Announcements

- Quiz 12 scores posted-HW scores were not updated
- Final homework deadline extended to 12noon, Tuesday-March 16. Hopefully those scores will be posted prior to the final.
- Deadline to challenge scores for all work, except the final exam, is Wed, March 17-3pm. I will be on campus W and Th, probably 9-3pm.
- You should expect a final slightly longer(20 questions, 5 pages, approx) than the two exams, broken down roughly 1/3 1st exam material,1/3 2nd exam material,1/3 material after the second exam (kinetics and equilibria).
- A compilation of all quizzes, exams and exam keys for the quarter has been posted as a pdf file. It can be reached from the Chem 222 main page. All quiz keys have been posted.
- Pure phases do not appear in Q_{rxn}
- There was nearly 100% correctness in setting up the calculation of K question. There was a roughly 10% error rate in carrying out the calculation.
- The combining equilibrium page has been revised to show more detail in the solution.

Kinetics and Equilibria

- $N_2O_4(g) \Leftrightarrow 2NO_2(g)$
- rate forward=$k_f[N_2O_4]$
- rate reverse=$k_r[NO_2]^2$
- Q= $[NO_2]^2/ [N_2O_4]$
- $\triangle[N_2O_4]/\triangle t$=-(rate forward-rate reverse)
- $\triangle[N_2O_4]/\triangle t=-(k_f[N_2O_4]- k_r[NO_2]^2)$
- one of the advantages of an initial rate study is that rate reverse=0
- at equilibrium: $\triangle[N_2O_4]/\triangle t=-(k_f[N_2O_4] - k_r[NO_2]^2)=0$
- $k_r[NO_2]_{eq}^2 - k_f[N_2O_4]_{eq} =0$
- $k_f[N_2O_4]_{eq}=k_r[NO_2]_{eq}^2 \Rightarrow k_r[NO_2]_{eq}^2/k_f[N_2O_4]_{eq}= 1$
- $[NO_2]_{eq}^2/ [N_2O_4]_{eq}=k_f/k_r=K$
- Repeat of Tuesday question: Does $k_f>k_r$ leading to $K>1$ make sense? Part two-is there anything special about $K>1$?

In general

- For a reaction aA + aB ⇔ cC + dD, if the rate laws for the forward and reverse reactions follow the stoichiometry of the overall reaction, the $K=k_f/k_r$
- $rate_f=k_f[A]^a[B]^b$ and $rate_r=k_r[C]^c[D]^d$
- $Q= [C]^c[D]^d/ [A]^a[B]^b$
- at equilibrium $k_f[A]_{eq}^a[B]_{eq}^b =k_r[C]_{eq}^c[D]_{eq}^d$
- $K= [C]_{eq}^c[D]_{eq}^d/ [A]_{eq}^a[B]_{eq}^b = k_f/k_r$

Final Exam-Key Ideas

- If you are comfortable with the topics listed below, you'll be comfortable with the exam.
- Nomenclature-no more need be said on this
- Thermodynamics
  - First Law of Thermo=ΔE,q and w
  - Heat and temperature changes (specific heat, heat capacity)
  - Heat transfer processes
  - The thermochemical equation
  - Hess' Law-every possible variation, including use of heats of formation
- Gases
  - every possible relationship in a gas change of state
  - ideal gas equation
  - molecular weights of gases
  - Dalton's Law
  - Graham's Law
- Solids and liquids
  - the intercomponent forces
  - the unit cell, packing, etc
  - phase diagrams
- Entropy and the Second Law

- Solutions
  - Like dissolve like
  - all the colligative properties
  - Raoult’s Law
- Kinetics
  - rate law, etc from kinetic data
  - use of the rate law and stoichiometry of rates
  - 1^{st} order processes
  - mechanisms and rate laws
  - reaction progress diagrams, rds, intermediates and transition states
- Equilibrium
  - writing the form of Q
  - calculating K (from complete and incomplete data) and equilibrium concentrations
  - Q vs K-direction of reaction
  - presentation of how to solve high order systems moving to equilibrium
  - Kp and Kc
  - LeChatelier
  - combining Ks