

CE 329, Fall 2015
Assignment 18

Problem Statement

Reagent A undergoes an essentially irreversible isomerization reaction that obeys first-order kinetics ($A \rightarrow B$). Both A and B are liquids at room temperature and both have extremely high boiling points. The rate constant at 163 °C is 0.2 h^{-1} and the activation energy associated with the rate constant is $28,960 \text{ cal mol}^{-1}$. The heat of reaction is constant and is equal to $-20,750 \text{ cal mol}^{-1}$. The heat capacities of species A and B may be assumed to be identical and equal to $125 \text{ cal mol}^{-1} \text{ }^\circ\text{C}^{-1}$. The initial charge to a perfectly mixed batch reactor contains no B, and it contains A at a concentration of $3.6 \text{ millimoles cm}^{-3}$ and at 163 °C. You need to determine how long it will take to reach 97% conversion and what the final temperature will equal if the reactor operates adiabatically.