

$$E = \frac{F}{\epsilon \cdot A} = \frac{U}{E}$$

$$F = E A \epsilon \quad \epsilon = \frac{F}{A} = G$$

$$\epsilon = \frac{\Delta e}{e}$$

$$R_{ges} = \frac{\Delta p_{ges}}{Q_{ges}}$$

A → B

(↗↘)

$$R_{A \rightarrow B} = \frac{p_A - p_B}{Q_{A \rightarrow B}}$$

$$\Delta p = R \cdot Q$$

$$\dot{V}_T = \dot{V}_{Ein} - \dot{V}_{Aus} \quad [\dot{V}] = \frac{m^3}{s}$$

$$\dot{V} = v A$$

$$\dot{m} = \rho \cdot \dot{V} = \rho v A \quad \dot{m} = \frac{kg}{s}$$

$$\left(\dot{m}_E - \dot{m}_A = \rho \cdot \frac{\Delta V}{\Delta t} \right)$$

$$v_1 A_1 = v_i A_i \leftrightarrow \rho v A = \text{const}$$

$$1 \text{ mmHg} \hat{=} 133,32 \text{ Pa}$$

$$\frac{1}{2} \rho v^2 + \rho g h + p = B = \text{const.}$$

$$(\rho g h + p = \text{const.}) \quad \left[\frac{1}{2} \rho v^2 \right] = p_a = \dots \text{ mmHg}$$

$$v = \frac{Q}{A} \quad v_{resp} = \frac{v_{Atm}}{2 \cdot \eta_{Atm}} \cdot \frac{1}{A}$$

$$Re = \frac{\rho h v}{\mu} = \frac{\rho d v}{\mu} < 2300 \quad [\mu] = \text{Pa} \cdot s$$

$$R = \frac{8 \mu l G}{\pi \left(\frac{d}{2} \right)^4} = \frac{128 \cdot \mu \cdot l}{\pi \cdot d^4}$$

$$\Delta p = R \cdot Q$$

$$[R] = \frac{\text{Pa} \cdot s}{m^3}$$

$$R' = \frac{1}{\lambda^4} R \quad r' = \lambda r \quad \lambda = 1 + z_0$$

$$R_{\text{res, parallel}} = \left(\frac{1}{\sum R_i} \right)^{-1} = \frac{\prod R_i}{\sum R_i} \quad \dot{p} = 0 \hat{=} Q \Leftrightarrow R' = R$$

$$\epsilon_{\text{Diastole}} = \frac{p_{\text{Diastole}} \cdot D}{2 \cdot E \cdot s} \quad \epsilon = \frac{\Delta D}{D}$$

$$\vec{a} = \frac{\partial \vec{v}}{\partial t} + \frac{\partial \vec{v}}{\partial x} v_x + \frac{\partial \vec{v}}{\partial y} v_y + \frac{\partial \vec{v}}{\partial z} v_z$$

$$m = 10^{-3}, \mu = 10^{-6}, G = 10^{-3} \\ \approx 1 \text{ mm} = 0,001 \text{ m} \\ \mu = 10^{-6}, \eta = 10^{-9} \\ \mu = 10^{-3} \text{ mm}$$

$$C = C = \frac{\Delta V}{\Delta p_T} \\ = \frac{\Delta V}{p_{\text{sys}} - p_{\text{dia}}}$$

$$p = \frac{2 \cdot G \cdot s}{D} = \frac{2 \cdot E \cdot \epsilon \cdot s}{D}$$

$$[C] = \frac{m^3}{\text{mmHg}} \quad p_T = p_i - p_a$$

$$\vec{a} = \frac{\partial \vec{v}}{\partial t} + (\vec{v} \cdot \nabla) \cdot \vec{v}$$

$$w_{\text{Herz}} = - \left[(p_{\text{sys}} - p_{\text{dia}}) \cdot (v_{\text{max}} - v_{\text{min}}) - (p_{\text{diastol.2}} - p_{\text{diastol.1}}) \cdot (v_{\text{max}} - v_{\text{min}}) \right]$$

$$w = p \cdot dV$$

$$[w] = J$$

$$P = \frac{w}{T} \quad [P] = \frac{J}{s} = [w]$$

$$w_{\text{zyklus}} = - \int_C p_a \cdot dV_B + \int_A^B p_a dV_B$$

$$p_i D_{\text{zustand 2}} = 2 E_G E_G \cdot S_G + \dots$$

$$p_i D_{zz} = 2 \cdot E_G \cdot \frac{D_{zz} - D_{z1}}{D_{z1}} \cdot S_G + \dots$$

$$\Delta p_{\text{stromig, lokal}} = \zeta \cdot p \cdot \frac{1}{2} v_A^2$$

$$(p_A - p_P) \cdot \pi \cdot r^2 = 2 \pi r G_{\text{Mittelmittig}} \\ p_A - p_P = \frac{2 G}{r} = \frac{2 E E}{r}$$

$$\Delta p = p_u - p_A = -p_A = R \cdot Q = \frac{128 \mu l}{\pi d^4} Q$$

$$\Leftrightarrow w = -(p_u - p_P) \Delta V \\ w = -p_P \Delta V = -\langle p_P \rangle \Delta V$$

$$\dot{\gamma} > 1000 \text{ s}^{-1}: \mu_{\text{Blut}} = 3,6 \cdot 10^{-3} \frac{\text{Ns}}{\text{m}^2} \\ = 3,6 \text{ cP}$$

$$\dot{\gamma} < 1000 \text{ s}^{-1}: \mu_{\text{Blut}} \gg 3,6 \cdot 10^{-3} \frac{\text{Ns}}{\text{m}^2}$$

$$\mu_{\text{Plasma}} = 1,2 \text{ cP} \quad \left\{ \begin{array}{l} G_{\text{Eryth,max}} = 200 \text{ Nm}^{-2} \end{array} \right.$$

$$v_{x, \text{Doppler}} = \frac{v_s}{\sin \alpha}$$

$$\gamma_y = \lim_{\Delta A \rightarrow 0} \frac{\Delta F_y(x,y)}{\Delta A}, \quad G_z = \lim_{\Delta A \rightarrow 0} \frac{\Delta F_z(x,y)}{\Delta A}$$

$$\dot{\gamma} = \frac{dx}{dt} [s^{-1}]$$

$$\gamma_{\text{max, Stromig}} = - \frac{r}{2} \frac{dp}{dr} \quad \left(C = \frac{\pi D^3 l}{4 E_s} \right)$$

$$(C_{\text{rel}} = \frac{D}{E \cdot s})$$

$$\mu v^2 \vec{v} + \rho \vec{g} - p_P = \rho \left(\frac{d \vec{v}}{dt} + (\vec{v} \cdot \nabla) \vec{v} \right)$$

$$K_{\text{Pvital}} = 7 \cdot (l - 1) = [65, 75 \text{ ml}] \cdot m$$

$$* 3 \text{ mm}^2 = (3 \cdot (0,001)^2) \text{ m}^2$$