SOLVING KINETICS PROBLEMS WITH THE TI-NSPIRE

TEACHER NOTES

Teaching time: One class period

Topic: Kinetics-Reaction Order

Level: Advanced Placement Chemistry

Prerequisite Knowledge: The student will be expected to have a working knowledge of Kinetics.

Materials: TI-Nspire Calculator

Objectives: In this activity the student will use the List and Spreadsheet and Graphs and Geometry to analyze the relationship between temperature and the concentration in a Kinetics experiment. The student will use the following functions:

1. enter data into lists
2. name lists
3. use formulas to populate data
4. determine regression equations
5. graph data
6. plot regression lines

Discussion: Chemical Kinetics explains the rate at which a chemical reaction occurs. To determine the order of a chemical reaction, time and concentration data is manipulated to get a linear relationship. If concentration vs time is linear, the relationship is zero order. If the natural log of concentration vs time is linear, the relationship is 1st order. If inverse of concentration vs time is linear, the relationship is 2nd order. See Table 12.6 on page 548 in Zumdahl Chemistry, 7th edition. This

problem deals with the dimerization of butadiene by the following reaction:

$$2C_4H_{6(g)} \leftrightarrow C_8H_{12(g)}$$

Teaching Tips: Students will need an understanding of the concept of Chemical Kinetics. Further, students will need an understanding of Orders of Reaction in Kinetics.

Answer: The graph of Inverse Concentration vs. Time is linear because the absolute value of the correlation coefficient (r) is closest to one (1). Therefore, it can be concluded that the reaction is second order in butadiene.