

Reference ♦ PHYSICAL SCIENCE ♦ Information

Acceleration = $\frac{\text{final velocity} - \text{initial velocity}}{\text{time}}$ ($a = \frac{v_f - v_i}{t}$)

Speed = $\frac{\text{distance}}{\text{time}}$ ($v = \frac{d}{t}$)

Density = $\frac{\text{mass}}{\text{volume}}$ ($D = \frac{m}{V}$)

Force = mass x acceleration ($F = ma$)

Power = $\frac{\text{work}}{\text{time}}$ ($P = \frac{W}{t}$)

Work = force x distance ($W = Fd$)

Mechanical advantage = $\frac{\text{effort distance}}{\text{resistance distance}}$ ($MA = \frac{d_e}{d_r}$)

Efficiency = $\frac{\text{work out}}{\text{work in}}$ ($e = \frac{W_o}{W_i}$)

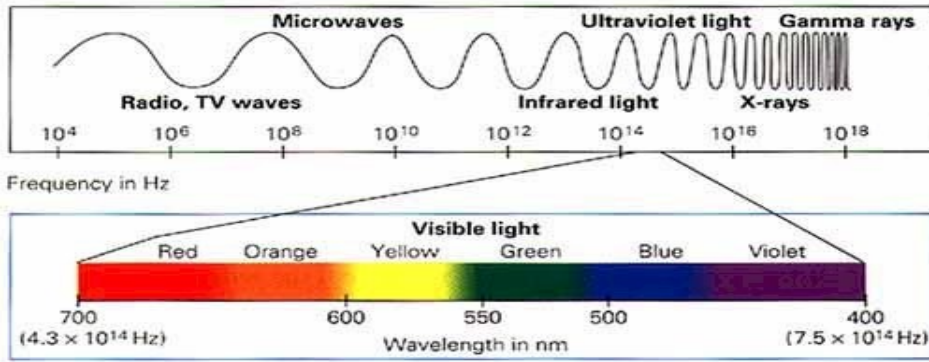
Kelvin = °Celsius + 273 ($K = °C + 273$)

Voltage = current x resistance ($V = IR$)

Weight = mass x acceleration of gravity ($w = mg$)

Acceleration of gravity = $g \approx 10 \frac{m}{sec^2}$

Volume of a rectangular solid = length x width x height ($V = lwh$) $F_{gravity} = \frac{km_1m_2}{d^2}$



<http://web.princeton.edu/sites/ehs/laserguide/spectrum.jpg>

| 10 ⁿ | Prefix | Symbol | Decimal |
|-------------------|--------|--------|-----------------------------------|
| 10 ²⁴ | yotta- | Y | 1 000 000 000 000 000 000 000 000 |
| 10 ²¹ | zetta- | Z | 1 000 000 000 000 000 000 000 |
| 10 ¹⁸ | exa- | E | 1 000 000 000 000 000 000 |
| 10 ¹⁵ | peta- | P | 1 000 000 000 000 000 |
| 10 ¹² | tera- | T | 1 000 000 000 000 |
| 10 ⁹ | giga- | G | 1 000 000 000 |
| 10 ⁶ | mega- | M | 1 000 000 |
| 10 ³ | kilo- | k | 1 000 |
| 10 ² | hecto- | h | 100 |
| 10 ¹ | deca- | da | 10 |
| 10 ⁰ | (none) | (none) | 1 |
| 10 ⁻¹ | deci- | d | 0.1 |
| 10 ⁻² | centi- | c | 0.01 |
| 10 ⁻³ | milli- | m | 0.001 |
| 10 ⁻⁶ | micro- | μ | 0.000 001 |
| 10 ⁻⁹ | nano- | n | 0.000 000 001 |
| 10 ⁻¹² | pico- | p | 0.000 000 000 001 |
| 10 ⁻¹⁵ | femto- | f | 0.000 000 000 000 001 |
| 10 ⁻¹⁸ | atto- | a | 0.000 000 000 000 000 001 |
| 10 ⁻²¹ | zepto- | z | 0.000 000 000 000 000 000 001 |
| 10 ⁻²⁴ | yocto- | y | 0.000 000 000 000 000 000 000 001 |

Periodic Table of Elements

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|-----------------------------------|----------------------------------|-----------------------------------|-------------------------------------|-----------------------------------|----------------------------------|-------------------------------------|---------------------------------|----------------------------------|------------------------------------|-----------------------------------|---------------------------------|----------------------------------|------------------------------------|------------------------------------|-----------------------------------|--------------------------------|-----------------------------------|
| 1 H Hydrogen 1.00794 | 2 He Helium 4.002602 | | | | | | | | | | | | | | | | |
| 3 Li Lithium 6.941 | 4 Be Beryllium 9.012182 | | | | | | | | | | | | | | | | |
| 11 Na Sodium 22.98976928 | 12 Mg Magnesium 24.3050 | | | | | | | | | | | | | | | | |
| 19 K Potassium 39.0983 | 20 Ca Calcium 40.078 | 21 Sc Scandium 44.955912 | 22 Ti Titanium 47.887 | 23 V Vanadium 50.9415 | 24 Cr Chromium 51.9961 | 25 Mn Manganese 54.938045 | 26 Fe Iron 55.845 | 27 Co Cobalt 58.933195 | 28 Ni Nickel 58.6934 | 29 Cu Copper 63.546 | 30 Zn Zinc 65.38 | 31 Ga Gallium 69.723 | 32 Ge Germanium 72.64 | 33 As Arsenic 74.92160 | 34 Se Selenium 78.96 | 35 Br Bromine 79.904 | 36 Kr Krypton 83.78 |
| 37 Rb Rubidium 85.4678 | 38 Sr Strontium 87.62 | 39 Y Yttrium 88.90585 | 40 Zr Zirconium 91.224 | 41 Nb Niobium 92.90638 | 42 Mo Molybdenum 95.96 | 43 Tc Technetium (97.9072) | 44 Ru Ruthenium 101.07 | 45 Rh Rhodium 102.90550 | 46 Pd Palladium 106.42 | 47 Ag Silver 107.8682 | 48 Cd Cadmium 112.411 | 49 In Indium 114.818 | 50 Sn Tin 118.710 | 51 Sb Antimony 121.760 | 52 Te Tellurium 127.60 | 53 I Iodine 126.90447 | 54 Xe Xenon 131.293 |
| 55 Cs Cesium 132.9054519 | 56 Ba Barium 137.327 | 57-71 Lanthanoids | 72 Hf Hafnium 178.49 | 73 Ta Tantalum 180.94788 | 74 W Tungsten 183.84 | 75 Re Rhenium 186.207 | 76 Os Osmium 190.23 | 77 Ir Iridium 192.222 | 78 Pt Platinum 195.084 | 79 Au Gold 196.966569 | 80 Hg Mercury 200.59 | 81 Tl Thallium 204.3833 | 82 Pb Lead 207.2 | 83 Bi Bismuth 208.98040 | 84 Po Polonium (209) | 85 At Astatine (210) | 86 Rn Radon (222.0176) |
| 87 Fr Francium (223) | 88 Ra Radium (226) | 89-103 Actinoids | 104 Rf Rutherfordium (261) | 105 Db Dubnium (262) | 106 Sg Seaborgium (266) | 107 Bh Bohrium (264) | 108 Hs Hassium (277) | 109 Mt Meitnerium (268) | 110 Ds Darmstadtium (271) | 111 Rg Roentgenium (272) | 112 Uub Ununbium (285) | 113 Uut Ununtrium (284) | 114 Uuq Ununquadium (289) | 115 Uup Ununpentium (288) | 116 Uuh Ununhexium (288) | 117 Uus Ununseptium | 118 Uuo Ununoctium (294) |

For elements with no stable isotopes, the mass number of the isotope with the longest half-life is in parentheses.

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|------------------------------------|----------------------------------|---------------------------------------|----------------------------------|---------------------------------|--------------------------------|---------------------------------|----------------------------------|----------------------------------|-----------------------------------|----------------------------------|-------------------------------|-----------------------------------|----------------------------------|----------------------------------|
| 57 La Lanthanum 138.90547 | 58 Ce Cerium 140.116 | 59 Pr Praseodymium 140.90765 | 60 Nd Neodymium 144.242 | 61 Pm Promethium (145) | 62 Sm Samarium 150.36 | 63 Eu Europium 151.964 | 64 Gd Gadolinium 157.25 | 65 Tb Terbium 158.92535 | 66 Dy Dysprosium 162.500 | 67 Ho Holmium 164.93032 | 68 Er Erbium 167.259 | 69 Tm Thulium 168.93421 | 70 Yb Ytterbium 173.054 | 71 Lu Lutetium 174.9668 |
| 89 Ac Actinium (227) | 90 Th Thorium 232.03806 | 91 Pa Protactinium 231.03688 | 92 U Uranium 238.02891 | 93 Np Neptunium (237) | 94 Pu Plutonium (244) | 95 Am Americium (243) | 96 Cm Curium (247) | 97 Bk Berkelium (247) | 98 Cf Californium (251) | 99 Es Einsteinium (252) | 100 Fm Fermium (257) | 101 Md Mendelevium (258) | 102 No Nobelium (259) | 103 Lr Lawrencium (260) |

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