

## Examrace

# Physical and astronomical constants to remember for Competitive Exams

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|              |   |  |
|--------------|---|--|
| $c$          | <i>Speed of light in vacuo</i>                        | $2.998 \times 10^8 \text{ ms}^{-1}$                                  |
| $e$          | <i>Elementary charge</i>                              | $1.602 \times 10^{-19} \text{ C}$                                    |
| $m_n$        | <i>Neutron rest mass</i>                              | $1.675 \times 10^{-27} \text{ kg}$                                   |
| $m_p$        | <i>Proton rest mass</i>                               | $1.673 \times 10^{-27} \text{ kg}$                                   |
| $m_e$        | <i>Electron rest mass</i>                             | $9.110 \times 10^{-31} \text{ kg}$                                   |
| $h$          | <i>Planck's constant</i>                              | $6.626 \times 10^{-34} \text{ Js}$                                   |
| $\hbar$      | <i>Dirac's constant</i> ( $= \frac{h}{2\pi}$ )        | $1.055 \times 10^{-34} \text{ Js}$                                   |
| $k$          | <i>Boltzmann's constant</i>                           | $1.381 \times 10^{-23} \text{ J K}^{-1}$                             |
| $G$          | <i>Gravitational constant</i>                         | $6.673 \times 10^{-11} \text{ N m}^2 \text{ k}^{-2}$                 |
| $\sigma$     | <i>Stefan- Boltzmann constant</i>                     | $5.670 \times 10^{-8} \text{ Jm}^{-2} \text{ K}^{-4} \text{ s}^{-1}$ |
| $c_1$        | <i>First Radiation Constant</i><br>( $= 2\pi hc^2$ )  | $3.712 \times 10^{-16} \text{ J m}^2 \text{ s}^{-1}$                 |
| $c_2$        | <i>Second Radiation Constant</i> ( $= \frac{hc}{k}$ ) | $1.439 \times 10^{-2} \text{ m K}$                                   |
| $\epsilon_0$ | <i>Permittivity of free space</i>                     | $8.854 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$    |
| $\mu_0$      | <i>Permeability of free space</i>                     | $4\pi \times 10^{-7} \text{ H m}^{-1}$                               |

|  |  |  |
|--|--|--|
| $N_A$                                      | <i>Avogadro constant</i>                               | $6.022 \times 10^{23} \text{ mol}^{-1}$  |
| $R$  | <i>Gas constant</i>                                    | $8.314 \text{ JK}^{-1} \text{ mol}^{-1}$ |
| $a_0$                                      | <i>Bohr radius</i>                                     | $5.292 \times 10^{-11} \text{ m}$        |
| $\mu_B$                                    | <i>Bohr magneton</i>                                   | $9.274 \times 10^{-24} \text{ JT}^{-1}$  |
| $\alpha$                                   | <i>Fine structure constant</i> ( $= \frac{1}{137.0}$ ) | $7,297 \times 10^{-3}$                   |
| $M_\odot$                                  | <i>Solar Mass</i>                                      | $1.989 \times 10^{30} \text{ kg}$        |
| $R_\odot$                                  | <i>Solar radius</i>                                    | $6.96 \times 10^8 \text{ m}$             |
| $L_\odot$                                  | <i>Solar luminosity</i>                                | $3.827 \times 10^{26} \text{ Js}^{-1}$   |
| $M_\oplus$                                 | <i>Earth mass</i>                                      | $5.976 \times 10^{24} \text{ kg}$        |
| $R_\oplus$                                 | <i>Mean earth radius</i>                               | $6.371 \times 10^6 \text{ m}$            |
| <i>1 light year</i>                        | <i>Mean earth radius</i>                               | $9.461 \times 10^{15} \text{ m}$         |
| <i>1 AU</i>                                | <i>Astronomical unit</i>                               | $1.196 \times 10^{11} \text{ m}$         |
| <i>1 pc</i>                                | <i>Parsec</i>  | $3.086 \times 10^{16} \text{ m}$         |
| <i>1 year</i>                              |  | $3.156 \times 10^7 \text{ s}$            |
| <i>Physical and astronomical constants</i> |  |  |

ENERGY CONVERSION:  $1 \text{ joule (J)} = 6.2415 \times 10^{18} \text{ electronvolts (eV)}$