E-Feld, Kondensator:

$$E = \frac{U}{d}$$

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

$$C_{Platte} = \varepsilon_0 \varepsilon_r \frac{A}{d}$$

$$Q = It$$

$$W = \frac{1}{2} C U^2$$

$$F_{el} = QE$$

$$F = \frac{1}{4\pi\varepsilon} * \frac{Q_1 Q_2}{r^2}$$

$$V_{beschl} = \sqrt{\frac{2QU}{m}}$$

$$C_{Para} = C_1 + C_2 + \ldots$$

$$\frac{1}{C_{Serie}} = \frac{1}{C_1} + \frac{1}{C_2} + \ldots$$

Konstanten:

$$e = 1{,}602 * 10^{-19} C$$

$$\varepsilon_0 = 8{,}854 * 10^{-12} \frac{C}{Vm}$$

$$\mu_0 = 1{,}26 * 10^{-6} \frac{H}{m}$$

$$\gamma = 6{,}67 * 10^{-11} \frac{m^3}{kg\,s}$$

$$h = 6{,}626 * 10^{-34} Js$$

$$m_P = 1{,}67 * 10^{-27} kg$$

$$m_e = 9{,}109 * 10^{-31} kg$$

$$m_{Erde} = 5{,}97 * 10^{24} kg$$

$$m_{Mond} = 7{,}36 * 10^{22} kg$$

$$r_{Erde} = 6{,}378 * 10^{6} m$$

B-Feld, Induktion:

$$\Phi_n = AB = LI$$

$$\omega = 2\pi f$$

$$U_{ind} = -\frac{d\Phi}{dt}$$

$$U_{ind} = BlV$$

$$\hat{U}_{ind} = ABn\omega$$

$$U_{ind} = U_0 * \sin(\omega t)$$

$$F = \frac{\mu_0 \mu_r I_1 I_2 l}{2\pi r}$$

$$F = BIl$$

$$\vec{F} = I * \vec{B} \times \vec{l}$$

$$F_L = QVB$$

$$\vec{F}_L = Q * \vec{V} \times \vec{B}$$

$$B = \mu_0 \mu_r I \frac{n}{l}$$

$$B_{Bio} = \frac{\mu_0 \mu_r I}{2r}$$

$$L = \frac{\Phi}{I} = \frac{\mu_0 \mu_r n^2 A}{l}$$

$$W = \frac{1}{2} L I^2$$

$$U_{Hall} = R_H \frac{IB}{d}$$

Elektrisches:

$$U = RI$$

$$P = UI$$

$$W = Pt$$

$$\rho = \frac{RA}{l}$$

$$R_{Serie} = R_1 + R_2 + \ldots$$

$$\frac{1}{R_{Para}} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots$$

Wechselstromkreis:

$$U_{eff} = \frac{U_0}{\sqrt{2}}$$

$$I_{eff} = \frac{I_0}{\sqrt{2}}$$

$$R = \frac{U_{eff}}{I_{eff}}$$

$$X_L = \omega L$$

$$X_C = \frac{1}{\omega C}$$

$$Z = \sqrt{R^2 + (\omega L - \frac{1}{\omega C})^2}$$

$$I = I_0 \sin(\omega\tau + \varphi)$$

$$U = U_0 \sin(\omega t)$$

$$\tan(\varphi) = \frac{\omega L - \frac{1}{\omega C}}{R}$$

LR-Kreis:

$$I_{lade} = I_0 * (1 - e^{\frac{-tR}{L}})$$

$$I_{entl} = I_0 * e^{\frac{-tR}{L}}$$

RC-Kreis:

$$Q_{lade} = Q_\infty * (1 - e^{\frac{-t}{RC}})$$

$$Q_{entl} = Q_0 * e^{\frac{-t}{RC}}$$

$$I_{lade/entl} = I_0 * e^{\frac{-t}{RC}}$$

Trafo:

$$n_1 I_1 = -n_2 I_2$$

$$U_{1eff} I_{1eff} = U_{2eff} I_{2eff}$$

Schwingkreis:

$$\Phi_n = AB = LI$$

$$U = U_C + U_R + U_L$$

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

$$U_R = RI = R\dot{Q}$$

$$U_L = \dot{\Phi} = L\dot{I} = LQ''$$

$$Q(t) = Q_0 \sin(\omega t + \varphi)$$

$$U = \frac{Q}{C} + R\dot{Q} + LQ''$$

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

$$\omega = 2\pi f = \sqrt{\frac{1}{LC}}$$

Viskosität, Druck:

$$F_{stokes} = 6\pi\eta r V$$

$$h_{steig} = \frac{2\sigma\cos(\alpha)}{\rho g r}$$

$$\Delta W = \sigma * \Delta A$$

$$p_{statisch} = \frac{F}{A}$$

$$\frac{\rho}{2} V_2^2 + p_2 = \frac{\rho}{2} V_1^2 + p_1$$

Durchfluss:

$$A_1 V_1 = A_2 V_2$$

$$V = Avt$$

$$\dot{V} = Av = \frac{V}{t} = \frac{dV}{dt}$$

$$V_{fluss} = \frac{\pi \Delta p t R^4}{8\eta l}$$

Fallbeschleunigung:

$$g = \frac{g_0 r_E^2}{r_E^2 + h} = \gamma \frac{m_E}{r^2}$$

Drehungen:

$$\vec{D} = \vec{r} \times \vec{F}$$

$$\theta = mr^2$$

$$\vec{l} = \theta\vec{\omega}$$

$$\theta_{scheibe} = \frac{1}{2} mr^2$$

$$W_{rot} = \frac{1}{2} \theta\omega^2$$

$$F_{zentr} = \frac{mv^2}{r}$$

Bewegung

$$V = at$$

$$V = \frac{s}{t}$$

$$p = mV$$

$$V_{bahn} = \omega r$$

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

$$s = \frac{V^2}{2a}$$

$$V = \sqrt{2sa}$$

Mechanisches:

$$F = am$$

$$W = Fs$$

$$W_{pot} = mgh$$

$$W_{kin} = \frac{1}{2} mV^2$$

$$F = \gamma \frac{m_1 m_2}{r^2}$$

Wärme, Gase:

$$pV = nRT$$

$$W = cm\Delta\vartheta$$

Schräger Wurf:

$$t_{steig} = \frac{V_0 \sin(\alpha)}{g}$$

$$h_{steig} = \frac{V_0^2 \sin^2(\alpha)}{2g}$$

$$t_{Wurf} = \frac{2V_0 \sin(\alpha)}{g}$$

$$s_{Wurf} = \frac{V_0^2 \sin(2\alpha)}{g}$$

Federn & Pendel:

$$D = \frac{F}{s}$$

$$W_{feder} = \frac{1}{2} D s^2$$

$$T_{Drehschwing} = 2\pi\sqrt{\frac{\theta}{D}}$$

$$T_{Federschwing} = 2\pi\sqrt{\frac{m}{D}}$$

$$T_{Fadenpendel} = 2\pi\sqrt{\frac{l}{g}}$$

Wellen:

$$E = h\nu$$

$$\lambda = \frac{c}{\nu}$$

Doppler-Effekt:

$$f_E = f_S \frac{c - V_E}{c - V_S}$$

Drehstoß:

$$\omega' = \frac{\theta_1\omega_1 + \theta_2\omega_2}{\theta_1 + \theta_2}$$

Doppelspalt:

$$\sin(\alpha_{max}) = k\frac{\lambda}{d}$$

$$\sin(\alpha_{min}) = (k + \frac{1}{2})\frac{\lambda}{d}$$

Einzelspalt:

$$\sin(\alpha_{max}) = (k + \frac{1}{2})\frac{\lambda}{b}$$

$$\sin(\alpha_{min}) = k\frac{\lambda}{b}$$

Optik, Linsen:

$$n_1 \sin(\alpha) = n_2 \sin(\beta)$$

$$c_1 n_1 = c_2 n_2$$

$$\frac{1}{f_{ges}} = \frac{1}{f_1} + \frac{1}{f_2}$$

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

$$\frac{B}{G} = \frac{b}{g}$$

$$\frac{1}{f} = (n-1)(\frac{1}{r_1} + \frac{1}{r_2})$$

$$n_2 \sin(\alpha_{totref}) = n_1$$

Elastischer Stoß:

$$V_1' = \frac{(m_1 - m_2)V_1 + 2m_2 V_2}{m_1 + m_2}$$

$$V_2' = \frac{(m_2 - m_1)V_2 + 2m_1 V_1}{m_2 + m_1}$$

Unelastischer Stoß:

$$V' = \frac{m_1 V_1 + m_2 V_2}{m_1 + m_2}$$

$$W = \frac{m_1 m_2}{2(m_1 + m_2)} (V_1 - V_2)^2$$