Formula sheet

$$g = 9.81\,\text{m/s}^2$$
$$R = 8.314\,\text{J/mol K}$$
$$N_A = 6.022\times10^{23}\,\text{things/mol}$$
$$k_B = 1.38065\times10^{-23}\,\text{J/K}$$
$$\sigma = 5.670\times10^{-8}\,\text{W/m}^2\text{K}^4$$
$$0 = ax^2 + bx^2 + c \Longrightarrow x = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

quantity	unit	equivalent to
force	N	kg·m/s^2
energy	J	kg·m^2/s^2 = N·m
power	W	J/s=m^2·kg/s^3

misc earlier:

$$\Sigma\vec{F} = \vec{F}_{\text{net}} = m\vec{a} \qquad \Sigma F_x = ma_x \qquad \Sigma F_y = ma_y$$
$$\vec{F}_{12} = -\vec{F}_{21} \qquad \Delta K = W \qquad P = \frac{\Delta W}{\Delta t}$$

SHM:

$$F = ma = -kx$$
$$a = -\omega^2 x$$
$$T = \frac{1}{f} = \frac{2\pi r}{v} \qquad \omega = \frac{2\pi}{T} = 2\pi f$$
$$x(t) = A\cos\omega t$$
$$v(t) = -\omega A\sin\omega t$$
$$a(t) = -\omega^2 A\cos\omega t$$
$$v(x) = \pm\omega\sqrt{A^2-x^2}$$
$$\omega = \sqrt{k/m} = 2\pi f \quad \text{springs}$$
$$\omega = \sqrt{g/L} \quad \text{pendulum}$$

waves:

$$y = A\sin(2\pi/\lambda - \omega t) \qquad \omega = 2\pi f$$
$$v = \frac{\lambda}{T} = \lambda f \quad \text{wave speed}$$
$$v = \sqrt{T/\mu} \quad \mu = M_{\text{string}}/L_{\text{string}} \quad T = \text{tension} \qquad \text{strings}$$
$$f_n = \frac{nv}{\lambda} = \frac{nv}{2L} \quad \lambda_n = \frac{2L}{n} \quad n = 1,2,3\ldots \qquad \text{strings \& open-open pipe}$$
$$f_n = \frac{nv}{\lambda} = \frac{nv}{4L} \quad \lambda_n = \frac{4L}{n} \quad n = 1,3,5\ldots \qquad \text{closed-open pipe}$$

fluids:

$$P = F/A$$
$$P(h) = P_{\text{above}} + \rho g h$$
$$\rho = M/V$$
$$\frac{F_1}{A_1} = \frac{F_2}{A_2} \quad F_1x_1 = F_2x_2 \qquad \text{hydraulics}$$
$$B = \text{buoyant force} = \text{weight of water displaced}$$

thermal stuff:

$$T(K) = T(^\circ C) + 273.15^\circ$$
$$Q = mc\Delta t \quad c = \text{specific heat} \qquad \text{no phase chg}$$
$$Q = \pm mL \qquad \text{phase chg}$$
$$H = \frac{\Delta Q}{\Delta t} = kA\frac{T_h - T_c}{L} \qquad \text{conduction}$$
$$k = \text{thermal cond.} \quad H = \text{rate of heat flow}$$
$$H = Ae\sigma T^4 \qquad \text{radiation} \quad \sigma = 5.670\times10^{-8}\,\text{Wm}^{-2}\text{K}^{-4}$$

ideal gas:

$$PV = NkT = nRT$$
$$K_{\text{avg}} = \frac{3}{2}nRT \quad \text{whole gas}$$
$$n = \text{num moles} \qquad N \qquad = \text{num molecules}$$
$$v_{\text{rms}} = \sqrt{\frac{3k_bT}{m}} = \sqrt{\frac{3RT}{M}}$$