
CONSTANTS, DATA, AND CONVERSIONS FOR PHYSICS EXAM

Acceleration due to gravity near Earth's surface (g) = $9.80 \text{ m/s}^2 = 9.80 \text{ N/kg}$

Atomic mass unit (amu) = $1.66 \times 10^{-27} \text{ kg} = 931.5 \text{ MeV}/c^2$

Avogadro's constant (N_A) = $6.02 \times 10^{23} / \text{mol}$

Boltzmann constant (k_B) = $1.38 \times 10^{-23} \text{ J/K}$

calorie = 4.18 J

Coulomb constant (k) = $1/(4\pi\epsilon_0) = 8.99 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$

Density of air at STP = 1.29 kg/m^3

Density of water at 20°C and 1 atm = $1.00 \times 10^3 \text{ kg/m}^3$

Electron charge (e^-) = $1.60 \times 10^{-19} \text{ C}$

Electron mass (m_e) = $9.11 \times 10^{-31} \text{ kg} = 5.49 \times 10^{-4} \text{ amu} = 0.511 \text{ MeV}/c^2$

Electron volt (eV) = $1.60 \times 10^{-19} \text{ J}$

Gas constant (R) = $8.31 \text{ J/mol}\cdot\text{K} = 0.0821 \text{ atm}\cdot\text{L/mol}\cdot\text{K}$

Gravitational constant (G) = $6.67 \times 10^{-11} \text{ N}\cdot\text{m}^2/\text{kg}^2$

Heat of fusion of ice at STP = $80.0 \text{ cal/g} = 3.33 \times 10^5 \text{ J/kg}$

Heat of vaporization of water at 100°C and 1 atm = $540 \text{ cal/g} = 2.26 \times 10^6 \text{ J/kg}$

Moment of inertia of solid object about axis through the center of mass:

Solid sphere, $\frac{2}{5}MR^2$

Solid cylinder, $\frac{1}{2}MR^2$ (axis of rotation along the axis of cylinder)

Long thin rod, $\frac{1}{12}ML^2$ (axis perpendicular to rod through the center)

Ring, MR^2

Permeability of free space (μ_0) = $4\pi \times 10^{-7} \text{ H/m}$ or N/A^2

Permittivity of free space $(\epsilon_0) = 1/(4\pi k) = 8.85 \times 10^{-12} \text{ C}^2/\text{N} \cdot \text{m}^2$

Planck's constant $(h) = 6.626 \times 10^{-34} \text{ J} \cdot \text{s} = 4.136 \times 10^{-15} \text{ eV} \cdot \text{s}$

Specific heat of water $= 1.00 \text{ cal/g} \cdot ^\circ\text{C} = 4186 \text{ J/kg} \cdot ^\circ\text{C}$

Speed of light $(c) = 3.00 \times 10^8 \text{ m/s}$

Speed of sound in air at 20°C and $1 \text{ atm} = 343 \text{ m/s}$

Standard atmosphere pressure $= 1 \text{ atm} = 1.01 \text{ bar} = 1.01 \times 10^5 \text{ Pa}$

$$= 1.01 \times 10^5 \text{ N/m}^2 = 760 \text{ mm Hg}$$

Stefan-Boltzmann constant $= 5.67 \times 10^{-8} \text{ W/m}^2 \cdot \text{K}^4$