FORMULA SHEET (MAT E 201, Midterm Exam)

$$\textit{Number of atoms} = \frac{\text{mass} \times \text{N}_\text{A}}{\text{Atomic Mass}};$$

N_A= 6.023 x 10^{23} atoms/mol; R= 8.314 J/mol·K

$$\rho = \frac{m}{V} \qquad \text{PF} = \frac{\textit{Number of atoms per unit cell} \times V_{at}}{V_{uc}};$$

$$\text{V} = \frac{4}{3} r^3 \pi \qquad \text{V} = \frac{\text{d}^2 \pi}{4} \text{l}$$

Volume of orthorhombic cell = $a_o b_o c_o$

$\rho = \frac{nA_r}{V_{uc} N_A}$; Volume of cubic cell= a_o^3; Volume of HCP cell = 0.866 $a_o^2 c_o$, c_o =1.633a_o

$$\text{D} = \text{D}_\text{O} \exp(-\frac{\text{Q}}{\text{RT}}) \qquad \text{n}_\text{V} = \text{n} \exp(-\frac{\text{Q}}{\text{RT}})$$

Relations between the atomic radius and lattice parameters for various cells:

SC	$a_o = 2r$
BCC	$a_o = \frac{4r}{\sqrt{3}}$
FCC	$a_o = \frac{4r}{\sqrt{2}}$
HCP	$a_o = 2r$
DC	$a_o = \frac{8r}{\sqrt{3}}$

First Fick's Law: $\text{J} = -\text{D}\frac{\text{dc}}{\text{dx}}$; Second Fick's Law: $\left(\frac{C_s - C_x}{C_s - C_0}\right) = erf\left(\frac{x}{2\sqrt{Dt}}\right)$