

CHAPTER 01: Classroom Manual: Drivetrain Basics

True / False

1. An automobile can be divided into four major systems: the engine, the drivetrain, the chassis and the body, interior and accessories.

a. True

b. False

ANSWER: True

2. The main components of the drivetrain are the transmission, differential, and drive axles.

a. True

b. False

ANSWER: True

3. All vehicles are either FWD or RWD or a combination of both.

a. True

b. False

ANSWER: True

4. A transaxle has a separate housing for the differential gears.

a. True

b. False

ANSWER: False

5. An engine develops torque that can be multiplied by transmission gears.

a. True

b. False

ANSWER: True

6. Large amounts of engine vacuum are formed in the cylinders during the exhaust stroke.

a. True

b. False

ANSWER: False

7. Engine load is the primary controlling factor that determines the amount of engine vacuum produced.

a. True

b. False

ANSWER: True

8. The driveline can multiply both power and torque.

- a. True
- b. False

ANSWER: False

9. As torque is multiplied, rotation speed is also multiplied.

- a. True
- b. False

ANSWER: False

10. One design function of a transmission is to produce torque.

- a. True
- b. False

ANSWER: False

11. Overdrive gears have ratios of less than 1:1.

- a. True
- b. False

ANSWER: True

12. Most automatic transmissions use at least one planetary gear set.

- a. True
- b. False

ANSWER: True

13. A planetary gear set contains two elements: a ring gear and a sun gear.

- a. True
- b. False

ANSWER: False

14. Hydraulically activated brake bands and multiple-friction disc packs are used to direct power flow through the transmission.

- a. True
- b. False

ANSWER: True

15. A CVT relies on the use of a torque converter.

- a. True
- b. False

ANSWER: False

16. A CVT uses belts and pulleys, instead of gear sets, to provide changing drive ratios.

- a. True

b. False

ANSWER: True

17. Some hybrid electric vehicles (HEVs) use a CVT that is based on the use of electric motors/generators to vary drive ratios.

a. True

b. False

ANSWER: True

18. A torque converter is a mechanical coupler that transmits engine torque into the transmission.

a. True

b. False

ANSWER: False

19. Most modern automatic transmissions rely on mechanical, hydraulic, and electronic components to accomplish gear ratio changes.

a. True

b. False

ANSWER: True

20. Most torque converters consist of an impeller, a turbine, and a stator.

a. True

b. False

ANSWER: True

21. The weight of a standard transmission flywheel is equal to the weight of an automatic transmission flexplate.

a. True

b. False

ANSWER: False

22. RWD vehicles use a long steel tube, using two universal joints and a slip joint, to connect the transmission to the rear axle.

a. True

b. False

ANSWER: True

23. The main purpose of a differential gear set is to allow equal wheel speed when a vehicle is turning a corner.

a. True

b. False

ANSWER: False

24. A transfer case is used in a 4WD vehicle to allow torque to be transferred to the front-drive axles.

- a. True
- b. False

ANSWER: True

25. Helical gears have their teeth parallel to and in alignment with the center of the gear.

- a. True
- b. False

ANSWER: False

26. The most common use for hypoid gears is in modern differentials.

- a. True
- b. False

ANSWER: True

27. A bushing is the simplest type of bearing.

- a. True
- b. False

ANSWER: True

28. Many bearings must be capable of withstanding both radial and axial loads.

- a. True
- b. False

ANSWER: True

29. Automatic transmission fluid (ATF) is responsible for the operation, lubrication, and cooling of the internal parts of the transmission.

- a. True
- b. False

ANSWER: True

30. All ATF have the same characteristics; therefore, it does not matter which ATF you add to a particular vehicle.

- a. True
- b. False

ANSWER: False

31. Transmission fluid filters, although different in appearance and composition, have the same function.

- a. True

b. False

ANSWER: True

32. The sun gear has teeth on the outer surface.

a. True

b. False

ANSWER: True

Multiple Choice

33. Which of the following is a component of the drivetrain.

a. Transmission

b. Differential

c. Drive axle

d. All of the above

ANSWER: d

34. Engine vacuum is largely determined by which of the following?

a. Engine speed

b. Engine load

c. Vehicle speed

d. None of the above

ANSWER: b

35. Which device is used to transfer engine torque to an automatic transmission?

a. Differential

b. Torque converter

c. Valve body

d. Flexplate

ANSWER: b

Technician A says that gears may be used to apply torque to other rotating parts.

Technician B says that gears may be used to multiply torque. Who is right?

36. Technician A says that gears may be used to apply torque to other rotating parts.

Technician B says ...

a. A only

b. B only

c. Both A and B

d. Neither A nor B

ANSWER: c

In order to create a low-pressure area in the cylinder during the intake stroke, the volume

of the cylinder does which of the following?

37. In order to create a low-pressure area in the cylinder during the intake stroke, the volume of the c...

- a. Remains the same
- b. Increases
- c. Decreases
- d. Pushes up

ANSWER: b

Technician A says a torque converter transfers engine power to the transmission, operating by hydraulic force. Technician B says a torque converter divides torque evenly. Who is correct?

38. Technician A says a torque converter transfers engine power to the transmission, operating by hydrau...

- a. A only
- b. B only
- c. Both A and B
- d. Neither A nor B

ANSWER: a

Technician A says by multiplying the number of teeth on one gear by the number of teeth on a second gear, a gear ratio can be determined. Technician B says the mathematical relationship, according to the number of teeth, of one gear to another is expressed as a gear ratio. Who is correct?

39. Technician A says by multiplying the number of teeth on one gear by the number of teeth on a second ...

- a. A only
- b. B only
- c. Both A and B
- d. Neither A nor B

ANSWER: b

Technician A says gears are used to multiply torque. Technician B says to apply torque to other rotating parts of the drivetrain, gears are used. Who is correct?

40. Technician A says gears are used to multiply torque. Technician B says to apply torque to other rota...

- a. A only
- b. B only
- c. Both A and B
- d. Neither A nor B

ANSWER: c

41. Which of the following is not true of an overdrive gear?

- a. It increases fuel economy.
- b. It increases torque.
- c. It decreases torque.
- d. It reduces operating noise.

ANSWER: b

By applying the engine's torque to one of the gears in a planetary gear set and preventing another member from moving, which of the following changes can take place?

42. By applying the engine's torque to one of the gears in a planetary gear set and preventing ano...

- a. Torque multiplication
- b. Speed increase
- c. Change of direction
- d. All of the above

ANSWER: d

Which gears are best suited for quiet, high-speed, low thrust applications when heavy loads are applied?

43. New Question

- a. Bevel
- b. Hypoid
- c. Herringbone
- d. Helical

ANSWER: d

Technician A says that in a RWD vehicle, the transmission and drive axle are located in a single assembly. Technician B says a transaxle is a single assembly containing the transmission and drive axle.

44. Technician A says that in a RWD vehicle, the transmission and drive axle are located in a single ass...

- a. A only
- b. B only
- c. Both A and B
- d. Neither A nor B

ANSWER: b

Completion

45. The main components of the drivetrain are the _____, _____, and _____.

ANSWER: transmission, differential, drive axles

46. The rotating or turning effort of the engine's crankshaft is called _____.

ANSWER: engine torque

47. Most automotive engines are _____ cycle engines.

ANSWER: four-stroke

48. The engine vacuum is dependent on engine _____.

ANSWER: load

49. Torque is measured by either _____ or _____.

ANSWER: foot-pounds, Newton-meters

50. Measurements of horsepower indicate the _____ of work being performed and the _____ at which it is being done.

ANSWER: amount, rate

51. Torque is calculated by multiplying the applied force by the _____ from the center of the _____ to the point where the force is exerted.

ANSWER: distance, shaft

52. Gear ratios can be varied by changing the _____ and _____ of teeth of the gears in mesh.

ANSWER: diameter, number

53. In gear systems, speed reduction means torque _____.

ANSWER: increase

54. Transmissions contain several combinations of large and small gears. Lower (high ratio) gears allow for lower vehicle speeds but more _____.

ANSWER: torque

55. A transmission has a _____ position that allows the engine to run without applying power to the drive wheels.

ANSWER: neutral

56. _____ gear allows for the greatest torque multiplication.

ANSWER: First

57. The purpose of _____ is to promote fuel economy and reduce operating noise while maintaining highway cruising speed.

ANSWER: overdrive

58. The ring-and-pinion gears in the drive axle assembly allow for _____ torque multiplication.

ANSWER: additional

59. A planetary gear set consists of a _____ gear, a _____ gear and several _____ gears mounted in a planetary _____.

ANSWER: ring, sun, planet, carrier

60. Instead of relying on gear sets to provide changing drive ratios, a CVT uses _____ and _____.

ANSWER: belts, pulleys

61. Hybrid electric vehicles use _____, _____ and the engine directly connected to a planetary gear set.

ANSWER: electric motors, generators

62. The _____ controls the flow of fluid throughout the transmission in response to the inputs it receives about engine and vehicle speeds and loads.

ANSWER: valve body

63. The torque convertor assembly is comprised of a(n) _____, a(n) _____ and a(n) _____.

ANSWER: turbine, impeller, stator

64. In FWD vehicles, the transmission and drive axle is located in a single assembly called a _____.

ANSWER: transaxle

65. In RWD vehicles, the drive axle is connected to the transmission through a _____.

ANSWER: drive shaft

66. The primary purpose of the differential is to allow _____ wheel speeds when the vehicle is rounding a corner.

ANSWER: unequal

67. In a FWD vehicle, _____ joints are fitted to the axles to allow the axles to

move with the vehicle's suspension and steering systems.

ANSWER: constant velocity

68. 4WD vehicles are equipped with a _____ to allow the engine torque to be transferred to the front-drive axles.

ANSWER: transfer case

69. _____ gears are like spur gears except that their teeth have been twisted at an angle from the gear centerline.

ANSWER: Helical

70. The most common type of gear found in automotive differentials is the _____ gear.

ANSWER: hypoid

71. A(n) _____ is the simplest type of bearing, a cylindrical hole usually lined with brass or bronze.

ANSWER: bushing

72. _____ or _____ bearings are used wherever friction must be minimized.

ANSWER: Ball, roller

73. A thrust washer is used to control end _____.

ANSWER: clearance

74. Automatic transmission fluid can be a _____ - based, partially _____, or totally _____ -based oil.

ANSWER: petroleum, synthetic, synthetic

75. Current automatic transmissions are fitted with one of three types of filters: a _____ filter, _____ filter, or _____ filter.

ANSWER: screen, paper, felt

76. Reverse is accomplished in a manual transmission by the use of an _____ brought into mesh with two other gears.

ANSWER: idler gear

Subjective Short Answer

77. What are the primary purposes of the vehicle's drivetrain?

ANSWER: The drivetrain has four primary purposes: *To connect the engine's power to the drive wheels *To select different speed ratios *To provide a way to move the vehicle in reverse *To control the power to the drive wheels for safe turning of the vehicle

78. Why does torque increase when a smaller gear drives a larger gear?

ANSWER: The larger gear turns at a slower speed (speed reduction means torque increase) but with an increase in torque.

79. What mechanisms do current CVTs use to vary gear and speed ratios?

ANSWER: A system of belts and pulleys

Essay

80. What is the intent of a CVT transmissions?

ANSWER: The CVT transmission design allows the engine operating within a fixed speed range for improved fuel economy and decreased emission levels.

Subjective Short Answer

81. What is the primary difference between a transaxle and transmission?

ANSWER: The transaxle has the differential drive gears located within the same housing as the rest of the transmission components. A transmission has a separate housing for the differential gears.

Essay

82. Why have modern vehicles seen an increase in the number of available gear ratios?

ANSWER: To achieve a better match between engine torque and vehicle speed.

83. What drivetrain component is added to a transmission to make it a transaxle?

ANSWER: The differential unit.

Subjective Short Answer

84. Why are U-joints used in the driveline?

ANSWER: To allow the driveshaft(s) to change angles in response to movements of the vehicle's suspension.

85. What does the ring and pinion in the drive axle do to the torque it receives from the transmission?

ANSWER: The ring and pinion multiplies the torque it receives from the transmission.

Essay

86. Name the four engine strokes.

ANSWER: Intake, compression, power, and exhaust strokes

Subjective Short Answer

87. What are the purposes of the ATF.

ANSWER: The purpose of the ATF is to act as a fluid coupling, to operate, to lubricate, and to cool the transmission.

88. What are the components of a simple planetary gear set?

ANSWER: A planetary gear set consists of a ring gear, a sun gear, and several planet gears all mounted in a common carrier.

89. Explain the purpose of the valve body.

ANSWER: The valve body controls the flow of fluid throughout the transmission and acts on the vacuum and mechanical signals it receives about engine and vehicle speeds and loads.

Essay

90. Explain the operation of the valve body in an electronically controlled transmission.

ANSWER: An electronic control unit operates solenoids in the valve body to shift gears based on data received from electronic sensors.

Subjective Short Answer

91. Explain how gear ratio changes are accomplished in an automatic transmission.

ANSWER: Brake bands or multiple-friction disc packs attached to the individual gear carriers and shafts are hydraulically activated in order to direct engine power to any of the gears and to prevent any of the gears from rotating.