

Problem Set 7
Due Friday, December 14, 2007 (at 4:00 p.m.)
(note change from syllabus)
Total Number of Points = 28

Reminders: (1) Write all numbers with the correct number of significant figures and units. Avoid rounding errors by writing intermediate results with additional subscripted non-significant figures. (2) Assume all zeroes to the left of the decimal place are significant. For example, 100 K has three significant figures (and should therefore have been written by Atkins and de Paula as 100. K or 1.00×10^2 K).

1. (18 points) Atkins and de Paula Problem 7.34. Notes:
 - Turn in a printout of your spreadsheet and graph with the trendline equation displayed.
 - Report $\Delta_r H^\circ$ (in kJ mol^{-1}) and $\Delta_r S^\circ$ (in $\text{J mol}^{-1} \text{K}^{-1}$) to three significant figures.
 - Answer these additional questions:
 - (c) Very briefly rationalize the signs of $\Delta_r H^\circ$ and $\Delta_r S^\circ$.
 - (d) Calculate $\Delta_r G^\circ$ (in kJ mol^{-1}) at 200. K (the temperature at the bottom of the stratosphere). Assume that the $\Delta_r H^\circ$ and $\Delta_r S^\circ$ found in part (a) are valid at this temperature.
 - (e) The product of the reaction, ClOOC1, is clearly favored thermodynamically at the temperatures found in the stratosphere. Explain qualitatively why the dimerization reaction does not go to completion.

2. (10 points) Atkins and de Paula Problem 22.31. Notes:
 - Turn in a printout of your spreadsheet and graphs with the trendline equations and R^2 values displayed.
 - Briefly justify your assignment of reaction order.
 - Report the rate constant and the half-life to three significant figures.