Groundwater Hydrology Definitions

1. **groundwater hydrology** - the study of the occurrence, distribution, movement, and chemistry of water in the subsurface
2. **porosity,** n - ratio of volume of void space to total volume of rock
3. **aquifer** - saturated unit capable of transmitting economic quantities of water
4. **aquitard** - saturated unit that transmits groundwater slowly, also called **confining bed**
5. **water table** - the surface on which the fluid pressure in the pores of a porous medium is exactly equal to atmospheric pressure
6. **phreatic aquifer** - aquifer that is bounded above by the water table, also called **water table aquifer**, **unconfined aquifer**
7. **confined aquifer** - aquifer overlain by a unit that is significantly less permeable
8. **capillary fringe** - region just above the water table where the porous medium is saturated but the pressure is below atmospheric, due to capillary rise
9. **vadose zone** - subsurface region between the soil surface and the water table, also called **unsaturated zone**
10. **piezometer** - open pipe installed in an aquifer to measure head at a point
11. **head,** h - energy per weight of water, also called **hydraulic head**, **total head**; equal to the height of water above the the datum
12. **pressure head** - pressure potential energy per weight of water; equal to the height that water rises in a piezometer
13. **elevation head** - gravitational potential energy per weight of water; equal to the height of the point of interest above the datum
14. **hydraulic gradient,** $dh/d\ell$ **or** ∇h - change in hydraulic head as a function of position
15. **piezometer nest** - several piezometers installed to different depths at essentially the same location; used to determine vertical flow direction
16. **potentiometric surface** - surface that represents the level to which water will rise in a piezometer
17. **hydraulic conductivity,** K - property of the porous medium and fluid describing the ability of the porous medium to transmit fluid
18. **specific discharge,** q - ratio of flow rate to cross-sectional area perpendicular to flow, also called **Darcy velocity**

19. **pore velocity,** v - average velocity of groundwater molecules; it is equivalent to the ratio of specific discharge to porosity, also called **groundwater velocity**, **average linear velocity**, **seepage velocity**

20. **permeability,** k - property of the rock describing the ability of the rock to transmit fluid

21. **homogeneous** - property values do not depend on location

22. **heterogeneous** - property values depend on location

23. **streamline** - path that is everywhere tangent to the groundwater velocity

24. **isotropic** - property values do not depend on direction

25. **anisotropic** - property values depend on direction

26. **anisotropy ratio,** K_s - ratio of hydraulic conductivity parallel to layering to hydraulic conductivity perpendicular to layering

27. **specific yield,** S_y - ratio of volume of water removed from a porous medium to the volume of the porous medium that was drained

28. **specific retention,** S_r - ratio of volume of water that is retained in the porous medium to the total volume of the porous medium that was drained

29. **compressibility,** β_p - change in pore volume of aquifer per unit change in pressure

30. **water compressibility,** β_w - change in volume of water per unit change in pressure per unit volume of fluid

31. **specific storage,** S_s - volume of water released from a unit volume of aquifer under a unit decline in hydraulic head

32. **storage coefficient,** S - volume of water released from a unit area of aquifer under a unit decline in hydraulic head ($S = S_s b$, where b is the aquifer thickness), also called **storativity**

33. **transmissivity,** T - property describing the ability of an aquifer to transmit water ($T = Kb$, where b is the aquifer thickness)

34. **slug test** - field test used to determine aquifer properties by observing the aquifer response to adding or removing a volume of water from a monitoring well

35. **drawdown** - drop in hydraulic head relative to its equilibrium position

36. **well hydraulics** - study of the behavior of an aquifer under the stress caused by injection or extraction of fluids through wells

37. **cone of depression** - region around a pumping well where drawdown occurs

38. **pumping test** - field test used to determine aquifer properties by pumping water out of one well and observing drawdown in other wells

39. **capture zone** - area that contributes water to a pumping well

40. **hydraulic containment** - the process of creating a cell that is hydraulically isolated from the rest of the aquifer by injection and pumping of water

41. **sorption** - surface reaction between a solute and the rock matrix

42. **advection** - transport of a solute with the bulk groundwater movement

43. **molecular diffusion** - movement of a solute due to random molecular motion

44. **tortuosity,** τ - ratio of straight line path length of a solute to the actual path length

45. **mechanical dispersion** - spreading of a solute due to small-scale velocity variations

46. **water content,** θ - ratio of volume of water to total volume of rock, also called **moisture content**

47. **saturation,** s - ratio of volume of water to volume of void space

48. **capillary head,** ψ - pressure head, used in the vadose zone where pressure head is negative, also called **pressure potential**, **moisture potential**, **suction head**, **tension head**

49. **hysteresis** - a retardation of an effect when the forces acting on a body are changed; in vadose-zone hydrology, hysteresis refers to differences in soil properties under wetting and drying conditions

50. **water retention curve** - relationship between water content and capillary head, also called **soil water characteristic curve**

51. **relative hydraulic conductivity** - ratio of hydraulic conductivity of an unsaturated soil to the hydraulic conductivity of the same soil when saturated