1. The purpose of the steering system is to turn the _________ wheels & in some cases the rears too.

2. The steering system is composed of the steering ______________, steering ________ and the steering column and wheel.

3. Steering linkage is the system of _____________ and connecting _______ between the steering gear and the steering arms or knuckles attached to the wheels that control the direction of travel.

4. _________________ linkage is the most common type on larger cars, pickups & larger SUV’s.

5. Any steering linkage can be placed either ________ of or _________ the front axle centerline.

6. The _______________ ______ connects the steering linkage to the steering gear or steering box.

7. The pitman arm also maintains the height of the center link, this reduces chances of _______ steer.

8. The ___________ _____ connects the steering linkage to the frame opposite of the pitman arm.

9. Pitman arms can be either wear or non-wear. Idler arms tend to wear _______ than pitman arms.

10. The ______________ ______ or drag link is the steering component that connects to the idler arm & pitman arm and also to the inner tie rod ends. They can also be either wear or non-wear by design.

11. ______ ________ connect the center links to the steering knuckles.

12. Tie rods consist of an adjustment _____________ in the center connecting to inner and outer, spring-loaded ball & socket ends. These are the components adjusted in order to achieve proper toe settings.

13. ______ & _________ steering linkage is lighter in weight with fewer components and provides quicker response as compared to parallelogram linkage. Rack & Pinion steering systems have no idler arm, pitman arm, or center link!

14. On rack & pinion systems, a small _____________ gear attached to the steering column moves a toothed _______ that is attached to the tie rods. The rack performs the task of the center link.

15. The rack & pinion assembly is housed in a tube with rubber ______________ boots covering the inner tie rod ends to protect them from contamination by road elements like salt, sand & gravel.

16. The metal housing of the rack maintains the correct _____________ of the steering components similar to the way the center link, idler arm, and pitman arm do to prevent bump steer.

17. Rack-to-pinion yoke _______ or preload affects steering harshness, feedback, and noise. This adjustment is done with either shims, and adjustment plug or an adjustment screw.

18. Styles of steering gears can be _________________ ball, _________ & roller, and rack & pinion.
19. In addition to air bags & collapsible materials, steering columns are fit with ________________ joints to allow the pivot needed to reach through the passenger compartment to the steering gear.

20. Steering column design differences include: fixed column, ________________ column, ________ column, and column-mounted transmission shift mechanisms. Air bags are mounted there too.

21. A steering ____________ is a horizontally mounted shock absorber that connects to the ________ link at one end and the frame at the other. They reduce road shock being transmitted through the steering system up the steering column, to the driver. **Found mostly on 4WD vehicles.**

22. __________-______________ systems reduce the amount of effort needed to turn the steering wheel. *They can be hydraulic units or can be electric motor driven and electronically controlled.*

23. On an ______________ piston power steering system, the power cylinder & control valve are both housed *within* the steering gear itself. Both recirculating ball & rack and pinion systems use this.

24. Power steering ____________ develop hydraulic flow which provides the force needed to operate the steering gear. Pumps can be either roller, vane, slipper or gear designs. *They are belt driven.*

25. __________ power steering (EPS), that uses either a 12-volt or 42-volt electric motor mounted to or mounted inside the steering gear replace the conventional fluid pump, hoses & drive belt.

26. Power steering uses both ________ control & pressure ________ valves in addition to a sensor which can signal the need for an RPM increase to the PCM under heavy steering load/psi at idle.

27. Power steering ________ transmit fluid under pressure, return fluid, act as reservoirs as well as sound and vibration dampeners. *Hose pressure may reach up to 1,500 psi & temperatures up to 300 degrees.*

28. _____ can change steering effort for parking vs. high speed driving & has made *self-park* a reality.

29. Electric power steering (EPS) may need up to ____ amperes to turn the wheel. EPS is always rack & pinion design.

30. If the engine stalls, **EPS** still provides assist since the battery is the power source. **True or False**

31. **Steering system complaints** include, excessive steering wheel ________, feedback, ________ steering, nibble (*a feeling similar to shimmy*), pulling, drifting, shimmy, poor return, noise & wander.

32. With any diagnosis, you should begin by trying to verify & duplicate the ___________ complaint. **All repairs should follow the 3 C’s**: verify **Complaint**, determine **Cause**, make **Correction**.

33. Road tests, visual inspections, and above all, a check of the ________ level & condition is smart.

34. A ___________ _____ is an electronic, inductive pick-up tool for noise identification.

35. Besides steering the wheel from lock-to-lock, there is also a vacuum method to ____________ a power steering system of trapped air. Bubbles in the fluid indicate trapped air & cause noise.

36. A power steering ______________ tester helps determine pump & valving problems. **On EPS, a scan tool is used to read DTC’s.** There are also many mechanical parts to cause problems too.
37. **Steering & suspension systems are best inspected with vehicle weight on them.** True or False …and adjustments are most often made with the weight on the steering & suspension systems too.

38. The __________ is the weakest link in the parallelogram steering system.

39. Any amount of movement over ___” on a tie rod or in a joint on a center link is excessive.

40. A steering damper that is **dripping oil** should be replaced.  **True or False**

41. A __________ check is done with full vehicle weight on the system and then rocking the steering wheel back & forth to feel for free play or lash.  *(30 mm max)*

42. Turning __________ can be measured with a pull scale fastened to a steering wheel spoke.

43. **Steering gear lash** adjustment *(felt as drag)* is checked with a __________ wrench at the steering wheel and the pitman arm disconnected from the steering gear box.

44. Bleeding or __________ a power steering system removes trapped air.  *(2 methods are used)*

45. System service also often includes __________ out the old fluid and replacing it with new.

46. __________ steering systems can provide near neutral steering for quicker cornering, better straight line stability, and a reduced turning circle.  *4WS may be mechanical or electro/hydraulic*

47. Quadrasteer® is a 4WS system where at low speeds the rear wheels turn in __________ directions from the fronts, at moderate speeds the rears are straight, and at high speeds the rear wheels turn in the same direction as the fronts.