Chemistry 236 -- Quiz 6

October 15, 2003 — Spectrophotometric Determination of *K*

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1. (3) In the derivation of the expression we will use to analyze our data to obtain the equilibrium constant *K* and the molar absorptivity ε_x for the complex, we made an important assumption. Which of the following was it?

   a. $[M] \approx [M]_0$, because [M] doesn't change during the reaction.
   b. $[I_2] \approx [I_2]_0$, because $[I_2]$ doesn't change during the reaction.
   c. $[M] \approx [M]_0$ and $[I_2] \approx [I_2]_0$, because neither reagent's concentration changes during the reaction.
   d. $[M] \approx [M]_0$, because $[M]_0$ will be chosen to be $>> [I_2]_0$.
   e. $[M] \approx [I_2]$, because we will choose starting conditions such that $[M]_0 = [I_2]_0$.

2. (3) Our derivation yielded a straight-line relationship permitting us to extract *K* and ε_x from an appropriate plot of "*y*" *vs*. "*x*." What are "*x*" and "*y*" here?

   a. $x \equiv [M]_0$; $y \equiv [I_2]_0 \ell / A_x$ b. $x \equiv [M]_0^{-1}$; $y \equiv [I_2]_0 \ell / A_x$
   c. $x \equiv [M]_0$; $y \equiv A_x / [I_2]_0 \ell$ d. $x \equiv [M]_0^{-1}$; $y \equiv A_x / [I_2]_0 \ell$ e. none of these

3. (3) The equilibrium constant *K* is found to be twice as large at 40°C as at 20°C. Calculate $\Delta H°$ for the reaction, under the usual assumption that $\Delta H°$ is independent of *T* over this range. [R = 8.3145 J mol^{-1} K^{-1}.]

   a. –0.23 kJ/mol b. 0.23 kJ/mol c. –26 kJ/mol d. 26 kJ/mol
   e This cannot be determined without additional information. f. none of these

4. (3) The equilibrium A + B ↔ C is studied under conditions that permit direct determination of [A] and [B]. The experiment is initiated by mixing together solutions of A and B containing no C. *K* is determined to be 12.3 L mol^{-1}, and in one particular run, $[A]_{eq}$ = 0.0567 M and $[B]_{eq}$ = 0.0321 M. What was the value of $[A]_0$ for this run?

   a. 0.0224 M b. 0.0321 M c. 0.0567 M d. 0.0791 M
   e This cannot be determined without additional information. f. none of these