

PHYSICAL AND ASTRONOMICAL CONSTANTS

for use in all Physics and Astronomy examinations

| Quantity | Symbol | Numerical value | Units |
|---------------------------------------------------------------------------------|--------------|--------------------------------------------|-------------------------------------------|
| speed of light in vacuum | c, c_0 | 299 792 458 | m s^{-1} |
| elementary charge | e | $1.602\,176\,634 \times 10^{-19}$ | C |
| Planck constant | h | $6.626\,070\,15 \times 10^{-34}$ | J s |
| $h/2\pi$ | \hbar | $1.054\,571\,817 \dots \times 10^{-34}$ | J s |
| Boltzmann constant | k | $1.380\,649 \times 10^{-23}$ | J K^{-1} |
| Avogadro constant | N_A | $6.022\,140\,76 \times 10^{23}$ | mol^{-1} |
| Faraday constant $N_A e$ | F | 96 485.332 12 ... | C mol^{-1} |
| fine structure constant | α | $7.297\,352\,5693(11) \times 10^{-3}$ | |
| unified atomic mass unit $\frac{1}{12}m(^{12}\text{C})$ | u | $1.660\,539\,066\,60(50) \times 10^{-27}$ | kg |
| magnetic constant | μ_0 | $1.256\,637\,062\,12(19) \times 10^{-6}$ | H m^{-1} |
| electric constant $1/\mu_0 c^2$ | ϵ_0 | $8.854\,187\,8128(13) \times 10^{-12}$ | F m^{-1} |
| electron mass | m_e | $9.109\,383\,7015(28) \times 10^{-31}$ | kg |
| proton mass | m_p | $1.672\,621\,923\,69(51) \times 10^{-27}$ | kg |
| neutron mass | m_n | $1.674\,927\,498\,04(95) \times 10^{-27}$ | kg |
| electron charge to mass quotient | $-e/m_e$ | $-1.758\,820\,010\,76(53) \times 10^{11}$ | C kg^{-1} |
| molar gas constant $N_A k_B$ | R | 8.314 462 618 ... | $\text{J mol}^{-1} \text{K}^{-1}$ |
| molar volume of ideal gas RT/p $T = 273.15 \text{ K}, p = 100 \text{ kPa}$ | V_m | $22.710\,954\,64 \dots \times 10^{-3}$ | $\text{m}^3 \text{mol}^{-1}$ |
| Stefan-Boltzmann constant $(\pi^2/60)k^4/\hbar^3 c^2$ | σ | $5.670\,374\,419 \dots \times 10^{-8}$ | $\text{W m}^{-2} \text{K}^{-4}$ |
| Rydberg constant $\alpha^2 m_e c / 2h$ | R_∞ | 10 973 731.568 160(21) | m^{-1} |
| Bohr radius $4\pi\epsilon_0 \hbar^2 / m_e e^2$ | a_0 | $5.291\,772\,109\,03(80) \times 10^{-11}$ | m |
| Bohr magneton $e\hbar/2m_e$ | μ_B | $9.274\,010\,0783(28) \times 10^{-24}$ | J T^{-1} |
| nuclear magneton $e\hbar/2m_p$ | μ_N | $5.050\,783\,7461(15) \times 10^{-27}$ | J T^{-1} |
| electron magnetic moment | μ_e | $-9.284\,764\,7043(28) \times 10^{-24}$ | J T^{-1} |
| proton magnetic moment | μ_p | $1.410\,606\,797\,36(60) \times 10^{-26}$ | J T^{-1} |
| Newtonian constant of gravitation | G | $6.674\,30(15) \times 10^{-11}$ | $\text{m}^3 \text{kg}^{-1} \text{s}^{-2}$ |
| standard acceleration of gravity | g_n | 9.806 65 | m s^{-2} |
| Earth mass | M_E | $5.972\,17(13) \times 10^{24}$ | kg |
| Earth radius (volumetric mean) | R_E | 6.371×10^6 | m |
| solar luminosity | L_\odot | 3.828×10^{26} | W |
| solar mass | M_\odot | $1.988\,410(45) \times 10^{30}$ | kg |
| solar radius (volumetric mean) | R_\odot | 6.957×10^8 | m |
| Jupiter mass | M_J | $1.898\,125(43) \times 10^{27}$ | kg |
| Jupiter radius (volumetric mean) | R_J | 6.9911×10^7 | m |
| astronomical unit | au | 149 597 870 700 | m |
| parsec | pc | $3.085\,677\,581\,49 \dots \times 10^{16}$ | m |