Physics 2010 Formula Sheet

Some useful (and not so useful) constants and formulas.

$$\Delta x = x_f - x_i$$
$$v_x = \frac{\Delta x}{\Delta t}$$
$$a_x = \frac{\Delta v_x}{\Delta t}$$
$$\Delta x = v_{ix}\Delta t + \frac{1}{2}a_x \Delta t^2$$
$$v_{fx} = v_{ix} + a_x \Delta t$$
$$v_{fx}^{\ 2} - v_{ix}^{\ 2} = 2a_x \Delta x$$

$$g = 9.8 \ \ m/s^2$$
$$\Sigma F_x = ma_x$$
$$W = mg$$
$$f_{s,\max} = \mu_k N$$

$$W = Fd\cos\theta$$
$$K = \frac{1}{2}mv^2$$
$$U = mgh$$
$$U = \frac{1}{2}kx^2$$
$$K_i + U_i = K_f + U_f$$

$$P = mv$$
$$P_i = P_f$$
$$\overline{F} = \frac{\Delta P}{\Delta t}$$
$$Mv_{cm} = m_1 v_1 + m_2 v_2$$
$$x_{cm} = \frac{m_1 x_1 + m_2 x_2}{m_1 + m_2}$$

$$v = v_0\sqrt{\frac{T}{T_0}}, \quad T_0 = 273 \ K, \quad v_0 = 331 \ \ m/s$$
$$\beta = 10\log(\frac{I}{I_0}), \quad I_0 = 10^{-12} W/m^2$$
$$f_o = (\frac{1}{1-\frac{v_s}{v}})f_s, \qquad f_o = (1-\frac{v_o}{v})f_s$$
$$f_o = (\frac{v - v_o}{v - v_s})f_s$$

$$\tau = rF\sin\theta$$
$$I = \Sigma mr^2$$
$$\tau = I\alpha$$
$$K = \frac{1}{2}I\omega^2$$
$$L = I\omega$$
$$\tau = \frac{\Delta L}{\Delta t}$$

$$s = r\theta$$
$$v = r\omega$$
$$a = r\alpha$$
$$a_r = \frac{v^2}{r}$$

$$\theta = \omega_i t + \frac{1}{2}\alpha t^2$$
$$\omega_f = \omega_i + \alpha t$$
$$\omega_f^{\ 2} - \omega_i^{\ 2} = 2\alpha\theta$$

$$f = \frac{1}{T}$$
$$\omega = 2\pi f = \frac{2\pi}{T}$$
$$\omega = \sqrt{\frac{k}{m}}$$
$$T = 2\pi\sqrt{\frac{m}{k}}$$
$$f = \frac{1}{2\pi}\sqrt{\frac{k}{m}}$$
$$T = 2\pi\sqrt{\frac{l}{g}}$$

$$x = A\cos\omega t$$
$$v = -v_m \sin\omega t$$
$$a = -a_m \cos\omega t$$
$$v_m = \omega A$$
$$a_m = \omega^2 A$$
$$E = \frac{1}{2}mv^2 + \frac{1}{2}kx^2$$
$$E = \frac{1}{2}kA^2$$

$$v = \sqrt{\frac{F}{\mu}}, \quad \mu = \frac{m}{L}$$
$$\lambda = vT, \quad \lambda = \frac{v}{f}$$
$$\omega = 2\pi f, \quad k = \frac{2\pi}{\lambda}$$
$$y(x,t) = A\cos(\omega t - kx)$$
$$I = \frac{P}{4\pi r^2}$$

$$C = \frac{\Delta Q}{\Delta T}$$
$$c = \frac{\Delta Q}{m\Delta T}$$
$$Q = mc\Delta T$$
$$Q = mL_f$$
$$Q = mL_v$$
$$Q = nC_v\Delta T$$
$$C_v = \frac{3}{2}R \ (monatomic)$$
$$C_p = C_v + R$$
$$P = kA\frac{\Delta T}{d}$$
$$P = e\sigma AT^4$$
$$1 \ cal = 4.186 \ joules$$
$$R = 8.314 \ J/K.mol$$
$$k = 1.38\times 10^{-23} J/K$$

$$T_F = 1.8\times T_C + 32$$
$$T_C = (T_F - 32)/1.8$$
$$T_K = T_C + 273$$
$$\Delta L = \alpha L_0 \Delta T$$
$$\Delta A = 2\alpha A_0\Delta T$$
$$\Delta V = \beta V_0 \Delta T$$
$$PV = NkT$$
$$PV = nRT$$
$$P = \frac{2}{3}\frac{N}{V} < K_{tr} >$$
$$< K_{tr} > = \frac{3}{2}kT = \frac{1}{2}mv^2{}_{rms}$$
$$v_{rms} = \sqrt{\frac{3kT}{m}}$$
$$N_A = 6.02\times 10^{23}$$
$$1u = 1.66\times 10^{-27} kg$$

$$\Delta U = Q + W$$
$$W = -P\Delta V$$
$$\Delta U = nC_v\Delta T$$
$$e = \frac{W_{net}}{Q_H} = 1 - \frac{Q_C}{Q_H}$$
$$W_{net} = Q_H - Q_C$$
$$e_{carnot} = 1 - \frac{T_C}{T_H}$$
$$K_p = \frac{Q_H}{W_{net}}$$
$$K_r = \frac{Q_C}{W_{net}}$$

$$\rho = \frac{M}{V}$$
$$P = \frac{F}{A}$$
$$P_{liquid} = \rho g d$$
$$F_B = m_{displaced}\times g$$
$$\frac{V_{in}}{V} = \frac{\rho_{object}}{\rho_{liquid}}$$
$$\frac{\Delta V}{\Delta t} = A_1 v_1 = A_2 v_2$$
$$P_1 + \rho g y_1 + \frac{1}{2}\rho v_1{}^2 = P_2 + \rho g y_2 + \frac{1}{2}\rho v_2{}^2$$
$$1 \ atm = 1.013\times 10^5 \ pa = 76 \ cmHg$$