Кинематика

$$v = \frac{S}{t} ::: x = x_0 \pm v \cdot t$$

$$S = x - x_0 = v \cdot t$$

$$a = \frac{\Delta v}{t} = \frac{v - v_0}{t}$$

$$v = \pm v_0 \pm a \cdot t$$

$$x = x_0 \pm v_0 \cdot t \pm \frac{a \cdot t^2}{2}$$

$$S = x - x_0 =$$

$$= v_0 \cdot t + \frac{a \cdot t^2}{2}$$

$$v^2 - v_0^2 = \pm 2a \cdot S$$

$$\Delta\varphi = \varphi_2 - \varphi_1$$

$$\omega = \frac{\Delta\varphi}{t} = \frac{2\pi}{T} = 2\pi\nu$$

$$\nu = \frac{1}{T} ::: S = \Delta\varphi \cdot R$$

$$v = \frac{S}{t} = \frac{\Delta\varphi \cdot R}{t} = \omega \cdot R$$

$$a_{ц} = \frac{v^2}{R} = \omega^2 \cdot R$$

Динамика

$$\vec{a} = \frac{\vec{F}}{m}$$

$$\vec{F} \cdot \Delta t = \Delta(m \cdot \vec{v})$$

$$F_{тяг} = G\frac{m_1 \cdot m_2}{r^2}$$

$$F_{тяж} = mg$$

$$v_{первая\_космическая} =$$

$$= \sqrt{\frac{G \cdot m_з}{R_з}} \approx 7{,}9 км/с$$

$$F_{тр} = \mu \cdot N$$

$$\vec{F}_{упр} = -k\Delta\vec{x}$$

$$M = F \cdot d$$

Законы сохранения

$$\vec{F} \cdot \Delta t = \Delta\vec{p}$$

$$A = F \cdot S \cdot \cos\alpha$$

$$N = \frac{A}{\Delta t} ::: \eta = \frac{A}{W}$$

$$W_k = \frac{mv^2}{2} ::: W_p = mgh$$

Механика жидкостей

$$p = \frac{F}{S}$$

$$p = \rho g h$$

$$\frac{h_1}{h_2} = \frac{\rho_2}{\rho_1}$$

$$F_A = \rho_{ж} V_{П} g$$

Колебания и волны

$$\nu = 1/T ::: F_{УПР} = ma$$

$$x = X_m \sin(\omega t + \varphi_0)$$

$$v = x' = X_m \omega \cos(\omega t + \varphi_0)$$

$$a = x'' = -X_m \omega^2 \sin(\omega t + \varphi_0)$$

$$\omega = \sqrt{\frac{k}{m}} = \sqrt{\frac{g}{l}}$$

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

$$W_K = \frac{mX_m^2\omega}{2}\cos^2(\omega t + \varphi_0)$$

$$W_P = \frac{kX_m^2}{2}\sin^2(\omega t + \varphi_0) =$$

$$= \frac{mX_m^2\omega^2}{2}\sin^2(\omega t + \varphi_0)$$

$$W = \frac{mX_m^2}{2} ::: \lambda = v_в T$$

$$x = X_m \sin(\omega t - kl)$$

Основы МКТ

$$W_{ср} = \frac{m_0 v_{ск}^2}{2}$$

$$n = \frac{N}{V} ::: p = \frac{2}{3} n W_{ср} ::: W_{ср} = \frac{3}{2} kT$$

$$v_{ск} = \sqrt{\frac{3kT}{m_0}} = \sqrt{\frac{3kN_A T}{\mu}} = \sqrt{\frac{3RT}{\mu}}$$

$$p = \frac{\nu RT}{V} ::: pV = \frac{m}{\mu} RT$$

Термодинамика

$$U = \frac{3}{2}\frac{m}{\mu}RT = \frac{3}{2}pV$$

$$\Delta U = \frac{3}{2} \cdot \frac{m}{\mu} \cdot R \cdot \Delta T$$

$$\Delta U = \frac{3}{2} p\Delta V ::: \Delta U = \frac{3}{2}\Delta pV$$

$$A = p\Delta V ::: Q = \Delta U + A$$

$$\Delta Q = C_T \Delta T ::: \Delta Q = cm\Delta T$$

$$\eta = \frac{A}{Q_1} = \frac{Q_1 - |Q_2|}{Q_1} = 1 - \frac{|Q_2|}{Q_1}$$

$$\eta = \frac{T_1 - T_2}{T_1} = 1 - \frac{T_2}{T_1}$$

$$Q = \lambda m ::: Q = rm$$

Оптика

$$n = \frac{c}{v_C} ::: \frac{\lambda_1}{\nu_1} = \frac{\lambda_2}{\nu_2}$$

$$n_1\lambda_1 = n_2\lambda_2$$

$$n_1 \sin\alpha = n_2 \sin\gamma$$

$$\alpha_{ПР} = \arcsin\frac{n_2}{n_1}$$

$$D = \frac{1}{F} = \frac{1}{d} + \frac{1}{f}$$

$$\Gamma = \frac{H'}{H} = \frac{f}{d}$$

$$\Delta\Phi = 2\pi\frac{\Delta l}{\lambda}$$

$$\Delta l = 2k(\lambda/2)$$

$$\Delta l = (2k+1)(\lambda/2)$$

$$d \sin\varphi_k = \pm k\lambda$$

$$d = \frac{N}{l}$$

Электростатика

$$F = k\frac{|q_1 q_2|}{r^2}$$

$$W_p = k\frac{q_1 \cdot q_2}{r} = Fd = qEd$$

$$\varphi = \frac{W_p}{q} = k\frac{q}{r} = Ed$$

$$A = -\Delta W_p = q(\varphi_1 - \varphi_2)$$

$$q = CU$$

$$C = \frac{\varepsilon\varepsilon_0 S}{d}$$

$$W = \frac{CU^2}{2} = \frac{q^2}{2C} = \frac{qU}{2}$$

$$W_p = \frac{q\varphi}{2}$$

Постоянный ток

$$I = \frac{\Delta q}{\Delta t} ::: R = \rho\frac{l}{S} ::: U = \varphi_1 - \varphi_2$$

$$I = \frac{U}{R} ::: I = \frac{\varepsilon}{R + r}$$

$$A = \Delta qU = IU\Delta t = \frac{U^2}{R}\Delta t = I^2 R\Delta t$$

$$N = \frac{A}{\Delta t} = IU = \frac{U^2}{R} = I^2 R$$

$$Q = A = IU\Delta t = \frac{U^2}{R}\Delta t = I^2 R\Delta t$$

Электромагнитные к-я

$$q = q_m \cos(\omega t + \varphi_0)$$

$$I = -q_m \omega \sin(\omega t + \varphi_0)$$

$$W_Э = \frac{q^2}{2C} ::: W_M = \frac{LI^2}{2}$$

$$\varepsilon = \varepsilon_m \cos\omega t$$

$$I = I_m \cos\omega t$$

$$U_R = IR = I_m \cos\omega t$$

$$U_L = I_m L\omega \cos(\omega t + \pi/2)$$

$$q = \frac{I_m}{\omega}\cos(\omega t - \pi/2)$$

$$U_C = I_m \frac{1}{C\omega}\cos(\omega t - \pi/2)$$

$$\omega = \frac{1}{\sqrt{LC}}$$

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

Индукция

$$F_Л = qvB\sin\alpha$$

$$F_A = IlB\sin\alpha$$

$$M = IlBa\sin\alpha = ISB\sin\alpha$$

$$\Phi = BS\cos\alpha$$

$$H = \frac{I}{2\pi r}$$

$$\varepsilon_И = -N\frac{\Delta\Phi}{\Delta t}$$

$$\varepsilon_C = -L\frac{\Delta I}{\Delta t}$$

$$W_M = \frac{LI^2}{2} = \frac{\Phi I}{2} = \frac{\Phi^2}{2L}$$

Квантовая физика

$$\varepsilon = h\nu = \frac{hc}{\lambda}$$

$$\varepsilon = mc^2$$

$$m = \frac{\varepsilon}{c^2} = \frac{h\nu}{c} = \frac{hc}{c^2\lambda} = \frac{h}{c\lambda}$$

$$p = mc = \frac{h\nu}{c} = \frac{h}{\lambda}$$

$$h\nu_0 = \frac{hc}{\lambda_0} = A + 0$$

$$\nu_0 = \frac{A}{h}$$

$$\lambda_0 = \frac{hc}{A}$$

$$h\nu = A + eU_З$$

Ядерные реакции

$$mv_n r_n = \frac{h}{2\pi} n$$

$$\nu = \frac{E_1 - E_2}{h}$$

$$\nu_{\min} = R\left(\frac{1}{n^2} - \frac{1}{m^2}\right)$$

$$E_Я = E_Н - E_{СВ}$$

$$\Delta m = m_Н - m_Я =$$

$$= (Zm_P + Nm_n) - m_Я$$

$$\Delta E = \Delta mc^2 =$$

$$= \Delta m \cdot 931{,}5(МэВ) =$$

$$= (m_{до} - m_{после}) \cdot$$

$$\cdot 931{,}5(МэВ)$$

$$N = N_0 2^{\frac{1}{T_{1/2}}}$$

Основы СТО

$$l = l_0\sqrt{1 - (v/c)^2}$$

$$t = \frac{t_0}{\sqrt{1 - (v/c)^2}}$$

$$\nu = \frac{\nu_1 + \nu_2}{1 + \nu_1\nu_2/c}$$

$$\vec{p} = \frac{m_0\vec{v}}{\sqrt{1 - (v/c)^2}}$$

$$m = \frac{m_0}{\sqrt{1 - (v/c)^2}}$$

$$\Delta E = \Delta mc^2$$

$$E = mc^2$$

$$W_K = m_0c^2\left(\frac{1}{\sqrt{1 - (v/c)^2}} - 1\right)$$