

Hjálpargögn á inntökuþrófi í læknadeild vorið 2009

Nokkrar formúlur og töflur sem gætu orðið til hjálpar við úrlausn verkefnanna.

$$\frac{P_1 \cdot V_1}{T_1} = \frac{P_2 \cdot V_2}{T_2}$$

$$\text{pH} = 1/2 (\text{p}K_a - \log c_a)$$

$$\text{pH} + \text{pOH} = \text{p}K_w = \text{p}K_w 14$$

við 25°C

$$\text{p}K_w = \text{p}K_a + \text{p}K_b$$

$$\text{pH} = \text{p}K_s + \log \frac{[\text{B}]}{[\text{S}]} \quad \text{eða}$$

$$\ln \left(\frac{k_2}{k_1} \right) = \frac{E_a}{R} \left(\frac{T_2 - T_1}{T_2 \cdot T_1} \right)$$

$$\Delta G = - 2,303 \cdot R \cdot T \cdot \log Q$$

$$E = E^0 - \frac{2,303 R \cdot T}{n \cdot F} \log Q$$

$$P \cdot V = n \cdot R \cdot T$$

$$[\text{H}_3\text{O}^+] [\text{OH}^-] = 10^{-14} \quad \text{við } 25^\circ\text{C}$$

$$[\text{H}_3\text{O}^+] = 1/2 K_a (-1 + \sqrt{1 + 4 \cdot C_a / K_a})$$

$$K_a = K_s = \frac{[\text{A}^-] [\text{H}_3\text{O}^+]}{[\text{HA}]} \quad [\text{H}_3\text{O}^+]^2 \approx K_a \cdot c_a$$

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

$$\Delta G = \Delta H - T \cdot \Delta S$$

$$\Delta G^0 = - 2,303 \cdot R \cdot T \cdot \log K$$

$$E = E^0 - \frac{0,0592}{n} \log Q$$

$$E = h \cdot \nu$$

$$\Delta G^0 = \Delta H^0 - T \cdot \Delta S^0$$

$$\Delta G^0 = - R \cdot T \cdot \ln K$$

$$\Delta G = - nFE \quad \text{og} \quad \Delta G^0 = - nFE^0$$

Physical Constants

Constant	Symbol	Value	
Atomic mass unit	amu	$1.66054 \times 10^{-27} \text{ kg}$	
Avogadro's number	N	$6.02214 \times 10^{23} \text{ mol}^{-1}$	
Bohr radius	a_0	$5.292 \times 10^{-11} \text{ m}$	
Boltzmann constant	k	$1.38066 \times 10^{-23} \text{ J/K}$	
Charge of an electron	e	$1.60218 \times 10^{-19} \text{ C}$	1 pascal = 1 N/m ² = 1 kg/m · s ²
Faraday constant	F	96,485 C/mol	1 atmosphere = 101.325 kilopascals = 760 torr (mmHg)
Gas constant	R	8.31451 J/K · mol 0.08206 L · atm/K · mol	
Mass of an electron	m_e	$9.10939 \times 10^{-31} \text{ kg}$ $5.48580 \times 10^{-4} \text{ amu}$	1 joule = 1 kg · m ² /s ²
Mass of a neutron	m_n	$1.67493 \times 10^{-27} \text{ kg}$ 1.00866 amu	K = °C + 273.15 1 calorie = 4.184 joules
Mass of a proton	m_p	$1.67262 \times 10^{-27} \text{ kg}$ 1.00728 amu	
Planck's constant	h	$6.62608 \times 10^{-34} \text{ J} \cdot \text{s}$	
Speed of light	c	$2.99792458 \times 10^8 \text{ m/s}$	

Sýrufastar ; K_s og pK_s gildi við 25°C

Sýra	Formúla	K_s	pK_s
Rammar sýrur		$pK_s < 0$	
Vetnisjoðið	HI	$\sim 10^9$	~ -9
Vetnisbrómíð	HBr	$\sim 10^8$	~ -8
Vetnisklórið	HCl	$\sim 10^7$	~ -7
Perklórsýra	HClO ₄	$\sim 10^7$	~ -7
Brennisteinssýra	H ₂ SO ₄	$\sim 10^3$	~ -3
Oxóníumjón	H ₃ O ⁺	54,95	-1,74
Saltpéturssýra	HNO ₃	22,39	-1,35
Daufar sýrur		$pK_s > 0$	
Oxalsýra	H ₂ C ₂ O ₄	$6,5 \times 10^{-2}$	1,19
Fosfórsýra	H ₃ PO ₄	$7,1 \times 10^{-3}$	2,15
Flúorsýra	HF	$6,7 \times 10^{-4}$	3,17
Maurasýra	HCHO ₂	$1,8 \times 10^{-4}$	3,75
Mjólkursýra	HC ₃ H ₅ O ₃	$1,4 \times 10^{-4}$	3,85
Saltpéturssýrlingur	HNO ₂	$4,7 \times 10^{-4}$	3,33
Ediksýra	HC ₂ H ₃ O ₂	$1,8 \times 10^{-5}$	4,76
Kolsýra	H ₂ CO ₃	$4,2 \times 10^{-7}$	6,38
Brennisteinsvetni	H ₂ S	$1,0 \times 10^{-7}$	7,00
Bórsýra	H ₃ BO ₃	$1,0 \times 10^{-9}$	9,00
Ammóníumjón	NH ₄ ⁺	$5,6 \times 10^{-10}$	9,25
Blásýra	HCN	$4,8 \times 10^{-10}$	9,32
Vetniskarbónatjón	HCO ₃ ⁻	$3,9 \times 10^{-11}$	10,4
Vetnisperoxíð	H ₂ O ₂	$2,5 \times 10^{-12}$	11,6
Vetnisfosfatjón	HPO ₄ ²⁻	$2,0 \times 10^{-13}$	12,7
Vetnissúlfiðjón	HS ⁻	$1,3 \times 10^{-13}$	12,9

Jöfnur

EÐL103

Hreyfifræði

$$a = \frac{\Delta v}{\Delta t} = \frac{v_2 - v_1}{t_2 - t_1}$$

$$s = v_j \cdot t$$

$$\bar{v} = \frac{\Delta s}{\Delta t}$$

$$\bar{v} = \frac{v_o + v}{2}$$

$$s = v_o t + \frac{1}{2} a t^2$$

$$s = v_o t + \frac{1}{2} g t^2$$

$$2as = v^2 - v_o^2$$

$$2gs = v^2 - v_o^2$$

$$s = \frac{v_o + v}{2} \cdot t$$

$$v = v_o + at$$

$$v = v_o + gt$$

Kraftfræði

$$F = m \cdot a$$

$$F_g = mg$$

$$F_{\text{min}} = \mu F_{\text{pver}}$$

$$F = -k \cdot x$$

$$F_{\text{pver}} = mg \cos \theta$$

$$F_{\text{samsíða}} = mg \sin \theta$$

$$\mu = \tan \theta$$

Vinna og orka

$$W = F \cdot \Delta s \cdot \cos \theta$$

$$P = \frac{W}{\Delta t}$$

$$P = F_{\text{sams}} \cdot v$$

$$K = \frac{1}{2} m v^2$$

$$U = mgh$$

Framhald vinna og orka

$$E = K + U$$

$$W = \Delta E$$

$$U_{sp} = \frac{1}{2} kx^2$$

$$F \cdot s = \frac{1}{2} m v_2^2 - \frac{1}{2} m v_1^2$$

$$\tau = F_{\text{pver}} \cdot a$$

$$F_1 \cdot a_1 = F_2 \cdot a_2$$

Þrýstingur:

$$p = \frac{F_{\text{pver}}}{A}$$

$$p = \rho gh + p_o$$

$$760 \text{ torr} = 1,013 \cdot 10^5 \text{ Pa} \equiv 1,013 \text{ B} \equiv 1013 \text{ mB} \equiv 1 \text{ atm}$$

Varmafræði:

$$C = \frac{Q}{T}$$

$$c = \frac{Q}{m \Delta T}$$

$$l_{\text{bræðstu}} = \frac{Q}{m}$$

$$l_{\text{gufu}} = \frac{Q}{m}$$

Atlag og skriðpungi:

$$p = mv$$

$$K = \frac{p^2}{2m}$$

$$F = \frac{\Delta p}{\Delta t}$$

$$I_{\text{heild}} = \Delta p$$

$$v_{B2} - v_{A2} = -(v_{B1} - v_{A1})$$

Ljós

$$\frac{\sin \alpha_1}{\sin \alpha_2} = \frac{\lambda_1}{\lambda_2}$$

$$\frac{v_1}{v_2} = \frac{\lambda_1}{\lambda_2}$$

$$\frac{\sin \theta_1}{\sin \theta_2} = \frac{c_1}{c_2}$$

$$n_{\text{efni}} = \frac{c_{\text{tóm}}}{c_{\text{efni}}}$$

$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

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

$$\text{stækkun} = \frac{b}{a}$$

Jöfnur

EÐL203

Varmafræði

$$C = \frac{Q}{T} \text{ (varmrýmd)}$$

$$c = \frac{Q}{m\Delta T} \text{ (eðlisvarmi)}$$

$$l_{\text{bræðslu}} = \frac{Q}{m}$$

$$l_{\text{gufu}} = \frac{Q}{m}$$

Gaslögmálið

$$T_K = T_c + 273,16$$

$$\frac{T}{273,16} = \frac{p}{p_3}$$

$$\frac{1}{2}mv^2 = \frac{3}{2}kT; k = 1,38 \cdot 10^{-23} \text{ J/K}$$

$$pV = nRT; R = 8,314 \text{ J/(mól} \cdot \text{K)}$$

$$p_1V_1 = p_2V_2$$

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

Bylgjufræði:

$$|\overline{S_1P} - \overline{S_2P}| = (n + \frac{1}{2})\lambda$$

$$|\overline{S_1P} - \overline{S_2P}| = n\lambda$$

$$\sin \theta_n = \frac{n\lambda}{d}$$

$$v = f \cdot \lambda$$

$$f = \frac{1}{T}$$

$$\lambda_n = \frac{2L}{n}$$

$$f_n = \frac{v}{\lambda_n} = n \cdot \frac{v}{2L} \Rightarrow f_n = nf_{\text{grunn}}$$

$$\lambda_n = \frac{4L}{(2n-1)}$$

$$f_n = \frac{(2n-1)v}{4L} = (2n-1)f_{\text{grunn}}$$

$$\lambda_n = \frac{2L}{n}$$

$$I = \frac{P_{\text{vert}}}{A} = \frac{P}{4\pi r^2}$$

$$L = 10 \cdot \log \frac{I}{I_0}; I_0 = 10^{-12} \text{ W/m}^2$$

Skákast:

$$v_x = v_o \cos \theta$$

$$v_y = v_o \sin \theta$$

$$y = \frac{v_{oy}}{v_x} x + \frac{g}{2v_x^2} x^2$$

$$x = x_o + v_x t$$

$$y = y_o + v_{oy} t + \frac{1}{2} g t^2$$

Hringhreyfing:

$$\omega = \frac{d\theta}{dt}$$

$$\omega = \frac{2\pi}{T} = 2\pi f$$

$$v = r\omega$$

$$a = r\omega^2$$

$$a_{mi\delta} = \frac{v^2}{r}$$

$$a_{mi\delta} = 4\pi^2 \frac{r}{T^2}$$

$$T = \frac{1}{f}$$

$$F_{mi\delta} = m \frac{v^2}{r}$$

$$T = 2\pi \sqrt{\frac{l \cos \theta}{g}}$$

Einföld sveifluhreyfing:

$$F = -k \cdot x$$

$$T = \frac{2\pi}{\omega}$$

$$\frac{d^2 x}{dt^2} = -\frac{k}{m} x$$

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

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

$$\omega^2 = \frac{k}{m}$$

$$v_{max} = \omega A$$

$$a_{max} = \omega^2 A$$

$$x = A \cos \omega t$$

$$v = -\omega A \sin \omega t$$

$$a = -\omega^2 A \cos \omega t$$

$$v = \pm \sqrt{\frac{k}{m}(A^2 - x^2)}$$

$$E = \frac{1}{2} k A^2 = \frac{1}{2} m \omega^2 A^2$$

Þyngdarlögmálið

$$F = G \frac{Mm}{r^2}$$

$$g = G \frac{M}{r^2}$$

$$\frac{a^3}{T^2} = \frac{GM}{4\pi^2}$$

$$U(r) = -G \frac{Mm}{r}$$

$$v_{lausn} = \sqrt{\frac{2GM}{r}}$$