Wzory na ćwiczenia laboratoryjne z biofizyki kierunek lekarsko-dentystyczny:

$\delta X = X - X_0$	$X_0 \in \langle X - \Delta X, X + \Delta X \rangle$	$\bar{T} = \frac{T_1 + T_2 + T_3 + \ldots + T_n}{n}$	$s_T = \sqrt{\frac{(T_1 - \bar{T})^2 + (T_2 - \bar{T})^2 + \cdots + (T_n - \bar{T})^2}{n-1}}$
$s_{\bar{T}} = \frac{s_T}{\sqrt{n}}$	$F = const \cdot A^a \cdot B^b \cdot C^c \cdot \ldots$	$\Delta F = \pm F \cdot \left[\left\| a \cdot \frac{\Delta A}{A} \right\| + \left\| b \cdot \frac{\Delta B}{B} \right\| + \left\| c \cdot \frac{\Delta C}{C} \right\| + \ldots \right]$	

$\frac{\sin(\alpha)}{\sin(\beta)} = \frac{v_\alpha}{v_\beta} = n_{\beta/\alpha}$	$n_\alpha = \frac{c}{v_\alpha}$	$\frac{1}{x} + \frac{1}{y} = \frac{1}{f}$	$z_l = \frac{1}{a_m}$	$z_k = \frac{1}{\alpha_m}$	$a_m = \frac{\lambda}{2 \cdot n \cdot \sin(u)}$
$A = 2 \cdot n \cdot \sin(u)$	$z_{mik} = \frac{2 \cdot A}{\lambda}$	$p = \frac{h'}{h}$	$p = p_{ob} \cdot p_{ok} \approx \frac{l \cdot d}{f_{ob} \cdot f_{ok}}$	$500 \cdot A < p_{uż} < 1000 \cdot A$	

$F = \eta \cdot S \cdot \frac{\Delta v}{\Delta x}$	$\eta_{wł} = \frac{\eta}{\eta_0} - 1$	$[\eta] = \lim_{c \to 0} \left(\frac{\eta_{wł}}{c} \right)$	$\Delta V = \frac{\pi \cdot r^4 \cdot \Delta t}{8 \cdot l \cdot \eta} \cdot \Delta p$
$R = 6 \cdot \pi \cdot r \cdot v \cdot \eta$	$\eta = \frac{2 \cdot r^2 \cdot g \cdot (\rho - \rho_c)}{9 \cdot v}$	$\frac{\eta}{\eta_0} = \frac{t}{t_0} \cdot \frac{\rho}{\rho_0}$	$\Phi = \frac{V_c}{V_r}$
$\frac{\eta}{\eta_0} = 1 + 2{,}5 \cdot \Phi$	$[\eta] = 2{,}5 \cdot \frac{N_A}{M} \cdot v_{cz}$	$r = \sqrt[3]{\frac{3 \cdot M}{10 \cdot \pi \cdot N_A} \cdot [\eta]}$	$\frac{\rho}{\rho_0} = 1 + 0{,}23 \cdot c$

$W = \sigma \cdot \Delta S$	$\sigma = \frac{F}{l}$	$\Delta p = \frac{2 \cdot \sigma}{R}$	$\frac{\sigma}{\sigma_0} = \frac{n_0 \cdot \rho}{n \cdot \rho_0}$	$\sigma = \frac{r \cdot h \cdot \rho \cdot g}{2 \cdot \cos(\alpha)}$	$\sigma = \frac{\rho \cdot V \cdot g}{2 \cdot \pi \cdot r \cdot n}$

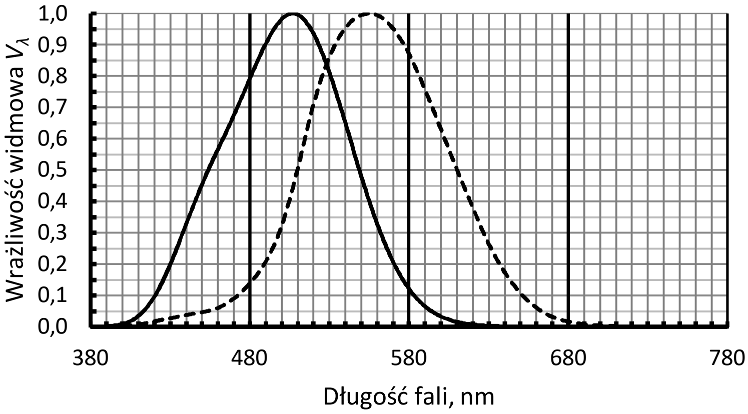
$\sigma_p = \frac{F}{l}$	$\sigma_p = \sigma_0 - \sigma$	$\sigma_p \cdot S_w = n_{cz} \cdot k_B \cdot T$	$S_w = n_{cz} \cdot s_0$
$V_w = \frac{c \cdot V_k}{\rho}$	$s_{cz} = \frac{S_w}{n_{cz}} = \frac{S_w \cdot M}{c \cdot V_k \cdot N_A}$	$d_{cz} = \sqrt{\frac{4 \cdot s_{cz}}{\pi}}$	$l_{cz} = \frac{c \cdot V_k}{\rho \cdot S_w}$

$\frac{dn}{dt} = -D \cdot S \cdot \frac{dc}{dx}$	$D = \frac{k \cdot T}{6 \cdot \pi \cdot r \cdot \eta}$	$\overline{\Delta x^2} = 2 \cdot D \cdot t$	$P = \frac{D}{dx}$
$\frac{dn}{dt} = P \cdot S \cdot (c_1 - c_2)$	$c_2 = \frac{c_0}{2} \cdot (1 - e^{-C \cdot D \cdot t})$	$C = \frac{2 \cdot A}{V \cdot dx}$	$\ln \left(\frac{c_0}{c_0 - 2 \cdot c_2} \right) = C \cdot D \cdot t$

$c = c_0 \cdot e^{-\kappa_D \cdot t}$	$c = c_0 \cdot e^{-\kappa_E \cdot t}$	$\frac{c_0}{2} = c_0 \cdot e^{-\kappa_E \cdot t_{1/2}}$	$\kappa_E = \frac{\ln(2)}{t_{1/2}} \approx \frac{0{,}693}{t_{1/2}}$
$\pi = f \cdot c \cdot R \cdot T$			

$\mu_i = \left(\frac{\partial G_i}{\partial n_i} \right)_{T, p, n_j \, dla \, j \neq i}$	$\mu_i = \mu_{ic}^0 + R \cdot T \cdot \ln(c_i)$	$\tilde{\mu}_i = \mu_i + \varphi \cdot F \cdot z$	$Me \rightleftharpoons Me^{z+} + z \cdot e^-$
$\Delta V_e = V_e - V_r = \Delta V_0 + \left(\frac{R \cdot T}{z \cdot F} \right) \cdot \ln(c_j)$		$\Delta V_d = V_2 - V_1 = \left(\frac{u^+ - u^-}{u^+ + u^-} \right) \cdot \left(\frac{R \cdot T}{z \cdot F} \right) \cdot \ln \left(\frac{c_1}{c_2} \right)$	
$u = \frac{v}{E}$	$E = \left(\frac{R \cdot T}{z \cdot F} \right) \cdot \ln \left(\frac{c_1}{c_2} \right)$	$E = \Delta V_{e1} - \Delta V_{e2}$	$E = \Delta V_e - \Delta V_{kal}$
$W = q \cdot U$	$I = \frac{1}{R} \cdot U$	$G = \frac{1}{R}$	$R = \rho \cdot \frac{l}{S}$

$h \cdot \nu = E_k + W$	$h \cdot \nu = E_k + h \cdot \nu' + W$	$h \cdot \nu = E_{kp} + m_{0p} \cdot c^2 + E_{ke} + m_{0e} \cdot c^2$	$I = I_0 \cdot e^{-\mu \cdot d}$		
$\mu_m = \frac{\mu}{\rho}$	$d_{1/2} = \frac{\ln(2)}{\mu} \approx \frac{0{,}693}{\mu}$	$a = a_0 \cdot e^{-\mu \cdot d}$	$\ln(a) = \ln(a_0) - \mu \cdot d$	$LET = \frac{\Delta E}{\Delta d}$	$\frac{\Delta n_j}{\Delta d}$



$\Omega = \frac{S}{R^2}$	$I_E = \frac{\mathrm{d}\Phi_E}{\mathrm{d}\Omega} = \frac{\frac{\mathrm{d}Q_E}{\mathrm{d}t}}{\mathrm{d}\Omega} \Rightarrow [I_E] = \frac{\mathrm{W}}{\mathrm{sr}}$	$I_V = \frac{\mathrm{d}\Phi_V}{\mathrm{d}\Omega} \Rightarrow [I_V] = \mathrm{cd} = \frac{\mathrm{lm}}{\mathrm{sr}}$
$\Phi_V = I_V \cdot \mathrm{d}\Omega \Rightarrow [\Phi_V] = \mathrm{lm} = \mathrm{cd} \cdot \mathrm{sr}$	$P = \Phi_E \equiv \frac{\mathrm{d}Q_E}{\mathrm{d}t} \Rightarrow [\Phi_E] = W$	$\mathrm{d}\Phi_V = \left(683\ \frac{\mathrm{lm}}{\mathrm{W}}\right) \cdot V_\lambda \cdot \mathrm{d}\Phi_E$
$E_V = \frac{\mathrm{d}\Phi_V}{\mathrm{d}S} \Rightarrow [E_V] = 1\ \mathrm{lx} = \frac{1\ \mathrm{lm}}{1\ \mathrm{m}^2}$	$E_V = \frac{I_V}{r^2} \cdot \cos(\alpha)$	$L_V = \frac{I_V}{S \cdot \cos(\alpha)} \Rightarrow [L_v] = \frac{\mathrm{cd}}{\mathrm{m}^2}$
$I_V(\alpha) = I_{V\perp} \cdot \cos(\alpha)$	$L_V = \frac{I_{V\perp}}{S}$	$L_V = \frac{\Phi_V}{S \cdot \cos(\alpha) \cdot \Omega}$

$Q = \frac{\Delta V}{\Delta t}$	$S_1 \cdot v_1 = S_2 \cdot v_2 = const$	$p_{S1} + \rho \cdot g \cdot h_1 + \frac{1}{2} \cdot \rho \cdot v_1^2 = p_{S2} + \rho \cdot g \cdot h_2 + \frac{1}{2} \cdot \rho \cdot v_2^2 = const$	
$\mathrm{Q} = \frac{\pi \cdot r^4}{8 \cdot l \cdot \eta} \cdot \Delta p$	$Q = \frac{1}{R_N} \cdot \Delta p$	$N_R = \frac{2 \cdot r \cdot v \cdot \rho}{\eta}$	$v_p = \frac{\Delta V}{S \cdot \Delta t}$
$v = \sqrt{\frac{K}{\rho}}$	$K = \frac{\Delta p}{\frac{\Delta V}{V}}$	$v_t = F \cdot \sqrt{\frac{E \cdot d}{2 \cdot R \cdot \rho_c}}$	$v_t = \frac{l_{AB}}{\Delta t}$