

Physics Formulas

1. This equation can describe velocity or speed. When d represents distance, the equation describes speed. When d represents displacement, v is equal to velocity.:

$$v = \frac{d}{t}$$

2. This equation describes acceleration, which is the change in velocity, or displacement/ unit time, per unit time. SI units are in m/s²:

$$a = \frac{\Delta v}{t}$$

3. This equation requires constant acceleration to hold true. x is displacement, v is velocity, t is time, and a is the acceleration.:

$$x = x_0 + v_0 t + \frac{1}{2} a t^2$$

4. This equation requires constant acceleration to hold true. v is velocity, a is acceleration, and t is time.:

$$v = v_0 + a t$$

5. This equation requires constant acceleration to hold true. v is velocity, a is acceleration, x is displacement.:

$$v^2 = v_0^2 + 2 a x$$

6. This equation requires constant acceleration to hold true. v(avg) is average velocity, v(o) is original velocity, v is current velocity.:

$$v_{avg} = \frac{v + v_0}{2}$$

7. This equation requires constant acceleration to hold true. v is velocity, g is gravitational acceleration (9.8m/s/s) and h is height fallen.:

$$v = \sqrt{2gh}$$

8. This equation describes an object moving in a circle at a constant speed v which experiences a centripetal acceleration a(c) that is proportional to the square of its speed and inversely proportional to the radius of the circle which is circumscribes.:

$$a_c = \frac{v^2}{r}$$

9. This equation describes the centripetal force applied to an object to give it a certain centripetal acceleration.:

$$F_c = m \frac{v^2}{r}$$

10. This equation describes the force due to gravity on two objects of masses m(1) and m(2) at a distance r. G is the gravitational constant.:

$$F = G \frac{m_1 m_2}{r^2}$$

11. This equation is Hooke's law, which describes the force generated when an object is deformed. k is the spring constant unique to the specific object, and x is the displacement from the rest position.:

$$F = -k \Delta x$$

12. This equation describes the force which acts on an object directly down the plane of an inclined plane when gravity is the only force on that object.:

$$F = mg \sin \theta$$

13. This equation describes the normal force which acts on an object on an inclined plane when gravity is the only force on that object.:

$$F_n = mg \cos \Theta$$

14. This equation describes the force on an object due to kinetic friction. Note, in order for friction to kinetic, both plane of the objects MUST be SLIDING past each other. This means cars tires do NOT experience kinetic friction.:

$$f_k \leq u_k F_n$$

15. This equation describes static friction acting between two objects which are stationary due to each other. This force must be overcome to slide the objects past each other.:

$$f_s \leq u_s F_n$$

16. This is Newton's second law, stating that the Force (net force) on an object is proportional to its mass and acceleration.:

$$F = ma$$

17. This equation describes power. P is power, E is energy, and t is time.:

$$P = \frac{\Delta E}{t}$$

18. This equation describes power. P is power, F is force, v is velocity, and theta is the angle between F and v.:

$$P = Fv \cos \Theta$$

19. This equation describes elastic potential energy. k is the spring constant, x is displacement.:

$$U_e = \frac{1}{2} k \Delta x^2$$

20. This equation describes gravitational potential energy. m is mass, g is gravitational acceleration, and h is height.:

$$U_g = mgh$$

21. This equation describes kinetic energy.:

$$E_k = \frac{1}{2} mv^2$$

22. This equation describes torque. Tau is torque, F is the force, and l is the lever arm (direction of force perpendicular to the axis of rotation.:

$$\tau = Fl$$

23. This equation describes work. F is force, d is distance, and theta is the angle between the force and displacement.:

$$W = Fd \cos \Theta$$

24. This equation describes total work when no heat is gained or lost. K is kinetic energy, U is potential energy, and E(i) is internal energy.:

$$W = \Delta K + \Delta U + \Delta E_i$$

25. This equation describes impulse.:

$$F_{avg} \Delta t = \Delta mv$$

26. This equation describes momentum:

$$p = mv$$

27. This equation describes rest mass energy.:

$$E = mc^2$$

28. This equation describes fluid density. Rho is density, m is mass, and V is volume. Unit are usually Kg/m³..

$$\rho = \frac{m}{V}$$

29. This equation describes pressure due to a liquid at rest. P is pressure, F is force, and A is area.:

$$P = \frac{F}{A}$$

30. This equation describes the S.G. of a fluid. The S.G of water is 1. Fluids with higher S.G than 1 are more dense than water.:

$$\text{Specific Gravity} = \frac{\rho_{\text{substance}}}{\rho_{\text{water}}}$$

31. This equation describes pressure due to a column of fluid at rest. P is pressure, rho is density, g is the gravitational constant, and y is the height of the column.:

$$P = \rho g y$$

32. This equation describe the buoyant force on an object immersed in a fluid. Rho is the density of the fluid, V is the volume of fluid displaced by object, and g is gravitational acceleration.:

$$F_{\text{buoyant}} = \rho V g$$

33. This equation describes volume flow rate. Q is rate, A is area, v is velocity of the fluid.:

$$Q = A v$$

34. This is Bernoulli's equation. K is a constant, P is pressure, rho is density, v is velocity, g is gravitational acceleration, and h is height.:

$$K = P + \frac{1}{2} \rho v^2 + \rho g h$$

35. This equation describes the velocity of a stream of water coming from a spigot at a height h below an open container of water. v is velocity, g is gravitational acceleration, and h is the height difference. Note for this equation to hold true, the spigot and container must be exposed to the same external pressure (atm):

$$v = \sqrt{2 g h}$$

36. Modulus of elasticity:

$$\text{modulus of elasticity} = \frac{\text{stress}}{\text{strain}}$$

37. This equation describes decibel levels.:

$$\beta = 10 \log \frac{I}{I_0}$$

38. This equation describes resonant frequency for a pipe open or closed at both ends, or a string with both ends tied down:

$$L = \frac{n \lambda_n}{4}$$

39. This equation describes beat frequency:

$$f_{\text{beat}} = |f_1 - f_2|$$

40. This equation describes resonant frequency for a string tied at one end of a pipe open at one end:

$$L = \frac{n \lambda_n}{2}$$

41. The doppler effect:

$$\frac{\Delta f}{f_s} = \frac{v}{c}$$

42. The doppler effect:

$$\frac{\Delta \lambda}{\lambda_s} = \frac{v}{c}$$

43. Velocity of electromagnetic radiation ($c = 3 \times 10^8$):

$$v = f \lambda$$

44. Period of a wave:

$$T = \frac{1}{f}$$

45. This equation describes the maximum voltage of an AC current. V_{rms} is the root mean square voltage (120 in AC outlets):

$$V_{max} = \sqrt{2V_{rms}}$$

46. This equation describes the maximum current of an AC circuit. I_{rms} is the root mean square voltage.:

$$I_{max} = \sqrt{2I_{rms}}$$

47. This equation describes capacitance. C is capacitance in farads, Q is charge on the plates, V is voltage between the plates.:

$$C = \frac{Q}{V}$$

48. This equation describes potential energy of a capacitor:

$$U = \frac{1}{2} QV$$

49. This equation describes potential energy of a capacitor:

$$U = \frac{1}{2} \frac{Q^2}{C}$$

50. This equation describes potential energy of a capacitor:

$$U = \frac{1}{2} CV^2$$

51. This equation describes the force on a charge q due to an electric field E :

$$F = Eq$$

52. This equation describes the potential energy of a point charge in an electric field due to an electric force times displacement of the charge (arbitrary, similar to gravitational pot energy):

$$U = qEd$$

53. Voltage. E field strength times distance:

$$V = Ed$$

54. Potential energy. Voltage times charge:

$$U = Vq$$

55. Force due to two point charges with charge q_1 and q_2 and distance between them r :

$$F = k \frac{q_1 q_2}{r^2}$$

56. Potential energy due to two point charges:

$$U = k \frac{q_1 q_2}{r}$$

57. Electric field due to a point charge:

$$E = k \frac{q_1}{r^2}$$

58. Electric field due to a point charge:

$$V = k \frac{q_1}{r}$$

59. Magnetism. q = charge, v = velocity, B = mag field strength, θ = angle between v and B :

$$F = qvB \sin \theta$$

60. Voltage = current times resistance:

$$V = IR$$

61. Power = current times voltage:

$$P = IV$$

62. Power = current squared times resistance:

$$P = I^2 R$$

63. Power = voltage squared divided by resistance:

$$P = \frac{V^2}{R}$$

64. This equation relates the speed of electromagnetic radiation, c , to its frequency and wavelength:

$$c = f \lambda$$

65. This is the relative speed of light in a medium. C is speed of light in a vacuum.:

$$n = \frac{c}{v}$$

66. This equation describes the energy of a photon.:

$$E = hf$$

67. This equation describes the refraction of a light wave when passing between two medium of different indices of refraction. Note, a higher index of refraction results in a lower speed in that medium.:

$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$



68. Equation relating focal point of mirror to center of curvature.:

$$f_{\text{mirror}} = \frac{1}{2}r$$

69. The thin lens equation.:

$$\frac{1}{f} = \frac{1}{p} + \frac{1}{q}$$

70. Lens power. (focal point):

$$P = \frac{1}{f}$$

71. Magnification:

$$m = -\frac{q}{p} = \frac{h_i}{h_o}$$