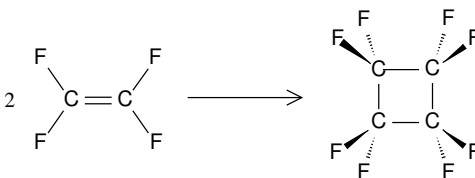


# Chemistry 2740 Spring 2008 Practice Test 3

**Time:** 50 min      **Questions:** 4      **Marks:** 43  
**Aids permitted:** calculator, one 8.5 × 11-inch formula sheet

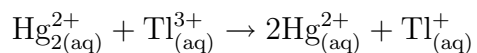
- Classify each of the following reactions as possibly, probably not or certainly not elementary. Explain your reasoning briefly. [2 marks each]
  - $O_{2(g)} + CH_{2(g)} \rightarrow CO_{(g)} + H_2O_{(g)}$
  - $OH_{(aq)} + NO_{(aq)} \rightarrow NO_{2(aq)}^- + H_{(aq)}^+$
- Sketch the apparatus used in the stopped-flow experiment and explain how it works, focusing particularly on aspects which make it suitable for the study of fast reactions. [10 marks]
- The following data were obtained for the gas-phase dimerization of  $C_2F_4$  at  $300^\circ C$ :



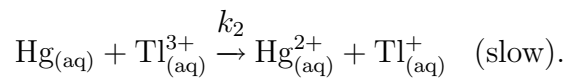
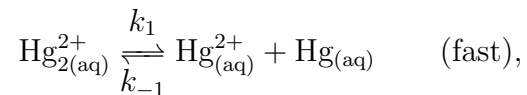
$t/\text{min}$	$[C_2F_4]/\text{mol L}^{-1}$
0	0.0500
250	0.0250
750	0.0125
1750	0.00625
3750	0.00312

- Show that the data are consistent with this being an elementary reaction and calculate the rate constant. [10 marks]
- Suppose that we wanted to collect at least 0.1 mol of the dimer in an experiment starting with 0.25 mol of  $C_2F_4$  in a volume of 0.60 L at  $300^\circ C$ . How long should we let the reaction go? [6 marks]
- The rate constant for the reverse reaction is  $9.6 \times 10^{-13} \text{ s}^{-1}$ . What is the equilibrium constant? [3 marks]

4. The mechanism for the reaction



is thought to be



- (a) What rate law would you predict based on this mechanism? [8 marks]
- (b) Suppose that we carried out two initial rate experiments where, all other factors being held constant, we doubled the concentration of the mercury (II) ion from one experiment to the next. What effect would this have on the rate? [2 marks]