\_\_\_\_\_ 11. Resistance wires have about \_\_\_\_\_ ohms of resistance per foot.  
 (A) 500  
 (B) 1000  
 (C) 5000  
 (D) 10,000

- 12. In most late-model vehicles, a short \_\_\_\_\_ often conducts high voltage from the direct ignition coil to the spark plug center electrode. \_\_\_\_\_
- 13. Somewhere between \_\_\_\_\_ and \_\_\_\_\_ volts are needed to make current jump the gap at the spark plug electrodes. \_\_\_\_\_
- 14. Explain the basic parts of a spark plug. \_\_\_\_\_

Ceramic insulator: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Name \_\_\_\_\_

*Grounded side electrode:* \_\_\_\_\_\_\_\_\_\_  
\_\_\_\_\_*Steel shell:* \_\_\_\_\_\_\_\_\_\_  
\_\_\_\_\_*Center terminal:* \_\_\_\_\_\_\_\_\_\_  
\_\_\_\_\_

15. What is spark plug reach?

\_\_\_\_\_  
\_\_\_\_\_16. Most vehicles require (resistor/non-resistor) \_\_\_\_\_  
plugs.

17. What is spark plug gap?

\_\_\_\_\_  
\_\_\_\_\_

18. Normal gap specifications range from \_\_\_\_\_ to \_\_\_\_\_.

\_\_\_\_\_  
\_\_\_\_\_19. Define *spark plug heat range*.\_\_\_\_\_  
\_\_\_\_\_20. A hot spark plug has a \_\_\_\_\_ (long/short) insulator tip; \_\_\_\_\_  
a cold spark plug has a (longer, shorter) \_\_\_\_\_ insulator tip.\_\_\_\_\_  
\_\_\_\_\_

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## Ignition Coils

21. An ignition coil is a(n) \_\_\_\_\_ transformer capable of \_\_\_\_\_  
producing the short bursts of high-voltage current that  
pass through the secondary wires (if used) and jump  
the spark plug gaps.

22. Name the components of an ignition coil.

\_\_\_\_\_  
\_\_\_\_\_

23. Explain the normal operating voltages of an ignition coil with older and newer systems.

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24. During ignition coil operation, when the current flowing \_\_\_\_\_ through the primary windings is interrupted by the ICM, the magnetic field \_\_\_\_\_ across the secondary windings.

25. What is a coil pack?

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\_\_\_\_\_ 26. A direct ignition coil mounts \_\_\_\_\_ the spark plug.

- (A) on the sides of
- (B) over the top of
- (C) under
- (D) in the middle of

27. How many direct ignition coils are required for each spark plug?

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## Coil Pack Ignition System

28. Describe a coil pack ignition system.

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29. The coil control unit in a coil pack ignition system \_\_\_\_\_ performs about the same function as the \_\_\_\_\_ in an electronic ignition.

30. Why are coil pack ignition systems often called “waste-spark ignition systems”?

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Name \_\_\_\_\_

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## Direct Ignition System

31. Describe a direct ignition system.

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32. What is the difference between coil pack ignition and direct ignition?

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33. What is an ionization knock sensing system designed to detect?

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34. *True or False?* A conventional knock sensor is needed \_\_\_\_\_  
on an engine with an ionization knock sensing system.

35. *True or False?* In some dual spark plug systems, one \_\_\_\_\_  
ignition coil is used to fire both spark plugs in a given  
cylinder at the same time.

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## Distributor Ignition Systems

\_\_\_\_\_ 36. All of the following are functions of an ignition distributor, *except*:

- (A) it actuates on/off cycles for ignition coil.
- (B) it times spark.
- (C) it drives oil pump.
- (D) distributes high-voltage pulses to the coil.

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## Engine Firing Order

37. Define *engine firing order*.

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38. What is the reason for the cylinders being marked 1-2-3-4, starting at the front of the engine?

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## Ignition Timing

39. Timing advance occurs when the spark plugs fire \_\_\_\_\_  
(sooner/later) on the engine compression stroke.

40. When is timing advance needed?

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41. When is timing retard needed?

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42. Describe the functions of the following sensors that influence ignition timing.

*Crankshaft position sensor:* \_\_\_\_\_

\_\_\_\_\_

*Camshaft position sensor:* \_\_\_\_\_

\_\_\_\_\_

*Manifold absolute pressure sensor:* \_\_\_\_\_

\_\_\_\_\_

*Intake air temperature sensor:* \_\_\_\_\_

\_\_\_\_\_

*Engine coolant temperature sensor:* \_\_\_\_\_

\_\_\_\_\_

*Knock sensor:* \_\_\_\_\_

\_\_\_\_\_

*Throttle position sensor:* \_\_\_\_\_

\_\_\_\_\_