5.60 Thermodynamics & Kinetics
Spring 2008

MASSACHUSETTS INSTITUTE OF TECHNOLOGY Department of Chemistry

5.60 Physical Chemistry Spring 2008

Exam 3 Information

The exam will be closed book and closed notes. Calculators will be allowed. Some formulas will be provided, and some you will need to know, but the emphasis will be on your understanding of thermodynamics, not on your memory of formulas.

Material covered

- Lectures 19-29
- Problem Sets 6-8
- Emphasis on material presented since Exam 2

Topics to review

Single-component phase equilibria

Two-component phase equilibria

Statistical mechanics

Equations you should know (in addition to those indicated on earlier exam information sheets)

Dalton's Law, Raoult's Law, Henry's Law
$p_i = x_i p$, $p_A = x_A p_A^*$, $p_B = x_B K_B$

Boltzmann molecular & system probability distributions & definitions of molecular & canonical partition functions q & Q

$$P_i = \frac{e^{-\varepsilon_i / kT}}{\sum_i e^{-\varepsilon_i / kT}} = \frac{e^{-\varepsilon_i / kT}}{q} \qquad P_i = \frac{e^{-E_i / kT}}{\sum_i e^{-E_i / kT}} = \frac{e^{-E_i / kT}}{Q}$$

Relations for and between q & Q for independent degrees of freedom

$q = q_{trans} q_{int}$

$Q = Q_{trans} Q_{int} = q_{trans}^N q_{int}^N$ distinguishable particles

$Q = Q_{trans} Q_{int} = \frac{q_{trans}^N}{N!} q_{int}^N$ indistinguishable particles

Classical equipartition of energy result

$U = \frac{1}{2} NkT$ $\quad C_V = \frac{1}{2} Nk$ for each classical degree of freedom kinetic or potential energy