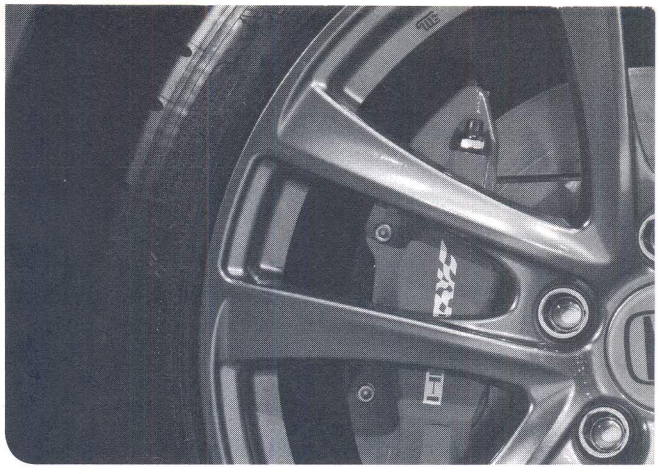
Chapter 81

Brake System Technology



Name _____ Date _____

Instructor _____ Score _____

Objective: After studying this chapter, you will be able to describe the operating principles of an automotive brake system.

Basic Brake System

1. Automotive _____ provide a means of using friction to slow, stop, or hold the wheels of a vehicle. _____
2. Describe how hydraulic brakes function.

   _____

   _____

   _____

   _____

   _____
3. With _____ brakes, a conventional hydraulic brake system is combined with an electric regenerative braking system provided by the hybrid's driveline. _____
4. Name and describe the basic parts of an automotive brake system.

   Brake pedal assembly:

   _____

   _____

   Master cylinder:

   _____

   _____

   Brake booster:

   _____

   _____

   Brake lines and hoses:

   _____

   _____

Wheel brake and assemblies:

_____

_____

Emergency brakes, or *parking brakes*:

_____

_____

_____ 5. Technician A says lever action pushes a rod into the brake booster and master cylinder when the driver pushes on the brake pedal. Technician B says this produces hydraulic pressure in the master cylinder. Who is right?
(A) A only.
(B) B only.
(C) Both A and B.
(D) Neither A nor B.

6. Describe the function and purpose of an emergency brake system.

_____

_____

_____

_____

_____

7. _____ brakes are frequently used on the two front wheels of a vehicle. _____ brakes are often used on the rear wheels.

_____

_____

_____ 8. All of the following are parts of a disc brake assembly, *except*:
(A) wheel cylinder.
(B) caliper.
(C) brake pads.
(D) rotor.

9. What are *brake pads*?

_____

_____

_____

_____ 10. Technician A says a wheel cylinder assembly houses a hydraulic piston that is forced outward by fluid pressure. Technician B says a brake drum rubs against brake shoes to stop or slow wheel rotation. Who is right?
(A) A only.
(B) B only.
(C) Both A and B.
(D) Neither A nor B.

Name _____

Braking Ratio

11. Define *braking ratio.*

_____

_____

_____

_____

_____

_____

12. How much braking power do the front wheel brakes handle?

_____

_____ 13. Technician A says front-wheel-drive cars can have a very low braking ratio at the front wheels. Technician B says front-wheel-drive cars can have a very high braking ratio at the front wheels. Who is right?
(A) A only.
(B) B only.
(C) Both A and B.
(D) Neither A nor B.

Brake System Hydraulics

14. A hydraulic system uses a(n) ____ to transmit motion and pressure. _____

15. List the three principles that apply to the operation of a hydraulic system.

_____

_____

_____

_____

_____

16. When hydraulic ____ of different sizes are used, motion and force can be increased or decreased. _____

Brake System Components

_____ 17. The ____ is a lever arm to increase the force applied to the master cylinder piston.
(A) push rod
(B) master cylinder
(C) firewall
(D) brake pedal assembly

19. List the parts of a master cylinder.

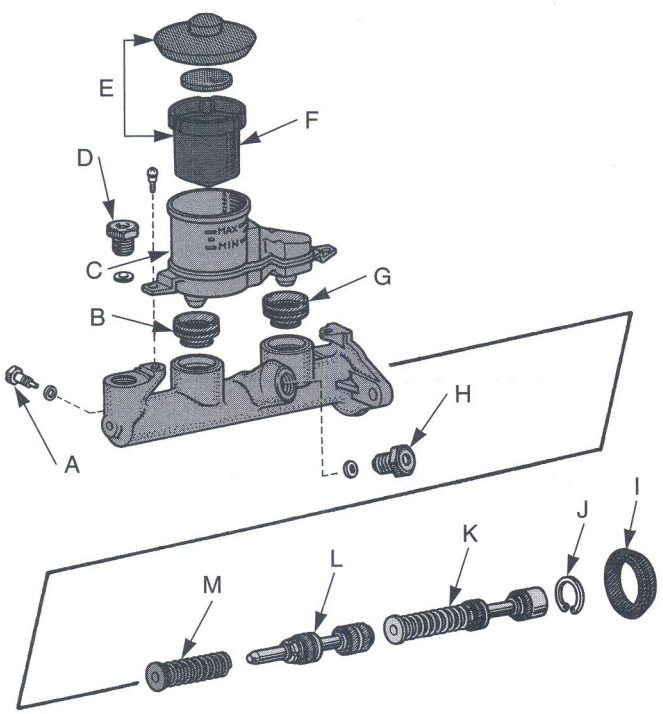
20. What is used to pressurize the brake system?

21. The master cylinder (compensating/intake) ____ port, or vent, allows fluid to enter the rear of the cylinder as the piston slides forward. ____

22. The (compensating/intake) ____ port releases extra pressure when the piston returns to the released position. ____

23. The ____ master cylinder has two separate hydraulic pistons and two fluid reservoirs. ____

24. Identify the parts of the master cylinder.



(A) ____

(B) ____

(C) ____

(D) ____

(E) ____

(F) ____

(G) ____

(H) ____

(I) ____

(J) ____

(K) ____

(L) ____

(M) ____

Name _____

_____ 25. Technician A says that in the dual master cylinder, the rear piston assembly is called the primary piston. Technician B says the front master cylinder piston is termed the secondary piston. Who is right?
(A) A only.
(B) B only.
(C) Both A and B.
(D) Neither A nor B.

26. Describe what happens in a dual master cylinder if there was pressure loss in the primary section of the brake system.

_____

_____

_____

_____

_____

27. What would be needed to slow and stop the vehicle if both primary and secondary hydraulic systems failed?

_____

_____

_____ 28. Power brakes use _____ to assist brake pedal application.
(A) a booster
(B) an engine vacuum
(C) atmospheric pressure
(D) Both A and B.

29. Describe the operation of a power brake *vacuum booster*.

_____

_____

_____

_____

_____

30. Name the two general types of vacuum brake boosters.

_____

_____

31. A power brake _____ uses power steering pump pressure to help the driver apply the brake pedal. _____

_____ 32. Technician A says hydro-boost power brakes are commonly used with vehicles equipped with diesel engines. Technician B says some gasoline powered vehicles also use hydro-boost systems. Who is right?
(A) A only.
(B) B only.
(C) Both A and B.
(D) Neither A nor B.

33. Name the two organizations that write specifications for brake fluid.

_____

_____

34. What are six desirable properties of brake fluid?

_____

_____

_____

_____

_____

_____

35. Brake _____ and brake _____ transfer fluid pressure from the master cylinder to the wheel brake assemblies. _____ _____

_____ 36. A _____ is used when a single brake line must feed two wheel cylinders.
(A) junction block
(B) fuse block
(C) combination valve
(D) diagonal valve

37. What is a *longitudinally split brake system*?

_____

_____

_____

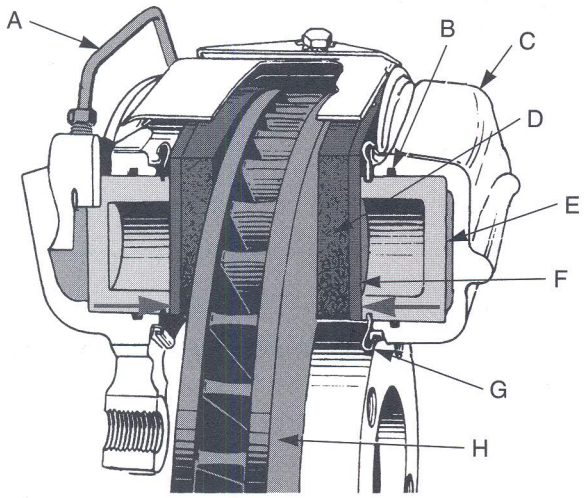
_____

38. *True or False?* Disc brakes are like the brakes on a ten-speed bicycle. _____

_____ 39. The _____ is included in a brake caliper assembly.
(A) cylinder cup
(B) master cylinder
(C) piston seal
(D) return spring

Name _____

40. Identify the components of the disc brake assembly.



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

For questions 41–43, match the following terms and identifying phrases.

(A) Piston seal
(B) Piston boot
(C) Bleeder screw

_____ 41. Keeps road dirt and water off the caliper piston and the wall of the cylinder.

_____ 42. Allows air to be removed from the hydraulic brake system.

_____ 43. Prevents pressure leakage between the piston and the cylinder.

44. Disc brake pads are ____ to which linings are riveted. _____

_____ 45. Technician A says newer vehicles use brake pad linings made of heat-resistant organic or semimetallic friction materials. Technician B says newer vehicles use pad linings made of asbestos. Who is right?
(A) A only.
(B) B only.
(C) Both A and B.
(D) Neither A nor B.

46. ____ are frequently used to keep the brake pads from vibrating and rattling. _____

47. Why is a pad-wear sensor sometimes used?

_____

_____

_____

_____

48. What is a *brake disc*?

_____

_____

_____

_____

_____ 49. All of the following are true about brake discs, *except*:
(A) they may be solid or vented.
(B) the ventilated disc has a series of ribs.
(C) they may be an integral part of the wheel hub.
(D) the brake disc is normally made of aluminum.

50. Define *floating caliper*.

_____ 51. Technician A says the sliding caliper uses more than one piston. Technician B says the fixed caliper disc brake is a one-piston caliper. Who is right?
(A) A only.
(B) B only.
(C) Both A and B.
(D) Neither A nor B.

52. Why are floating and sliding calipers used?

53. List the parts of a drum brake assembly.

_____ 54. The backing plate holds all of the following drum brake components, *except*:
(A) brake drum.
(B) shoes.
(C) wheel cylinder.
(D) springs.

55. What is the purpose of a wheel cylinder assembly?

56. What wheel cylinder component keeps road dirt and water out?

Name _____

57. Explain the function of a wheel cylinder *bleeder screw*.

_____

_____

_____

_____

58. Name two ways linings are attached to brake shoes?

_____

_____

_____ 59. Technician A says the secondary brake shoe is the front shoe. Technician B says the primary shoe has the shorter lining. Who is right?
(A) A only.
(B) B only.
(C) Both A and B.
(D) Neither A nor B.

60. _____ pull the brake shoes away from the brake drums. _____

61. Some manufacturers use _____ instead of hold-down springs and locking cups. _____

62. What are brake springs made of?

_____

_____

_____

_____

_____ 63. Technician A says the brake shoe adjuster maintains the correct drum-to-lining clearance. Technician B says many vehicles use a star wheel-type brake shoe adjusting mechanism. Who is right?
(A) A only.
(B) B only.
(C) Both A and B.
(D) Neither A nor B.

64. Explain how automatic brake shoe adjusters normally function.

_____

_____

_____

_____

_____

_____

65. _____ provide a rubbing surface for the brake shoe lining. _____

_____ 66. The brake shoes are drawn tighter against the drum by _____.
(A) shoe action
(B) self-energizing action
(C) inertia action
(D) capillary action

67. Define *servo action*.

_____

_____

_____

68. Because of servo action, (more/less) _____ wheel cylinder hydraulic pressure is needed to apply the brakes.

_____

69. Name the three switches commonly used in brake systems.

_____

_____

_____

_____ 70. Technician A says most modern cars use a mechanical stoplight switch. Technician B says most modern cars use a hydraulically operated stoplight switch. Who is right?
(A) A only.
(B) B only.
(C) Both A and B.
(D) Neither A nor B.

71. What switch warns the driver of a pressure loss on one side of a dual brake system?

_____

_____

72. Where is the low-fluid warning light switch usually mounted?

_____

_____

_____ 73. Many brake systems use _____ to regulate the pressure to each wheel cylinder.
(A) brake warning light switches
(B) check valves
(C) control valves
(D) differential valves

_____ 74. The metering valve prevents the front brake from applying until the pressure reaches _____.
(A) 25–50 psi
(B) 50–125 psi
(C) 75–135 psi
(D) 100–150 psi

_____ 75. Technician A says a metering valve is designed to equalize braking action at each wheel during light braking. Technician B says a proportioning valve is used to equalize pressure in systems with front disc and rear drum brakes. Who is right?

(A) A only.
(B) B only.
(C) Both A and B.
(D) Neither A nor B.

76. Where is the proportioning valve normally located?

_____

_____

_____

77. A(n) _____ valve is a single unit that functions as a brake warning light switch, a metering valve, and/or a proportioning valve. _____

Parking Brakes

78. Parking brakes provide a(n) _____ means (cables and levers) of applying the brakes. _____

79. Describe the parking brake action on vehicles with disc brakes.

_____

_____

_____

_____

_____

_____

Hybrid Brakes

80. Today's hybrid vehicles are equipped with _____ braking systems. _____