

Experimental Chemistry I. CH 361 & 361H
Department of Chemistry, Oregon State University
Fall Term 2019

Guide for the Third Lab Report

Due date: 5:00 PM Wednesday December 11,
Submit on Canvas

This report will be a “Full Paper” format (similar to Report I), but written jointly by the 5-6 people in your group. Each group should continue its collaborative effort through the analysis of the equilibration data and the writing of the group report. How you divide up the work is in your hands. The report should be written as if for submission to a journal. You can assume that the reader is familiar with (or could look it up) background information on laboratory equipment and basic techniques, but the report should include whatever information would be needed for someone to repeat your experiment.

Please make sure that your report addresses the five questions on page 26 of the lab manual. You don't need to “answer” them one at a time; just make sure that your discussion addresses the issues raised in the five questions somewhere. In addition, please perform representative sample calculations for each type of calculation. Graphs should be attached or included within the document; graph labels and legends should be in appropriately sized fonts.

You will cite the individual Communication reports as the source of your alkenes. The beginning of the work reported as a group is the fractional distillation of each alkene. You need to continue through the quantitative GC analysis (determination of response factors P_1/P_c and P_2/P_c from analysis of the stock solutions) and then to the equilibration studies.

From your GC data you will calculate the following (consult the thermodynamic notes following this experiment in the lab manual and the information given in lecture):

- The equilibrium constant, K_{eq} , for 1-ene going to 2-ene for the stock olefin solution at each temperature;
- The free energy, ΔG° , in kJ / mol at each temperature;
- First, make a plot of $\ln K_{eq}$ vs. $1/T$ and determine ΔH° and ΔS° for the isomerization reaction;
- Second, make a plot of ΔG° vs. T and again determine ΔH° and ΔS° for the isomerization reaction;
- Compare the results for ΔH° and ΔS° from each plot and compare with the literature values given in the lab manual. Note: The values of ΔH° and ΔS° should be obtained by linear regression analysis of the data (least squares). A spreadsheet is useful for repetitive calculations, graphing, and performing linear regression (among other functions). See GNS, 7th or 8th Ed., Chapter III on the use of spreadsheets;
- Perform a detailed error analysis of your values for ΔH° and ΔS° for each method of analysis. Since different members of a group may focus on different sections, a completely consistent style of presentation throughout the report is not expected. (Note that this comment does not extend to things like numbers, significant figures, and notations!) However, it is expected that everyone will review the final report prior to submission.