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

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 $= 4.18\ \text{J}$

Coulomb constant $(k) = 1/(4\pi\varepsilon_0) = 8.99 \times 10^9\ \text{N}\cdot\text{m}^2/\text{C}^2$

Density of air at $\text{STP} = 1.29\ \text{kg/m}^3$

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 $(\mu_0) = 4\pi \times 10^{-7}\ \text{H/m or N/A}^2$

Permittivity of free space $= (\varepsilon_0) = 1/(4\pi k) = 8.85 \times 10^{-12}\ \text{C}^2/\text{N} \cdot \text{m}^2$

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 $= 1.00\ \text{cal/g} \cdot °\text{C} = 4186\ \text{J/kg} \cdot °\text{C}$

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

Speed of sound in air at $20°\text{C}$ 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 $= 5.67 \times 10^{-8}\ \text{W/m}^2 \cdot \text{K}^4$