

KAAVALIITE/FORMELBILAGA

$$\begin{aligned}
 N_A &= 6,022\,140\,76 \cdot 10^{23} \text{ 1/mol} \\
 G &= 6,674 \cdot 10^{-11} \text{ Nm}^2/\text{kg}^2 \\
 e &= 1,602\,176\,634 \cdot 10^{-19} \text{ C} \\
 F &= 96\,500 \text{ C/mol} \\
 V_m &= 22,41 \text{ dm}^3/\text{mol (NTP)} \\
 g &= 9,81 \text{ m/s}^2 \\
 h &= 6,626\,070\,150 \cdot 10^{-34} \text{ J} \cdot \text{s} \\
 &= 4,1357 \cdot 10^{-15} \text{ eV} \cdot \text{s} \\
 \sigma &= 5,670 \cdot 10^{-8} \text{ W}/(\text{m}^2 \cdot \text{K}^4) \\
 \epsilon_0 &= 8,85 \cdot 10^{-12} \text{ F/m} \\
 c &= 299\,792\,458 \text{ m/s} \\
 c_a &= 343 \text{ m/s} \\
 \rho(\text{H}_2\text{O}) &= 1,00 \cdot 10^3 \text{ kg/m}^3 (0 \text{ }^\circ\text{C} - 100 \text{ }^\circ\text{C}) \\
 c(\text{H}_2\text{O}) &= 4,19 \text{ kJ}/(\text{kg} \cdot \text{K}) \\
 K_w &= 1,008 \cdot 10^{-14} (\text{mol/l})^2 \\
 R &= 8,314 \text{ J}/(\text{mol} \cdot \text{K}) \\
 0 \text{ }^\circ\text{C} &= 273,15 \text{ K} \\
 1 \text{ atm} &= 101\,325 \text{ Pa} \\
 1 \text{ eV} &\approx 1,602 \cdot 10^{-19} \text{ J} \\
 1 \text{ kWh} &= 3,6 \text{ MJ} \\
 e &\approx 2,718\,28 \\
 \ln 2 &\approx 0,693 \\
 \text{protoni/proton: } m_p &= 1,672\,621\,6 \cdot 10^{-27} \text{ kg} \\
 \text{neutroni/neutron: } m_n &= 1,674\,927\,3 \cdot 10^{-27} \text{ kg} \\
 \text{elektroni/elektron: } m_e &= 9,109\,382\,2 \cdot 10^{-31} \text{ kg} \\
 u &= 1,660\,538\,9 \cdot 10^{-27} \text{ kg} \\
 m_p &= 1,007\,276\,5 \text{ u} \\
 m_n &= 1,008\,665\,0 \text{ u} \\
 m_e &= 5,485\,799\,1 \cdot 10^{-4} \text{ u}
 \end{aligned}$$

$$\begin{aligned}
 p &= \rho gh \\
 A &= 4\pi r^2; V = \frac{4}{3}\pi r^3 \\
 ax^2 + bx + c = 0 &\Rightarrow x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\
 W &= \vec{F} \cdot \vec{s} \\
 E_p &= mgh; E_k = \frac{1}{2}mv^2 \\
 s &= v_0t + \frac{1}{2}at^2 \\
 v &= v_0 + at \\
 T &= \frac{2\pi}{\omega}; f_n = \frac{n}{t} = \frac{1}{T} \\
 \varphi &= \varphi_0 + \omega_0t + \frac{1}{2}\alpha t^2 \\
 \omega &= \omega_0 + \alpha t \\
 a &= \frac{v^2}{r} \\
 F &= G \frac{m_1 m_2}{r^2}, E_p = -\frac{Gm_1 m_2}{r} \\
 F &= \frac{mv^2}{r} = m\omega^2 r = \frac{4\pi^2}{T^2} mr \\
 y(x, t) &= y_{\max} \sin(\omega t - kx) \\
 p(x, t) &= p_{\max} \cos(\omega t - kx) \\
 \vec{M} &= \vec{r} \times \vec{F}
 \end{aligned}$$

$$\begin{aligned}
 \bar{p} &= m\bar{v} \\
 P &= W/t \\
 \eta &= \frac{W_o}{W_i} = \frac{W_o/t}{W_i/t} = \frac{P_o}{P_i} \\
 \frac{\sin \alpha_1}{\sin \alpha_2} &= \frac{\lambda_1}{\lambda_2} = \frac{c_1}{c_2} = \frac{n_2}{n_1} = n_{12} \\
 F &= -kx; \frac{F}{A} = E \frac{\Delta l}{l} \\
 p &= \frac{F}{A} = \frac{Fs}{As} = \frac{W}{V} \\
 L &= 10 \lg \left(\frac{I}{I_0} \right) \text{ dB} \\
 f &= f_0 \frac{v}{v \pm v_1}; f = f_0 \frac{v \pm v_h}{v} \\
 pV &= nRT \\
 l &= l_0(1 + \alpha\Delta T); V = V_0(1 + \gamma\Delta T) \\
 \Delta Q &= c_p m \Delta T \\
 Q &= sm; Q = rm \\
 U &= RI, P = UI \\
 M &= NAB I \sin \alpha \\
 e &= NAB \omega \sin(\omega t) \\
 F &= QE; E = U/d \\
 \vec{F} &= q(\vec{v} \times \vec{B}); F = qvB \sin \alpha \\
 F &= \frac{Q_1 Q_2}{4\pi\epsilon_0 r^2} \\
 E_{\text{pot}} &= qU \\
 V(x_0) &= E_0/q \\
 B &= \frac{\mu_0 I}{2\pi r} \\
 \lambda &= \frac{h}{p} = \frac{h}{mv} \\
 E &= hf = \frac{hc}{\lambda}; E(\text{eV}) = 1240/\lambda(\text{nm}) \\
 T_{1/2} &= \frac{\ln 2}{\lambda} \\
 A &= \lambda N = \lambda N_0 e^{-\lambda t} = A_0 e^{-\lambda t} \\
 A &= A_1 e^{-\lambda_1 t} + A_2 e^{-\lambda_2 t} \\
 I &= I_0 e^{-\mu x} \\
 E_B &= [Zm_p + Nm_n - m_A + Zm_e]c^2 \\
 K_a &= \frac{[A^-][\text{H}_3\text{O}^+]}{[\text{HA}]} \\
 \text{pH} &= \text{p}K_a + \lg \frac{[A^-]}{[\text{HA}]} \\
 \Delta V &= -\frac{RT}{ZF} \ln \frac{c^s}{c^u} \\
 J &= -D \left(\frac{dc}{dx} + Zc \frac{F}{RT} \frac{dV}{dx} \right) \\
 \frac{c_K^s}{c_K^u} &= \frac{c_{\text{Cl}}^u}{c_{\text{Cl}}^s}; (c_{\text{Cl}}^u + |Z_p|c_p^u)c_{\text{Cl}}^0 = c_K^s c_{\text{Cl}}^s
 \end{aligned}$$

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

$$R = \frac{\Delta p}{q_v} = \frac{8\eta L}{\pi r^4}; Re = \frac{\rho v R}{\eta}$$

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

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

$$PVR = \frac{80(PA_m - LA_m)}{V_p}; SVR = \frac{80(AO_m - RA_m)}{V_p}$$

Alkuaineiden jaksollinen järjestelmä / Periodiska systemet
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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
¹ H 1,0079																	² He 4,0026
³ Li 6,9412	⁴ Be 9,0121											⁵ B 10,811	⁶ C 12,010	⁷ N 14,006	⁸ O 15,999	⁹ F 18,998	¹⁰ Ne 20,179
¹¹ Na 22,989	¹² Mg 24,305											¹³ Al 26,981	¹⁴ Si 28,085	¹⁵ P 30,973	¹⁶ S 32,065	¹⁷ Cl 35,453	¹⁸ Ar 39,948
¹⁹ K 39,098	²⁰ Ca 40,078	²¹ Sc 44,995	²² Ti 47,867	²³ V 50,941	²⁴ Cr 51,996	²⁵ Mn 54,938	²⁶ Fe 55,845	²⁷ Co 58,933	²⁸ Ni 58,693	²⁹ Cu 63,546	³⁰ Zn 65,409	³¹ Ga 69,723	³² Ge 72,641	³³ As 74,921	³⁴ Se 78,963	³⁵ Br 79,904	³⁶ Kr 83,798
³⁷ Rb 85,467	³⁸ Sr 87,621	³⁹ Y 88,905	⁴⁰ Zr 91,224	⁴¹ Nb 92,906	⁴² Mo 95,942	⁴³ Tc 98,906	⁴⁴ Ru 101,07	⁴⁵ Rh 102,90	⁴⁶ Pd 106,42	⁴⁷ Ag 107,86	⁴⁸ Cd 112,41	⁴⁹ In 114,81	⁵⁰ Sn 118,71	⁵¹ Sb 121,76	⁵² Te 127,60	⁵³ I 126,90	⁵⁴ Xe 131,29
⁵⁵ Cs 132,90	⁵⁶ Ba 137,32	⁵⁷ La 138,90	⁷² Hf 178,49	⁷³ Ta 180,94	⁷⁴ W 183,84	⁷⁵ Re 186,20	⁷⁶ Os 190,23	⁷⁷ Ir 192,21	⁷⁸ Pt 195,08	⁷⁹ Au 196,96	⁸⁰ Hg 200,59	⁸¹ Tl 204,38	⁸² Pb 207,21	⁸³ Bi 208,98	⁸⁴ Po 208,98	⁸⁵ At 209,98	⁸⁶ Rn 222,01
⁸⁷ Fr 223,01	⁸⁸ Ra 226,02	⁸⁹ Ac 227,02	¹⁰⁴ Rf 261,10	¹⁰⁵ Db 262,11	¹⁰⁶ Sg 266,12	¹⁰⁷ Bh 264,12	¹⁰⁸ Hs [270]	¹⁰⁹ Mt [278]	¹¹⁰ Ds [281]	¹¹¹ Rg [282]	¹¹² Cn [285]	¹¹³ Nh [286]	¹¹⁴ Fl [289]	¹¹⁵ Mc [290]	¹¹⁶ Lv [293]	¹¹⁷ Ts [294]	¹¹⁸ Og [294]
Lantanoidit				⁵⁸ Ce	⁵⁹ Pr	⁶⁰ Nd	⁶¹ Pm	⁶² Sm	⁶³ Eu	⁶⁴ Gd	⁶⁵ Tb	⁶⁶ Dy	⁶⁷ Ho	⁶⁸ Er	⁶⁹ Tm	⁷⁰ Yb	⁷¹ Lu
Lantanoider				140,11	140,90	144,24	146,91	150,36	151,96	157,25	158,92	162,50	164,93	167,25	168,93	173,04	174,96
Aktinoidit				⁹⁰ Th	⁹¹ Pa	⁹² U	⁹³ Np	⁹⁴ Pu	⁹⁵ Am	⁹⁶ Cm	⁹⁷ Bk	⁹⁸ Cf	⁹⁹ Es	¹⁰⁰ Fm	¹⁰¹ Md	¹⁰² No	¹⁰³ Lr
Aktinoider				232,03	231,03	238,02	237,04	244,06	243,06	247,07	247,07	251,07	252,08	257,09	258,09	259,10	260,10

T 1: $\ln(x)$

x	$\ln x$	x	$\ln x$	x	$\ln x$
0,50	-0,693	1,30	0,262	2,10	0,742
0,52	-0,654	1,32	0,278	2,12	0,751
0,54	-0,616	1,34	0,293	2,14	0,761
0,56	-0,580	1,36	0,307	2,16	0,770
0,58	-0,545	1,38	0,322	2,18	0,779
0,60	-0,511	1,40	0,336	2,20	0,788
0,62	-0,478	1,42	0,351	2,22	0,798
0,64	-0,446	1,44	0,365	2,24	0,806
0,66	-0,416	1,46	0,378	2,26	0,815
0,68	-0,386	1,48	0,392	2,28	0,824
0,70	-0,357	1,50	0,405	2,30	0,833
0,72	-0,329	1,52	0,419	2,32	0,842
0,74	-0,301	1,54	0,432	2,34	0,850
0,76	-0,274	1,56	0,445	2,36	0,859
0,78	-0,248	1,58	0,457	2,38	0,867
0,80	-0,223	1,60	0,470	2,40	0,875
0,82	-0,198	1,62	0,482	2,42	0,884
0,84	-0,174	1,64	0,495	2,44	0,892
0,86	-0,151	1,66	0,507	2,46	0,900
0,88	-0,128	1,68	0,519	2,48	0,908
0,90	-0,105	1,70	0,531	2,50	0,916
0,92	-0,083	1,72	0,542	2,52	0,924
0,94	-0,062	1,74	0,554	2,54	0,932
0,96	-0,041	1,76	0,565	2,56	0,940
0,98	-0,020	1,78	0,577	2,58	0,948
1,00	0,000	1,80	0,588	2,60	0,956
1,02	0,020	1,82	0,599	2,62	0,963
1,04	0,039	1,84	0,610	2,64	0,971
1,06	0,058	1,86	0,621	2,66	0,978
1,08	0,077	1,88	0,631	2,68	0,986
1,10	0,095	1,90	0,642	2,70	0,993
1,12	0,113	1,92	0,652	2,72	1,001
1,14	0,131	1,94	0,663		
1,16	0,148	1,96	0,673		
1,18	0,166	1,98	0,683		
1,20	0,182	2,00	0,693		
1,22	0,199	2,02	0,703		
1,24	0,215	2,04	0,713		
1,26	0,231	2,06	0,723		
1,28	0,247	2,08	0,732		

$$\ln x = \log_e x$$

$$\log xy = \log x + \log y$$

$$\log \frac{x}{y} = \log x - \log y$$

$$\log_a x = \frac{\log_b x}{\log_b a}$$