

Kaavaliite

Kaavaliitteen vakiot ja taulukkoarvot oletetaan las-
kuissa tarkoiksi arvoiksi.

Avogadron luku $N_A = 6,022 \cdot 10^{23}$ 1/mol
 Gravitaatiovakio $\gamma = 6,6742 \cdot 10^{-11}$ Nm²/kg²
 Elektronin varaus $e = -1,602 \cdot 10^{-19}$ C
 Elohopean tiheys 13600 kg/m³
 Faradayn luku $F = 96,5 \cdot 10^3$ C/mol
 Ideaalikaasun moolitilavuus $V_m = 22,41$ l/mol (NTP)
 Kuivan ilman tiheys 1,29 kg/m³ (NTP)
 Kuulokynnyksen intensiteetti $I_0 = 10^{-12}$ W/m²
 Normaali-ilmanpaine 1 atm = 101325 Pa
 Maan painovoiman aiheuttama putoamiskiihtyvyys
 $g = 9,81$ m/s²
 $0^\circ\text{C} = 273,15$ K
 Planckin vakio $h = 6,626 \cdot 10^{-34}$ Js = $4,1357 \cdot 10^{-15}$ eVs
 Stefan-Boltzmannin vakio $\sigma = 5,67 \cdot 10^{-8}$ W/(m² · K⁴)
 Tyhjiön permittiivisyys $\epsilon_0 = 8,85 \cdot 10^{-12}$ F/m
 Valon nopeus $c = 3,0 \cdot 10^8$ m/s
 Veden tiheys $1,0 \cdot 10^3$ kg/m³ ($0^\circ\text{C} - 100^\circ\text{C}$)
 Veren tiheys 1050 kg/m³
 Veden höyrystymislämpö 2260 kJ/kg
 Veden ionitulo $K_w = 1,008 \cdot 10^{-14}$ (mol/l)²
 Veden ominaislämpökapasiteetti 4,19 kJ/(K · kg)
 Yleinen kaasuvakio $R = 8,314$ J/(mol · K)
 Äänen nopeus ilmassa 343 m/s
 $k = 1$ mustalle kappaleelle
 $1 \text{ eV} = 1,602 \cdot 10^{-19}$ J
 $1 \text{ curie} = 1 \text{ Ci} = 3,7 \cdot 10^{10}$ Bq
 $1 \text{ kwh} = 3,6$ MJ
 protoni: $m_p = 1,6726586 \cdot 10^{-27}$ kg
 neutroni: $m_n = 1,6749543 \cdot 10^{-27}$ kg
 elektroni: $m_e = 9,109 \cdot 10^{-31}$ kg
 atomimassayksikkö: $m_u = 1,6605655 \cdot 10^{-27}$ kg
 $m_p = 1,0072825 m_u$
 $m_n = 1,0086650 m_u$

$$ax^2 + bx + c = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$K = \frac{[A^-][HB^+]}{[HA][B]}$$

$$K_a = \frac{[A^-][H_3O^+]}{[HA]}$$

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

$$pH = pK_a + \lg \frac{[A^-]}{[HA]}$$

$$\frac{[A^-]}{[HA] + [A^-]} = \frac{1}{1 + 10^{(pK_a - pH)}}$$

$$\frac{[HA]}{[HA] + [A^-]} = \frac{1}{1 + 10^{(pH - pK_a)}}$$

$$I = I_0 e^{-ecd}$$

$$A = \lg(I_0/I)$$

$$A = \epsilon cd$$

$$[H_3O^+] = \sqrt{K_a \cdot C_{\text{tot}}}$$

$$p = \rho gh$$

$$U = RI, \quad P = UI$$

$$c = Hp_0$$

$$A = 4\pi r^2$$

$$V = (4/3)\pi r^3$$

$$\frac{J_d}{\Delta c} = P = \frac{KD}{\Delta x}$$

$$P = \phi D / \Delta x$$

$$\Delta V = -\frac{RT}{ZF} \ln \frac{c^s}{c^u}$$

$$J = -D \left(\frac{dc}{dx} + Zc \frac{F}{RT} \frac{dV}{dx} \right)$$

$$\Delta V = V_s - V_u = \frac{RT}{F} \ln \left(\frac{P_{Na}c_{Na}^u + P_Kc_K^u + P_{Cl}c_{Cl}^s}{P_{Na}c_{Na}^s + P_Kc_K^s + P_{Cl}c_{Cl}^u} \right)$$

$$\frac{c_K^s}{c_K^u} = \frac{c_{Cl}^u}{c_{Cl}^s}$$

$$(c_{Cl}^u + |Z_p|c_p^u)c_{Cl}^0 = c_K^s c_{Cl}^s$$

$$I = C_m \frac{dE}{dt} + g_{Na}(E - E_{Na}) + g_K(E - E_K) + g_l(E - E_l)$$

$$\frac{\sin(\alpha)}{\sin(\beta)} = \frac{\lambda_1}{\lambda_2} = \frac{c_1}{c_2} = \frac{n_2}{n_1} = n_{21}$$

$$\frac{1}{a} + \frac{1}{b} = \frac{1}{f}$$

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

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

$$B = \mu_0 I / (2\pi r)$$

$$F = Q_1 Q_2 / (4\pi \epsilon_0 r^2)$$

$$F = QE, \quad E = U/d$$

$$F = m\omega^2 r = V(\rho_m - \rho_n)\omega^2 r$$

$$v = F/f = V(\rho_m - \rho_n)\omega^2 r/f$$

$$W = \frac{1}{2} J \omega^2$$

$$v = QE \frac{1}{6\pi r \eta}$$

$$E_s = [Zm_p + Nm_n - m_\gamma]c^2$$

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

$$\lg A = \lg A_0 - (\lg e)\lambda t$$

$$T_{1/2} = \frac{\ln(2)}{\lambda}$$

$$\lambda_{\text{ef}} = \lambda_{\text{fys}} + \lambda_{\text{biol}}$$

$$T_e = \frac{T_f T_b}{T_f + T_b}, \quad T_b = \frac{T_f T_e}{T_f - T_e}$$

$$A = A_1 e^{-\lambda_1 t} + A_2 e^{-\lambda_2 t}$$

$$I = I_0 e^{-\mu x}$$

$$H = w_R D; \quad H_T = w_R D_T$$

$$E = \sum_R \sum_T w_R w_T D_T; \quad \sum W_T = 1$$

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

$$f = 1/(2\pi\sqrt{LC})$$

$$v = \sqrt{\gamma RT/M}$$

$$v = \sqrt{E/\rho}$$

$$I_0 = 10^{-12} \text{ W/m}^2$$

$$\beta = 10 \lg(I/I_0)$$

$$R = 10 \lg(P_1/P_2) = 10 \lg(1/\tau)$$

$$\tau = \frac{\tau_1 A_1 + \tau_2 A_2 + \dots}{A}$$

$$f = f_0 \frac{c}{c \pm v}; \quad f = f_0 \frac{c \pm v}{c}$$

$$F = mv^2/r$$

$$T = \sqrt{4\pi^2(r/a)}$$

$$F = m\omega^2 r = \frac{4\pi^2}{T^2} mr$$

$$F = \gamma \frac{m_1 m_2}{r^2}$$

$$\phi = \frac{\lambda A \theta}{d}$$

$$q = \frac{\lambda \theta}{d}$$

$$\phi = hA\theta$$

$$\theta = T_1 - T_2$$

$$\frac{P}{A} = \sigma T^4; \quad \frac{P}{A} = k\sigma T^4$$

$$h = 1/2gt^2$$

$$v = v_0 + gt$$

$$h = v_0 t + 1/2gt^2$$

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

$$\varphi = \varphi_0 + \omega_0 t + 1/2\alpha t^2$$

$$T = 2\pi/\omega$$

$$n = 1/T$$

$$a_n = v^2/r$$

$$F = mv^2/r = m\omega^2 r = (4\pi^2/T^2)mr$$

$$y(x, t) = y_{\max} \sin(\omega t - kx)$$

$$p(x, t) = p_{\max} \cos(\omega t - kx)$$

$$I = \Phi/\omega = \Phi_{\text{tot}}/4\pi$$

$$E = \Phi/A$$

$$L = I/A; [L] = \text{cd/m}^2 = 1 \text{ Nit} = 1 \text{ nitti}$$

$$L = I_g/(A \cos(\epsilon))$$

$$(n_1/a) + (n_2/b) = (n_2 - n_1)/r$$

$$f_2 = [(n_2 - n_1)r + n_1 r]/(n_2 - n_1) = f_1 + r$$

$$X_L = 2\pi fL$$

$$(f_1/f_2) = (n_1/n_2)$$

$$pV = nRT$$

$$\frac{p_1 V_1}{T_1} = \frac{p_2 V_2}{T_2}$$

$$V = V_0(1 + \alpha_V \Delta T)$$

$$p = p_0(1 + \alpha_p \Delta T)$$

$$Q = c_p m \Delta T$$

$$W = \gamma \Delta A$$

$$W = F \Delta \ell$$

$$\frac{E_k}{V} = \frac{1/2 m v^2}{V} = 1/2 \rho v^2$$

$$\frac{E_p}{V} = \frac{mgh}{V} = \rho gh$$

$$p = \frac{F}{A} = \frac{F_s}{A_s} = \frac{W}{V}$$

$$c = \sqrt{(\Delta p/\Delta V)(V/p)}$$

$$F = (EA/\ell)(\Delta \ell)$$

$$F = NABI \sin(\alpha)$$

$$R = \Delta p/q_v = 8\eta L/(\pi r^4)$$

$$\text{PRU} = \Delta p(\text{mmHg})/q_v(\text{ml/s})$$

$$\text{PVR} = 80(PA_m - LA_m)/V_p$$

$$\text{SVR} = 80(AO_m - RA_m)/V_p$$

$$q_v = \frac{\pi \Delta p R^4}{8\eta L}$$

$$\text{Re} = \frac{\rho v R}{\eta}$$

$$v = \frac{2(\rho - \rho_0)gr^2}{9\eta}$$

$$W = Fs$$

$$E_p = mgh$$

$$p = mv$$

$$E_k = 1/2 m v^2$$

$$E_r = 1/2 J \omega^2$$

$$P = W/\Delta t$$

$$\eta = W_a/W_o$$

$$\eta = (W_a/\Delta t)/(W_o/\Delta t) = P_a/P_o$$

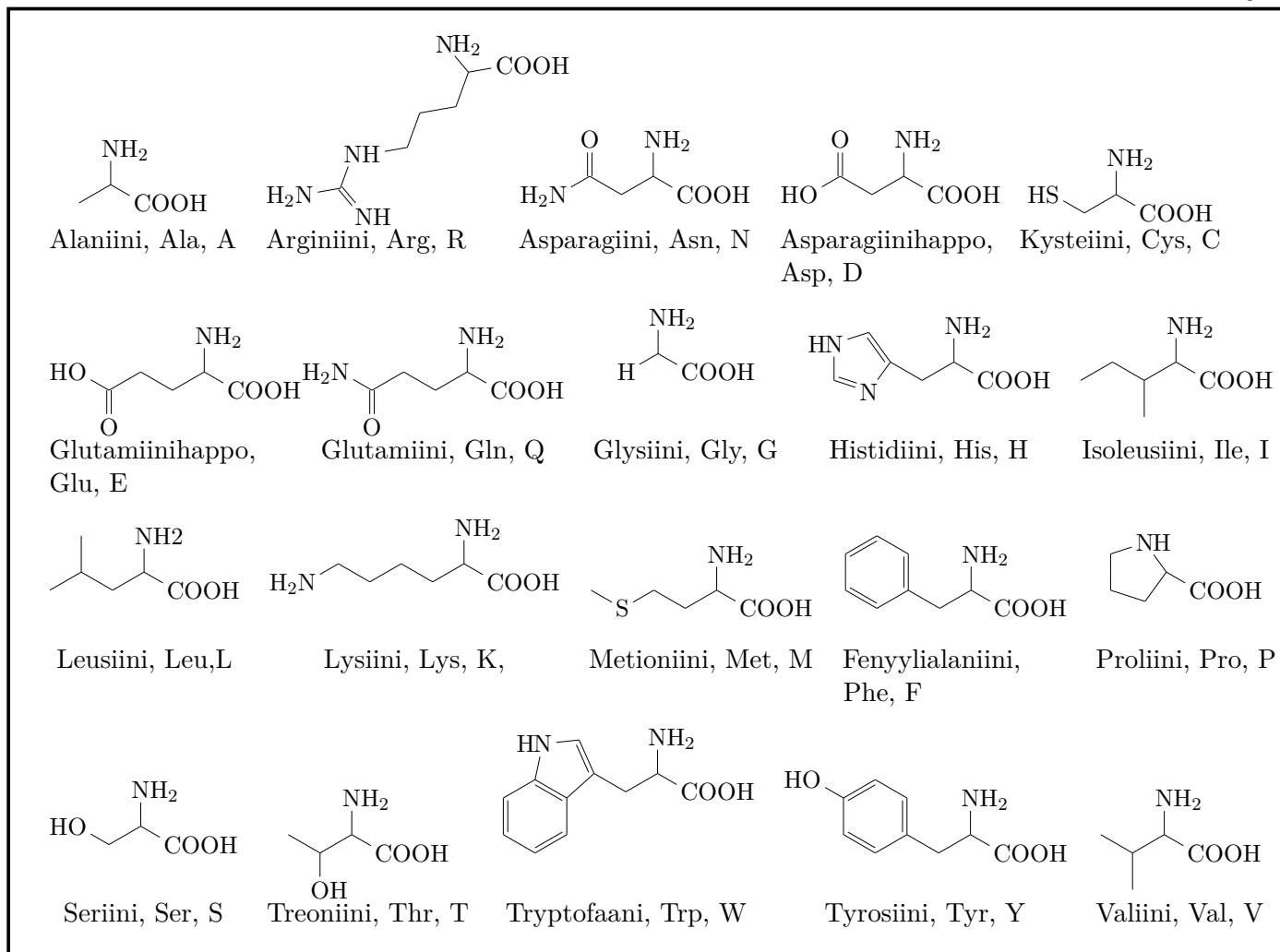
$$TT\text{-luku} = 1000 \frac{\mu(x, y, z) - \mu_{\text{vesi}}}{\mu_{\text{vesi}}}$$

$$M = F \cdot r$$

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

$$X_C = 1/(2\pi fC)$$

$$J = \sum m s^2$$



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
I	II	IIIb	IVb	Vb	VIb	VIIb	VIIIb			ib	Iib	III	IV	V	VI	VII	VIII
H [1] 1,0079																	He [2] 4,0026
Li [3] 6,9412	Be [4] 9,0121											B [5] 10,811	C [6] 12,010	N [7] 14,006	O [8] 15,999	F [9] 18,998	Ne [10] 20,179
Na [11] 22,989	Mg [12] 24,305											Al [13] 26,981	Si [14] 28,085	P [15] 30,973	S [16] 32,065	Cl [17] 35,453	Ar [18] 39,948
K [19] 39,098	Ca [20] 40,078	Sc [21] 44,955	Ti [22] 47,867	V [23] 50,941	Cr [24] 51,966	Mn [25] 54,938	Fe [26] 55,845	Co [27] 58,933	Ni [28] 58,693	Cu [29] 63,546	Zn [30] 65,409	Ga [31] 69,723	Ge [32] 72,641	As [33] 74,921	Se [34] 78,963	Br [35] 79,904	Kr [36] 83,798
Rb [37] 85,467	Sr [38] 87,621	Y [39] 88,905	Zr [40] 91,224	Nb [41] 92,906	Mo [42] 95,942	Tc [43] 98,906	Ru [44] 101,07	Rh [45] 102,90	Pd [46] 106,42	Ag [47] 107,86	Cd [48] 112,41	In [49] 114,81	Sn [50] 118,71	Sb [51] 121,76	Te [52] 127,60	I [53] 126,90	Xe [54] 131,29
Cs [55] 132,90	Ba [56] 137,32	La [57] 138,90	Hf [72] 178,49	Ta [73] 180,94	W [74] 183,84	Re [75] 186,20	Os [76] 190,23	Ir [77] 192,21	Pt [78] 195,08	Au [79] 196,96	Hg [80] 200,59	Tl [81] 204,38	Pb [82] 207,21	Bi [83] 208,98	Po [84] 208,98	At [85] 209,98	Rn [86] 222,01
Fr [87] 223,01	Ra [88] 226,02	Ac [89] 227,02	Rf [104] 261,10	Db [105] 262,11	Sg [106] 266,12	Bh [107] 264,12	Hs [108]	Mt [109]	Ds [110]	Rg [111]	Uub [112]	Uut [113]	Uuq [114]	Uup [115]	Uuh [116]	Uus [117]	Uuo [118]
Lantanoidit				Ce [58] 140,11	Pr [59] 140,90	Nd [60] 144,24	Pm [61] 146,91	Sm [62] 150,36	Eu [63] 151,96	Gd [64] 157,25	Tb [65] 158,92	Dy [66] 162,50	Ho [67] 164,93	Er [68] 167,25	Tm [69] 168,93	Yb [70] 173,04	Lu [71] 174,96
Aktinoidit				Th [90] 232,03	Pa [91] 231,03	U [92] 238,02	Np [93] 237,04	Pu [94] 244,06	Am [95] 243,06	Cm [96] 247,07	Bk [97] 247,07	Cf [98] 251,07	Es [99] 252,08	Fm [100] 257,09	Md [101] 258,09	No [102] 259,10	Lr [103] 260,10