

KAVALIITE/FORMELBILAGA

Vakioita / Konstanter

$$N_A = 6,022\,140\,76 \cdot 10^{23} \text{ 1/mol}$$

$$G = 6,674 \cdot 10^{-11} \text{ Nm}^2/\text{kg}^2$$

$$e = 1,602\,176\,634 \cdot 10^{-19} \text{ C}$$

$$F = 96\,485 \text{ C/mol}$$

$$g = 9,81 \text{ m/s}^2$$

$$h = 6,626\,070\,15 \cdot 10^{-34} \text{ J} \cdot \text{s}$$

$$= 4,135\,7 \cdot 10^{-15} \text{ eV} \cdot \text{s}$$

$$\sigma = 5,670 \cdot 10^{-8} \text{ W}/(\text{m}^2 \cdot \text{K}^4)$$

$$\varepsilon_0 = 8,85 \cdot 10^{-12} \text{ F/m}$$

$$\mu_0 \approx 4\pi \cdot 10^{-7} \text{ Vs}/(\text{Am}) \approx 1,257 \cdot 10^{-6} \text{ Vs}/(\text{Am})$$

$$c = 299\,792\,458 \text{ m/s}$$

$$c_a = 343 \text{ m/s}$$

$$R_H = 1,096\,8 \cdot 10^7 \text{ m}^{-1}$$

$$c(\text{H}_2\text{O}) = 4,19 \text{ kJ}/(\text{kg} \cdot \text{K})$$

$$K_w = 1,008 \cdot 10^{-14} (\text{mol/l})^2$$

$$R = 8,314\,51 \text{ Pa} \cdot \text{m}^3/(\text{mol} \cdot \text{K})$$

$$= 0,083\,1451 (\text{bar} \cdot \text{dm}^3)/(\text{mol} \cdot \text{K})$$

$$e \approx 2,718\,28$$

$$\pi \approx 3,1416$$

$$\text{protoni/proton: } m_p = 1,672\,621\,6 \cdot 10^{-27} \text{ kg}$$

$$\text{neutroni/neutron: } m_n = 1,674\,927\,3 \cdot 10^{-27} \text{ kg}$$

$$\text{elektroni/elektron: } m_e = 9,109\,382\,2 \cdot 10^{-31} \text{ kg}$$

$$u = 931,49 \text{ MeV}/c^2$$

$$= 1,660\,538\,9 \cdot 10^{-27} \text{ kg}$$

$$m_p = 1,007\,276\,5 \text{ u}$$

$$m_n = 1,008\,665\,0 \text{ u}$$

$$m_e = 5,485\,799\,1 \cdot 10^{-4} \text{ u}$$

Kaavoja ja muuntokertoimia / Formler och omvandlingsfaktorer

$$0^\circ\text{C} = 273,15 \text{ K}$$

$$1 \text{ atm} = 101\,325 \text{ Pa}$$

$$1 \text{ eV} \approx 1,602 \cdot 10^{-19} \text{ J}$$

$$A = 4\pi r^2; V = \frac{4}{3}\pi r^3$$

$$ax^2 + bx + c = 0 \Rightarrow x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$1 \text{ kWh} = 3,6 \text{ MJ}$$

$$360^\circ = 2\pi \text{ rad}$$

$$\ln 2 \approx 0,693$$

$$\cos x = \sin(90^\circ - x), 0 \leq x \leq 90^\circ$$

$$\cos^2 x + \sin^2 x = 1$$

Kemia / Kemi

$$It = n z F$$

$$pV = nRT$$

$$K_a = \frac{[\text{A}^-][\text{H}_3\text{O}^+]}{[\text{HA}]}$$

$$\text{pH} = \text{p}K_a + \lg \frac{[\text{A}^-]}{[\text{HA}]}$$

Fysiikka / Fysik

$$v = v_0 + at$$

$$s = v_0 t + \frac{1}{2}at^2$$

$$v = \omega r$$

$$T = \frac{2\pi}{\omega}; f_n = \frac{n}{t} = \frac{1}{T}$$

$$\omega = \omega_0 + \alpha t$$

$$\varphi = \varphi_0 + \omega_0 t + \frac{1}{2}\alpha t^2$$

$$a = \frac{v^2}{r}$$

$$F = G \frac{m_1 m_2}{r^2}, E_p = -\frac{G m_1 m_2}{r}$$

$$F = -kx; \frac{F}{A} = E \frac{\Delta l}{l}$$

$$T = 2\pi\sqrt{\frac{m}{k}} = 2\pi\sqrt{\frac{l}{g}}$$

$$\bar{p} = m\bar{v}$$

$$W = \bar{F} \cdot \bar{s}$$

$$P = W/t$$

$$pV = nRT$$

$$l = l_0(1 + \alpha\Delta T); V = V_0(1 + \gamma\Delta T)$$

$$\eta = \frac{W_o}{W_i} = \frac{\frac{W_o}{t}}{\frac{P_i}{t}} = \frac{P_o}{P_i}$$

$$\Delta Q = cm\Delta T$$

$$Q = sm$$

$$Q = rm$$

$$F = \frac{Q_1Q_2}{4\pi\epsilon_0r^2}$$

$$F = QE$$

$$V(x_0) = E_0/q$$

$$E_{\text{pot}} = qU$$

$$E = \frac{U}{d}$$

$$C = Q/U$$

$$C = \epsilon_r\epsilon_0\frac{A}{d}$$

$$E = \frac{1}{2}QU$$

$$E = hf = \frac{hc}{\lambda}; E(\text{eV}) = 1240/\lambda(\text{nm})$$

$$I = I_0e^{-\mu x}$$

$$\lambda = \frac{h}{p} = \frac{h}{mv}$$

$$E_p = mgh; E_k = \frac{1}{2}mv^2$$

$$\bar{M} = \bar{r} \times \bar{F}$$

$$p = \frac{F}{A} = \frac{Fs}{As} = \frac{W}{V}$$

$$p = \rho gh$$

$$\mu_{\text{max}} = 1 - \frac{T_2}{T_1}$$

$$f = f_0\frac{v}{v \pm v_l}; f = f_0\frac{v \pm v_h}{v}$$

$$I = \frac{P}{A}$$

$$L = 10 \lg \left(\frac{I}{I_0} \right) \text{ dB}$$

$$\frac{\sin \alpha_1}{\sin \alpha_2} = \frac{\lambda_1}{\lambda_2} = \frac{v_1}{v_2} = \frac{n_2}{n_1} = n_{12}$$

$$U = RI, P = UI$$

$$\Delta Q = I \cdot \Delta t$$

$$B = \frac{\mu_0 I}{2\pi r}$$

$$\bar{F} = q(\bar{v} \times \bar{B}); F = qvB \sin \alpha$$

$$F_m = IlB \sin \alpha$$

$$\Phi = AB \cos \alpha$$

$$e = NAB\omega \sin(\omega t)$$

$$M = NABI \sin \alpha$$

$$\frac{U_1}{U_2} = \frac{N_1}{N_2} \approx \frac{I_2}{I_1}$$

$$2d \sin(\theta) = n\lambda$$

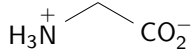
$$\frac{1}{\lambda} = R_H \left(\frac{1}{n^2} - \frac{1}{m^2} \right)$$

$$N = \frac{m}{M} N_A$$

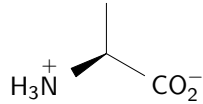
$$A = \lambda N = \lambda N_0 e^{-\lambda t} = A_0 e^{-\lambda t}$$

Luonnon aminohapot / Aminosyörrna i naturen

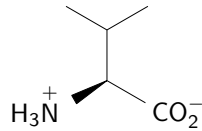
Aminohapot on esitetty siinä muodossa, jossa ne pääosin esiintyvät fysiologisessa pH-arvossa 7,4. Aminosyörrna presenteras i den form som mest förekommer vid det fysiologiska pH-värdet 7,4.



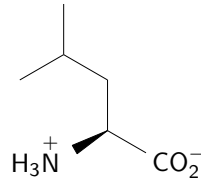
**glysiini /
glycin**
Gly, G



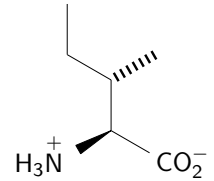
**alaniini /
alanin**
Ala, A



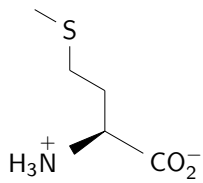
**valiini /
valin**
Val, V



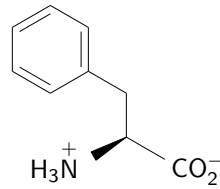
**leusiini /
leucin**
Leu, L



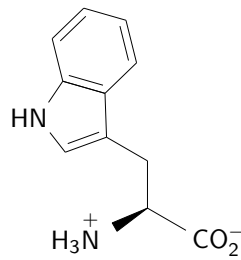
**isoleusiini /
isoleucin**
Ile, I



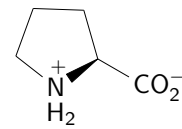
**metioniini /
metionin**
Met, M



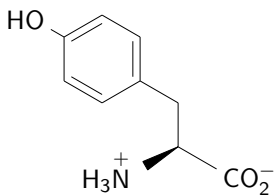
**fenyylialaniini /
fenylalanin**
Phe, F



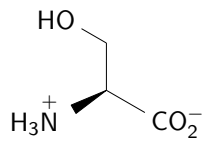
**tryptofaani /
tryptofan**
Trp, W



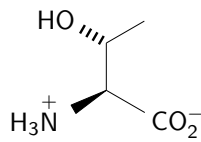
**proliini /
prolin**
Pro, P



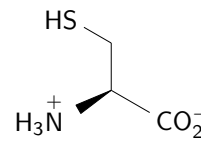
**tyrosiini /
tyrosin**
Tyr, Y



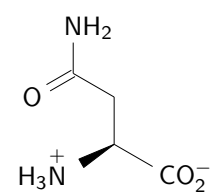
**seriini /
serin**
Ser, S



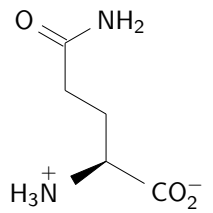
**treoniini /
treonin**
Thr, T



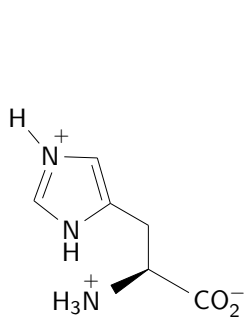
**kysteiini /
cystein**
Cys, C



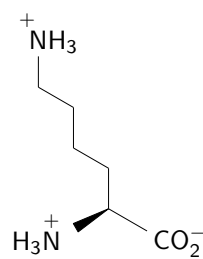
**asparagiini /
asparagin**
Asn, N



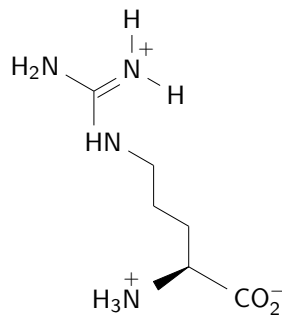
**glutamiini /
glutamin**
Gln, Q



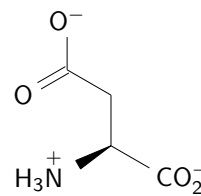
**histidiini /
histidin**
His, H



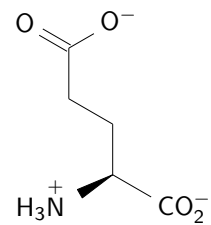
**lysiini /
lysin**
Lys, K



**arginiini /
arginin**
Arg, R



**asparagiinihappo /
asparaginsyra**
Asp, D



**glutamiinihappo /
glutaminsyra**
Glu, E

Alkuaineiden jaksollinen järjestelmä / Grundämnenas periodiska system

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
H [1] 1,008																		He [2] 4,003
Li [3] 6,941	Be [4] 9,012											B [5] 10,81	C [6] 12,01	N [7] 14,01	O [8] 16,00	F [9] 19,00	Ne [10] 20,18	
Na [11] 22,99	Mg [12] 24,31											Al [13] 26,98	Si [14] 28,09	P [15] 30,97	S [16] 32,07	Cl [17] 35,45	Ar [18] 39,95	
K [19] 39,10	Ca [20] 40,08	Sc [21] 44,96	Ti [22] 47,87	V [23] 50,94	Cr [24] 52,00	Mn [25] 54,94	Fe [26] 55,85	Co [27] 58,93	Ni [28] 58,69	Cu [29] 63,55	Zn [30] 65,38	Ga [31] 69,72	Ge [32] 72,63	As [33] 74,92	Se [34] 78,96	Br [35] 79,90	Kr [36] 83,80	
Rb [37] 85,47	Sr [38] 87,62	Y [39] 88,91	Zr [40] 91,22	Nb [41] 92,91	Mo [42] 95,96	Tc [43] (98)	Ru [44] 101,07	Rh [45] 102,91	Pd [46] 106,42	Ag [47] 107,87	Cd [48] 112,41	In [49] 114,82	Sn [50] 118,71	Sb [51] 121,76	Te [52] 127,60	I [53] 126,90	Xe [54] 131,29	
Cs [55] 132,91	Ba [56] 137,32	57-71	Hf [72] 178,49	Ta [73] 180,95	W [74] 183,84	Re [75] 186,21	Os [76] 190,23	Ir [77] 192,22	Pt [78] 195,08	Au [79] 196,97	Hg [80] 200,59	Tl [81] 204,38	Pb [82] 207,2	Bi [83] 208,98	Po [84] (209)	At [85] (210)	Rn [86] (222)	
Fr [87] (223)	Ra [88] (226)	89-103	Rf [104] (261)	Db [105] (262)	Sg [106] (266)	Bh [107] (264)	Hs [108] (277)	Mt [109] (268)	Ds [110] (281)	Rg [111] (272)	Cn [112] (285)	Nh [113] (286)	Fl [114] (289)	Mc [115] (288)	Lv [116] (293)	Ts [117] (294)	Og [118] (294)	

Lantanoidit Lantanoider	La [57] 138,91	Ce [58] 140,12	Pr [59] 140,91	Nd [60] 144,24	Pm [61] (145)	Sm [62] 150,36	Eu [63] 151,96	Gd [64] 157,25	Tb [65] 158,93	Dy [66] 162,50	Ho [67] 164,93	Er [68] 167,26	Tm [69] 168,93	Yb [70] 173,05	Lu [71] 174,97
Aktinoidit Aktinoider	Ac [89] (227)	Th [90] 232,04	Pa [91] 231,04	U [92] 238,03	Np [93] (237)	Pu [94] (244)	Am [95] (243)	Cm [96] (247)	Bk [97] (247)	Cf [98] (251)	Es [99] (252)	Fm [100] (257)	Md [101] (258)	No [102] (259)	Lr [103] (262)